SUSTAINABLE STORAGE OF GRAINS
BY IMPLEMENTING A NOVEL PROTECTANT
AND A VERSATILE APPLICATION TECHNOLOGY

D4.1 Report on the reference scenarios and alternatives selected per region/type of storage system
June 2021
novIGRain

Reference Scenarios and Alternatives	
Lead beneficiary:	**United Experts**
Main authors:	**Astrid Croes, Lies Bamelis**
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CONTENT

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Executive summary

As the EU is ongoingly adjusting the regulatory framework for plant protection products, fewer and fewer insecticides are still allowed on the market. In addition to the decreasing number of approved active substances, resistance to the existing grain protectants is becoming widespread. The NovIGRain project will start from a scientific resistance assessment and develop a safe to use larvicide (insect growth regulator) in combination with a versatile, dual and ultra low volume application technology which allows to combine two products, diversify the application and help prevent resistance.

This report provides an overview of the current grain storage management systems in Europe and determines the reference scenarios. The research for this report consisted of a literature review, but also interaction with stakeholders during three co-creation workshops and a questionnaire. Not only an overview is given of all currently used systems, but also some upcoming alternatives. The reference scenarios will be the baseline against which the new novIGRain product and application technology will be assessed.

Following a previous study by the European Commission (EU COM, 2017), three regions were selected representing the biggest storage capacity in Europe: France and Spain (southern region), Hungary and Romania (central region) and Germany and Poland (northern region). The research for this study has focussed on respectively France, Hungary and Germany because the novIGRain project partners and their network are situated in these member states.

To differentiate the techniques applied in different kinds and sizes of storage there were also three different types of grain storage defined: storage on farm level, at the operator's level and on port silo level.

The research shows that, over all, either the application of liquid insecticides or fumigation are the most widespread techniques: liquid insecticides in the southern region and fumigation in the central-northern region. The liquid insecticides most used contain the active substances Deltamethrin and Pyrimiphos-Methyl. Phosphines are the most used fumigants. For each of these active substances, the report also describes the most used/sold products containing these substances, their application technique(s) and health hazards.

Remarkable is also that in Hungary there is no real grain storage management system applied on farm level, besides the cleaning of the storage facilities (warehouses). This first step is considered to be common practice in all other regions and on all levels of storage. Further, the research also showed that in Germany the application of diatomaceous earth is the most common technique on farm level.

As alternatives, also fumigation or liquid insecticides are most common (as the counterpart of their respective reference scenario) or ventilation with cool air. Especially in France, ventilation with cool air is already in use and found to be effective. Although there are doubts about the possibilities on farm level because of the costs and benefits at a small scale (high energy costs). It was pointed out that fumigation is not considered as a relevant alternative in this region. Most importantly because of the health hazards connected to this technique.

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PART I

1 Introduction

1.1 Background

The past years, a lot of effort was done to increase the storage capacity for cereals, oilseed complex and protein crops. Nevertheless, there is still a risk of capacity shortage in a number of member states. In order to ensure that the demands of the EU market are met, investments should not only be done in the logistic system itself, but should also focus on the actual storage quality of the cereals. Therefore, to minimize the risk of grain shortage in the EU, the NovIGRain project aims to battle storage losses by developing a new grain protection product, application technique and decision supporting tool, specified in the following objectives:

- The development and testing of a novel larvicide, based on the active substance S-methoprene;
- The development, testing and demonstration of a new ULV application technology;
- To perform an impact assessment that will make the comparison between the more common storage management techniques and the product/application techniques developed in the NovIGRain project.

As the EU is ongoingly adjusting the regulatory framework for plant protection products, fewer and fewer insecticides are still allowed on the market and it is to be expected that in the future more and more active substances will be withdrawn.[1] In addition to the decreasing number of approved active substances, resistance to the existing grain protectants is becoming widespread. This evolution will result in an unvaried application of plant protection products and therefore an increased risk of resistance development.

Within the NovIGRain project the aim is to start from a scientific resistance assessment and develop a new product for larvicide treatment in combination with a versatile, dual and ultra low volume application technology. The benefits of this new product and application technology are multiple, amongst which:

- The broadening of the market with a new product that targets a broad species spectrum;

[1] See for example the study for the United Kingdom (when still in the EU) by the Anderson Center: “Crop Production Technology: The effect of the Loss of Plant Protection Products on UK Agriculture and Horiticulture and the Wider Economy”, p. 17-18, https://www.nfuonline.com/andersons-final-report/.

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- The development of a larvicide or IGR (insect growth regulator) which targets precise development stages in a new and unique way;
- The possibility to apply multiple plant protection products in combination (the larvicide together with an adulticide for example), which diversifies the application even more and reduces the risk of resistance;
- The development of a less hazardous product, with consequently less hazardous residues and therefore good MRL values;
- The development of a product with a favourable mammalian toxicological profile, important for the safe use by product users and grain consumers;
- The use of oil from a renewable and natural origin as a carrier, making the product more sustainable.

The assessment of the innovations will be exercised for different sizes of scale, different regions and for different types of impact (environmental, social and economic). In order to provide an adequate assessment framework, not only the NovIGRain-innovations will be assessed, but also the currently used systems, techniques and products for each region and each type of grain storage. To make the assessment complete, also some new and upcoming other management systems will be assessed in comparison to the NovIGRain innovations.

1.2 Objective

The objective of this report is to determine the reference scenarios and the new upcoming alternatives for each of the selected regions and storage types. This report will give an overview and full description of the reference scenarios to be used as a framework for the impact assessment.

1.3 Outline and methodology of the report

The first part of this report is set out to define the different types of grain storage and the selected regions, but also to give an overview of the current management systems, techniques and products. This first part will be mainly based on a literature review, in combination with the information gathered during the first co-creation workshops[2]. The minutes of these first co-creation workshops are added to this report as annexes I-III.

In the second part of this report, the reference scenarios will be construed. This will be based upon the information shared by the stakeholders who participated in the co-creation workshops but also on the basis of the questionnaire distributed (electronically) afterwards.

[2] These co-creation workshops were held online due to the COVID19-measures.

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The questionnaire and its results are also added to this report as annexes IV-V. The questionnaire is focused on gathering information about the products that are currently used and which upcoming alternatives are being considered.

2 Overview of the current practices in grain storage management

2.1 Overview of the types of grain storage

There are different types of grain storage which can be divided into categories corresponding to the chain of grain storage. The NovIGRain project focuses on pest management, so the grain storage on the farm and in between transportation before the actual processing of the grain are of main importance. The types of storage are therefore defined as follows (from small to bigger storage facilities):

- Storage at farm level: small scale storage varying from 2.000 to 20.000 tons by the farmer himself/herself. Usually in warehouses or smaller silo's.

- Storage at the operator's own silos: medium to large scale storage varying from 50.000 to 500.000 tons by either a farmers cooperative or a grain trading company. Usually in silo's.

- Storage at port silos: medium to large scale storage in ports varying from 20.000 to 500.000 tons (by the sea or along larger rivers, see below), owned by grain trading companies specialized in import and export. Always in silo's.

Important remark is that the storage at port silos are not bigger than the storage by grain trading companies because in ports there are also transit silos located with a continuous flow (in and out) of grain, the grain doesn't stay long in these silos. On the contrary, for trading companies it is sometimes important to keep the grain stored for longer periods (up to one year) to await the right price before selling. There is therefore a difference between trading companies that are based in a port, and transit silos in a port.

Transportation, including transportation on ships, are not covered by the project.

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2.2 Overview of the selected regions

The regions selected are based on:

- Partners involved;
- Largest storage capacity in the EU;
- Geographical diversification.

The Partners of the NovIGRain project are based in Hungary, the Czech Republic, Germany, France and Belgium, already covering a big part of the EU.

Following a previous study on EU crop storage capacity, the member states below have the biggest storage capacity (EU COM, 2017; see figure 1):

- France;
- Germany;
- Spain;
- Poland;
- Hungary;
- Romania.

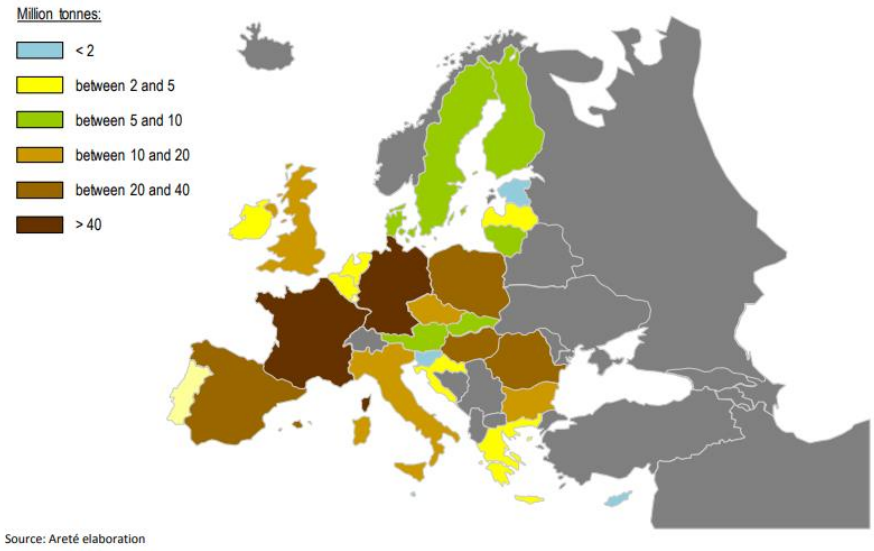

Figure 1 - Current national storage capacity in the EU-28 Member States, by size classes

As for the geographical diversification, it is important the project studies different climatological areas. Not only temperature, but also humidity is an important factor that influences pest management. Therefore, the project partners decided to select three regions: southern (Mediterranean), central and northern Europe.[3] Because the grain

[3] It must be noted that these regions do not correspond to the zones for the authorisation of plant protection products as defined in Annex I to the Regulation (EC) No 1107/2009 of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC.

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storage in the Scandinavian member states are not representative for the rest of the EU, these northern countries are not taken into consideration.

Taken all the above into account, the following groups of member states are chosen as the reference scenario regions for this project:

- South: France and Spain;
- Eastern: Hungary and Romania;
- Central: Germany and Poland.

2.3 Scope of the report

2.3.1 The focus countries

As described above, three regions – south, central and northern – were determined for this research. Each of these regions were selected on the basis of the largest grain producing countries. For the defining of the reference scenarios however, the research was mostly limited to three countries, each for every region. Germany, France and Hungary were selected for organising the first co-creation workshops because novIGRain project partners are located in these countries. These countries are therefore also the focus of this report, including its literature review. For this report we assume, on the basis of the knowledge of the novIGRain project partners and its network, that the grain storage practices in these countries are the same for their region.

2.3.2 Insecticides as referred to in this report

As will be described below, different management systems are currently used in Europe. This report will make the distinction between different systems, for example between the use of liquid insecticides and insecticidal fumigants, although they might be all described in other literature as “insecticides”. For more information about the different management systems and how they are described in this report, see point 2.5.

Outside of the scope of this report:

- Biocides: products used to clean or treat the storage facilities against diseases and regulated by other European legislation than the plant protection products.
- Fungicides: products used to control or exterminate diseases caused by fungi, not insects.
- Herbicides: products used to control or exterminate weeds.
- Rodenticides: products used to kill rodents (mice, rats, …).

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2.4 The current management systems, techniques and products

The most commonly used grain storage management systems, techniques and products are described below. These systems range from preventative techniques such as cleaning to mechanical systems such as ventilation and rotation, and the application of chemical products such as the use of pesticides. Also some new, upcoming alternatives are also described.

2.4.1 Thorough cleaning

Good protection of stored grain starts with general hygiene on the farm or storage area. If the area around the storage place attracts few insects, the risk of contamination will be reduced. Another preventative measure is thorough cleaning of the grain handling equipment and the silos before harvesting.

Research shows that in France and Hungary, the stakeholders present identified cleaning as the most used measure against pest infestations. Especially in Hungary where the present stakeholders shared their experience that farmers in general do not invest at all in products to spray as insecticide or fumigate over their harvest and cleaning is the only pest management system applied (see annexes I and II).

The information shared by the stakeholders referred in general to the cleaning of warehouses by the farmers themselves before storing their harvest and selling their harvest to traders or producers. But in general, every storage facility needs a thorough cleaning as an important and basic step in every storage management system.

Cleaning includes the following actions (alone or combined, not limitative):

- Sweeping;
- Vacuuming;
- Blowing with compressed air or vacuum guns;
- Washing…

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Figure 2 - Sweeping of a silo[4] (left) and a warehouse (right)

Figure 3 - Washing of a silo

Also the application of biocides are done within this step, but fall outside the scope of this research.

2.4.2 Ventilation and rotation

The ventilation or aeration of grain storage facilities is a wide spread pest management technique in Europe (annexes I-III). Especially in France, the ventilation of warehouses and/or silos is considered as the good and safe way to control the temperature and humidity in the storage on farm level (Annex II and N. Bareil, K. Crépon, F. Piraux, 2018). Because pests and insects thrive better in warmer and humid conditions, it is found that an appropriate ventilation which cools and dries the storage environment has a very good effect on the quality of the grain. Above all, the installation of ventilation systems like fans can be rather inexpensive in comparison with other pest management systems.

Depending on the region, to control temperature and humidity is more or less difficult. In more Northern countries, good ventilation can suffice to keep the temperature low enough but in more southern climates, cool air might not be available in the season after harvest. More and cooled ventilation might be necessary in this case but significantly increases costs.

The stirring (rotation) of the grain in the storage facility is a commonly used technique for the drying of the grain. The stirrers can be installed on the floor of the facility or on the top

[4] http://www.steel-silo.com/grain-silo-maintenance-and-cleaning.html.

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of a silo. This technique is indicated to be most used in combination with ventilation, but did not come up as a commonly used technique during the first co-creation workshops (see annex I, only mentioned during the first co-creation Workshop with Hungarian stakeholders).

2.4.3 Liquid insecticides

For this report, insecticides are understood to be chemical, insect killing substances to be distinguished from insect repellents. Also for this study, insecticides are understood to be liquid substances while fumigants are gaseous substances (see below). Following a recent study (Coceral et.al., 2018) the use of contact insecticides is the number one pest management method applied in larger storage facilities and port silos.

Insecticides are products consisting of an active substance that kills or inactivates infestations of insects. Insecticides can be applied directly on stored grain (Coceral et.al., 2018) and are found to have a longer lasting protection than the fumigation of grains with an active substance (see annex II and the comparison between insecticides and fumigants in part II of this report).

The active substances currently approved in the EU are[5]:

- Deltamethrin
- Pirimiphos-Methyl
- Pyrethrum + Piperonyl Butoxide
- Spinosad

It was pointed out during the workshops that insecticides provide a more long lasting protection (see annex II). On the other hand, the immediate efficiency is experienced as lower than in the case of fumigation. Lastly, the application (conduct of the equipment) of insecticides is easier and also less hazardous in comparison with fumigation. All these reasons combined, give a good explanation why insecticides are more often used at farm level in comparison with fumigation.

The most prominent challenge for the use of insecticides is the upcoming resistance. More and more, the resistance to one or more of the approved insecticides is being detected in most pest species. Therefore, a combination of insecticides becomes necessary and a more used method (Coceral et.al., 2018 and Talukder, 2009).

[5] EU Pesticides Database (v.2.2) Search Active substances, safeners and synergists (europa.eu).

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2.4.4 Fumigation

Fumigation is a technique where a chemical, lethal gas is used to exterminate pests (insects, larvae or fungi), either through poisoning or suffocation. Fumigation applied as a grain storage management technique is always applied in an enclosed space. Following the study of Coceral et.al. (2018, see above) fumigation with phosphine is the **most widespread** management method in Europe. Other fumigants are found to be less effective or more harmful to the grain (Greig & Reeves, 1985).

During the first co-creation workshops (annex I and II), some benefits of fumigation were identified, amongst which the fact that fumigation is less expensive and more effective. The stakeholders identified the efficiency of fumigation to be nearly 100 %. However, on the other hand, also some important challenges were brought up. First of all, the fact that fumigation is a hazardous operation where those involved in the process need to be trained and operate very cautiously. Secondly, the equipment needs to be installed in a building appropriate for the operation of fumigation. Besides these aspects, the stakeholders also acknowledged that although fumigation is very effective, the effect of the product is only temporary and therefore does not prevent re-infestation. For this reason, grain traders in Hungary for example indicated that fumigation is applied several times in a row during storage for a longer period (annex I). Lastly, there is already some detection of resistance to phosphine around the world which makes resistance in Europe more and more plausible, especially considering the fact that phosphine is at the moment the most used fumigant (Coceral et.al., 2018 and Collins, 1998).

Fumigation is used at all levels of the grain supply chain and data show that the use of fumigation has increased over the years. However, because this technique is hazardous and often strictly legislated at national level, it is considered not to be the most used technique on farm level. This was also noticed during the first co-creation workshops (annex I-III). Lastly, it was also observed that fumigation is more and more often outsourced to specialized companies (Coceral et.al., 2018).

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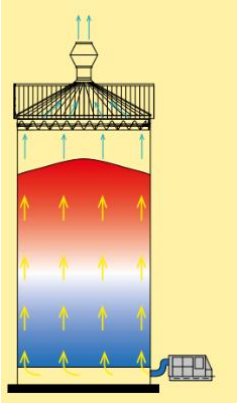
2.4.5 New upcoming and/or biological alternatives

2.4.5.1 Cold

In addition to ventilation, cold airflows can be used to cool down the grain storage facility. When the grain storage is cooled the grain metabolism and the growth of mould, insects and microorganisms are being slowed down and therefore the loss of grain can be reduced. These systems use suction of outside air, cool down this air and flow it into the silo from the bottom up. According to the first co-creation workshop (annex II), this method is applied frequently in France.



The advantage of this technique is that there are no chemicals needed. However, the problem is that the cold does not kill the infestations but freezes it (to sleep) at the most. In that sense, reinfestation is always a possibility. The technique is mostly used by larger companies with silos. For smaller scale storage, the system is found to be too expensive. Not only the installation of the equipment but also the resources (electricity) needed to feed the installation night and day (see annex II). A schematic example is given on the left (figure 2).[6]

Figure 4 - cold air ventilation

2.4.5.2 Heat

The treatment of stored grain with hot air is, besides ventilation and treatment with cool air, another grain storage management system that does not include any additional products. The hot air can be generated by electric, gas, oil, solid fuel (coal, wood or biomass) or steam heaters. The heating can be direct or indirect. With direct heating, the grain passes through a drying bed with hot air. Indirect means that the drying hot air is distributed over the storage facility with fans. The drying air does not come in contact with the combustion air which avoids any contamination with the combustion products.

When using the indirect heating, the whole facility is heated up to 50-60 °C. Any cool spots below 50 °C must be avoided. The effectiveness of this technique depends on the duration of the heating and the temperature. The heating can be lethal for some insects or can reduce its productiveness, depending on the species. There has been multiple studies and lab tests on this subject, which should be studied before implementation (R. Hulasare, B. Subramanyam and A.Y. Abdelghany, 2010). The treatments generally take up multiple

[6] https://en.zanin-italia.com/doc/Zanin_chiller.pdf.

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hours and the heating will also require a lot of energy, which can be found to be negative aspects to this treatment.

2.4.5.3 Inert powders

All over the world, especially in developing countries, the use of inert materials such as ashes, sand and mineral powders are used to fill up the interstitial space in grain storage to provide a barrier to insect movement, which ultimately leads to less infestations (FAO, 1999 and D. Losic and Z. Korunic, 2018). Inert materials are free of chemicals, easy and hazardless in use and leave no (or very small amounts) of residues.

Studies have shown that some materials need more quantity to be effective than others. For example silica-based inert materials such as diatomaceous earths have proven to be very effective and can be used in smaller quantities which is more practical in use (W.G. Jean et.al., 2015).

Diatomaceous earth is the most common inert dust registered for grain storage protection and was mentioned a few times by stakeholders in the first cocreation workshops. Diatomaceous earth consists of almost pure amorphous silicon dioxide, made up of fossilised diatoms, and is especially effective because it causes the removal of the waxy outer layer of the skeleton of many insects. This layer protects the insect's body as a barrier and prevents the loss of water vapour. When this layer is damaged, it causes lethal dehydration.

At this moment, the use of mineral powders such as diatomaceous earth is limited to smaller scale storage facilities because the application on larger scale struggles with the clogging of the nozzles of the appliances. However, it seems that the sector sees real future in these products because research and developments are ongoing (annex I and II). The reason for this interest can be attributed to the fact that it has almost no health risks and also no MRL is identified, which is a huge benefit in comparison to fumigants and chemical insecticides.

2.4.5.4 Controlled atmospheres (CO_2)

There are two types of controlled atmospheres for disinfecting stored grain: low O_2 and high CO_2 atmospheres. With low O_2 atmospheres, the oxygen level must drop below 2% to be fatal for insects. A typical composition contains 1% or less O_2 and 95% of a mixture of N_2, CO_2 and inert gases. This atmosphere can be created naturally when the storage is hermetically closed, the respiratory processes will absorb all the oxygen and produce carbon dioxide, or by burning cokes (or straw) in the air. An efficient high CO_2 atmosphere contains on average 60% CO_2 and would be more rapid in its action than low oxygen atmospheres (Bailey & Banks, n.d.). Which controlled atmosphere combination is best suitable for a certain situation depends on the target (species, development stage and age)

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and on the physical environment (temperature and humidity) and should be examined in advance (Banks & Annis, 1990).

During the first co-creation workshops, the use of CO_2 as pest management technique was indicated as already being used by two silos in France (annex II). However, the stakeholders added that this technique is very difficult to use, possibly referring to the required knowledge of the personnel/farmers and the installation of the technique.

2.4.5.5 Biological control

The application of biological control by adding harmless parasitoids or predators, is a technique that is been known for a longer time and knows a lot of different application methods in different sectors (f.ex. green houses) but is now being reinvestigated in light of the more stringent (European) legislation (M. Schöller, 2010). This research is apparently a hot topic in Germany, but is not received as a good solution by a lot of stakeholders stating that the use of biological control will not be feasible in lager facilities (see annex III). In the literature it is also described as an unknown alternative control method although these parasitoids and predators are abundant and present, for example in Spain (J. Riudavets, “Stored Product Protection Perspectives in Spain).

2.4.5.6 Early warning systems

Lastly, it was pointed out by stakeholders during the first co-creation workshops that besides the development of new products for pest management, there is also interest in the development of so called “early warning systems”. These systems can consist of sensors or drones to scan different parameters like temperature and humidity, parameters known to be of importance for the increase of infestations.

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PART II

3 Defining the reference scenarios

3.1 Determination of the reference framework

In light of the impact assessment that will be carried out on multiple levels of the project in Work Package 4, it was set out to be of big importance to determine the reference framework early on in the project. Therefore, the first task of this Work Package is to research and describe the reference situation or the “business as usual” at this moment in time.

Because the common pest management techniques differ depending on specific storage situations in the different regions in Europe, it was decided to compare three main reference situations (types of storage): the storage at farm level, at the operator’s own silo and at a port silo. For each of these situations, it was also decided that apart from the new novIGRain solution, also two other upcoming alternatives would be evaluated.

The reference management system and the two alternatives are based upon a literature review, the first co-creation workshops, as well as a questionnaire distributed to the stakeholders present at the first co-creation workshop and the network of the novIGRain partners. As indicated before, the notes of the workshops as well as the results of the questionnaire can be found in the annexes.

3.1.1 Germany/Poland

During the first co-creation workshop for the region Germany/Poland, it was indicated that both fumigation and insecticides are used depending on the size of the storage. On the basis of the most recent information provided by the Julius Kühn Institute, official advisor of the federal German government, the most domestic sold active substance in 2019 was Sulfuryl Fluoride. However, although Sulfuryl Fluoride is also registered as a plant protection product, it is in practice only used for fumigation of empty grain mills. Because it is not used to treat the grain itself, it is not within the scope of this study.

Sulfuryl fluoride was followed by several phosphines (aluminium phosphine and magnesium phosphine), fumigants used as plant protection products. Zinc phosphine is not used as a fumigant but in solid form as rodenticide (bait for rodents).

Interesting is the large amount of Kieselgur that is traded in Germany, generally considered as an alternative pest management technique (see above). Kieselgur is a diatomaceous earth (mineral powder) and because of its natural origin not considered as an insecticide in this report. Because it was indicated by the stakeholders that the application of diatomaceous earth on large(r) scale struggles with practical difficulties, f.ex. the clogging

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of the application nozzles, it is assumed in this report that the use of Kieselgur can be attributed to farmers. Therefore it is assumed that the reference scenario on farmer's level is the use of Kieselgur and on larger scale, at the operator's silo or port silo, the use of phosphine. Also for Poland, literature research showed that phosphine is the most used after Methyl Bromide was banned because of its strong ozon depleting characteristics (S. Ignatowicz and P. Olejarski, 2010).

The information of the Julius Kühn Institute is given in the figure below (figure 3) and can be consulted on their website.

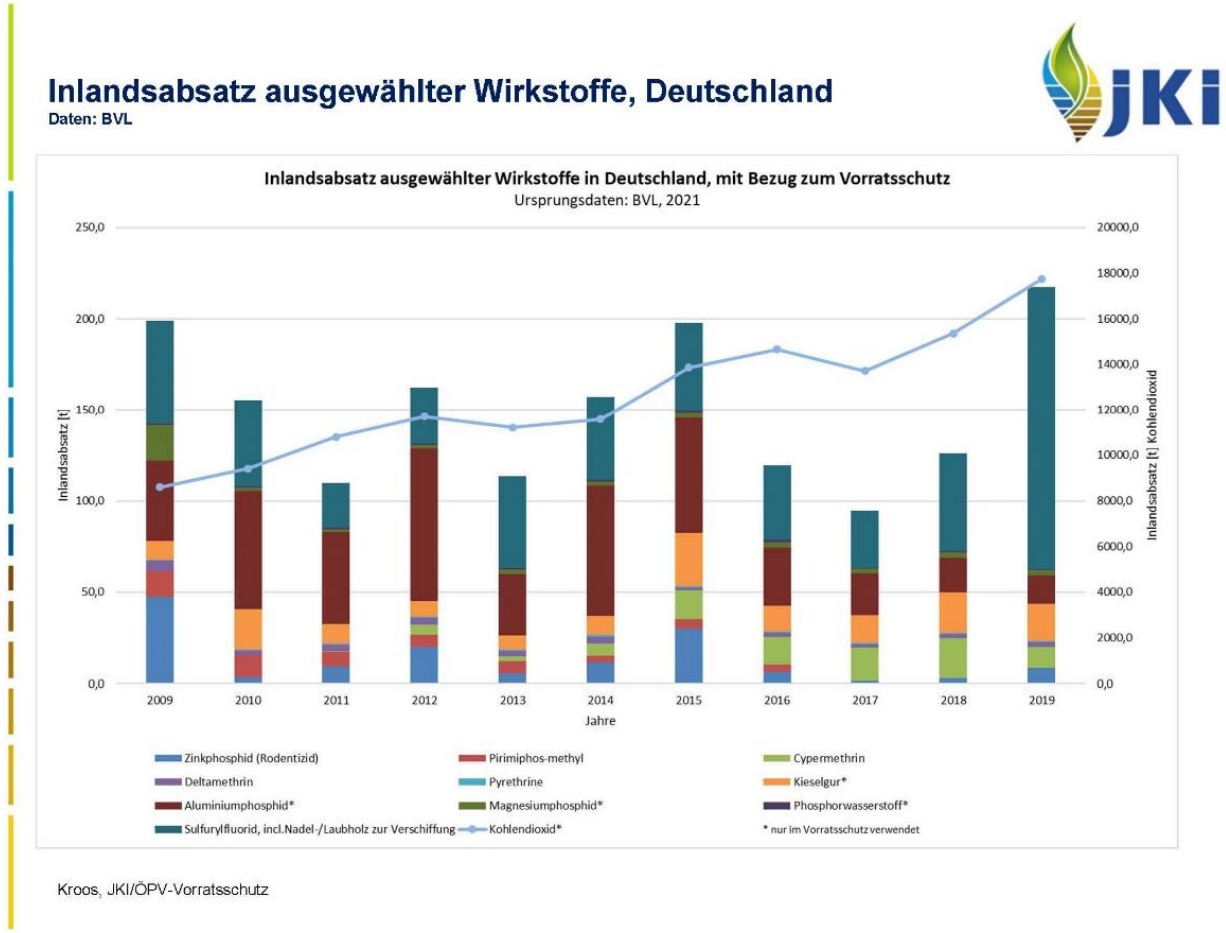

Figure 5 - Domestic sales of actives substances, Julis Kühn Institute[7]

[7] https://vorratsschutz.julius-kuehn.de/images/10-Inlandsabsatz-Wirkstoffe-bis-2019-Kroos-5Mai2020.jpg.

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3.1.1.1 Farm level

Reference scenario: mineral powder

Diatomaceous earth, in the EU commonly known as Kieselgur, is a mineral powder which causes the insects' death by desiccation (dehydration) because it affects/absorbs the insects' protective outer layer. Kieselgur is a fine, white, insoluble powder that originates from fossilized diatoms (micro algae). It is a natural non-chemical product, which immediately gives the benefit of being resistance-free.

The representative formulation that was evaluated by the European Commission was SilicoSec, a product that was also mentioned by the stakeholders during the first co-creation workshops. This product contains 1.000 g/kg of the active substance Kieselgur. SilicoSec is registered in Germany to treat stored products since 1997.

Kieselgur can be applied as earth dust or as slurry (GRDC, 2017 and D. Losic and Z. Korunic, 2018). In literature it is described that slurry spraying has the advantage of exposing workers to less dust and has less impact on the grain bulk density. In the literature it is also mentioned that is should be easier to apply but during the first co-creation workshops the stakeholders identified the clogging of the spraying equipment as a serious problem (annex I). In any case, it is found that the application of dry dust is more effective, reason why the proposed application ratio for dust is much lower than for slurry (D. Losic and Z. Korunic, 2018; see also below). The uses evaluated by the European Commission were only uses with the product as earth dust: mixing with stored cereal grain during the putting into storage and dusting in storage rooms (EFSA, 2020). These uses were identified as the most critical authorised uses on stored cereals from European member states.

The effectiveness and needed dosage of Kieselgur seems to depend on which pest is to be eradicated. In literature it is described that the difference can be attributed to the outer layer of the insect: thick or thin, hairy or flat and the size. Research shows a higher mortality rate, meaning more absorption of particles of diatomaceous earth, when the insect is more hairy. Also the mobility and living habits have an impact on the mortality. The more activity, the more ccontact with the dust particles. The application period can therefore vary quite a bit from 24 hours up to 21 days (D. Losic and Z. Korunic, 2018). For SilicoSec a 100 procent mortality rate for Sitophilus Granaries is obtained after 3-4 weeks and for Oryzaephilus Surinamensis after 1-2 weeks.[8] The same reasoning is suggested to explain the mortality amongst larvae. It is found that younger larvae are more susceptible to the product than older ones: the younger larvae have a softer cuticle and are more agile (D. Losic and Z.

[8] SilicoSec® product information, https://www.biofa-profi.de/en/products-info/silicosec.html.

This project has received funding from the European Union's Horizon 2020 research and innovation programme, under grant agreement No 101000663.

Korunic, 2018). Literature describes that when applied correctly and at a sufficient dosage, Silicosec can provide protection for 12 months (H. Mortazavi et. al., 2020).

A general indication of the application rate is given below (GRDC, 2017):

For the product SilicoSec, the following application rates are given for stored grain[9]:

	Treatment rate	
Preventative	1 kg/t	0,1 %
Curative	2 kg/t	0,2 %

In the assessment by the EU, it is identified that there are "no issues that need to be included as critical areas of concern with respect to the identity, physical, chemical and technical properties of Kieselgur or the representative formulations" as well as no risk at endocrine disruption. The evaluation mentioned only a low risk to birds, wild mammals, aquatic organisms, bees, non-target arthropods other than bees, earthworms, soil organisms, non-target terrestrial plants and sewage treatment organisms (EFSA, 2020). However, it is recommended to use dust masks and goggles during application to avoid breathing in an excessive amount of dust. The safety data sheet for SilicoSec consequently does not show any danger symbols (annex VI).

As mentioned above and in line with the health evaluation, there are no MRL's established for Kieselgur.

For the application by dusting, it is required to have a moving air-stream to spread and direct the dust onto the grains. The product needs to be added evenly to the grain. For SilicoSec specifically it is stated that the application is ideal by hand or with an applicator to a moving grain stream (auger, elevator or conveyor). A problem that was indicated by the stakeholders is the fact that this application of diatomaceous earth is difficult because the nozzles of spraying equipment quickly clogs and breaks the pumps. This is caused by the relatively big particle size of the powder and the fact that is not soluble in water. Also for SilicoSec it is indicated that "pneumatic transport facilities are not suitable for the mixing process or the transport of grain mixed with SilicoSec"[10]. Stakeholders indicated that at this moment, new application appliance(s) are developed to fix this problem. In addition, it is also suggested that the milling industry is (might be) reluctant to accept grain treated with diatomaceous earth because of possible harm to the milling machinery as an effect of its abrasive nature and its negative effect on grain flow in higher dosages (D. Losic and Z. Korunic, 2018).

[9] SilicoSec® product information, https://www.biofa-profi.de/en/products-info/silicosec.html.
[10] SilicoSec® product information, https://www.biofa-profi.de/en/products-info/silicosec.html.

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Besides this practical issue, the use of Kieselgur as pesticide is also limited because the use of the product is not allowed or authorised in a lot of countries around the world. A lot of these countries forbid or limit the addition of dust to grains and grade the quality of the grain based upon the bulk density. The relatively high dosage of Kieselgur needed for an effective performance affects the physical properties and bulk density of the grains (D. Losic and Z. Korunic, 2018).

A study performed in Germany and published in 2000 shows that the farmers who participated were all organic growers. For treatment of stored products, the study shows that SilicoSec was found to be 95 percent successful. In addition it was found that in practice the minimum recommended dosage of SilicoSec should not be applied below the abovementioned indications to minimize damage and avoid efficacy delays (M. Erb-Brinkmann, 2000).

3.1.1.2 Operator's silo

Reference scenario: fumigation

The use of phosphine was already determined to be the predominant fumigant throughout the world (Harin and Subramanyam, 1990) but also for Europe specifically (Coceral et.al., 2018). As stated above, phosphines were the most sold fumigant in Germany after sulfuryl fluoride. However, because it is not directly use on stored grains, it is not considered as a reference. Sulfuryl fluoride was followed by phosphines as most sold fumigant in Germany in 2019.[11]

The formulations of aluminium phosphide and magnesium phosphide are available in solid form: pellets, tablets, filled bags and bag blankets (figure 5). The phosphine tablets or bags start to release gas when in contact with moisture and a high temperature. Depending on the temperature, grain moisture and formulation, the time needed for the phosphine to be released varies. The usual practice is to leave the grain undisturbed after fumigation for more than 72 hours, although it is found that after this period the fumigant compound in the grain declines below the MRL (and even already after one night).

[11] https://vorratsschutz.julius-kuehn.de/images/10-Inlandsabsatz-Wirkstoffe-bis-2019-Kroos-5Mai2020.jpg.

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Figure 6 - Phosphine from left to right: pellets, tablets and bag

The current MRL's for phosphine following the EU authorisation and the Inernational Codex Alimentarius are given in the table below:

	EU MRL mg/kg[12]	CODEX MRL mg/kg[13]
Phosphine (PH3)	0,5 barley, oat, rice, rye, wheat 0,7 sorghum, oat, maize	0,1 cereal grains

Phosphine is found to be only effective against all stages of the life cycle of pests when the gas concentration levels are maintained at a high enough level. Literature describes a level of 300 ppm for seven days or 200 ppm for 7-10 days between 15-25°C (GRDC, 2011). However, for the product Phostoxin (see also below) an exposure time of 4 days at a temperature of 16°-20°C is described.[14]

As stated above, phosphine is the most used fumigant. One of the most important reasons is because other fumigants are more expensive. The other side of the coin is that there is already a lot of resistance detected around the world. Not only because of its widespread use, but also because of mis-use of the product. Most important is that the space where is fumigated (mostly in a silo) is gas-tight and sealed so there are no leakages and the abovementioned levels of phosphine can be maintained. When the silo has leakages, eggs, pupae and larvae might not be killed because they need a constant level before they are affected. These insects in early stages are left in the grain, unseen, and will cause reinfestation. More important, these so-called "partial kills" are very bad for the development of resistance because they will grow resistance genes (GRDC, 2011). The figures below show fumigation in a gas-tight silo and in a silo with leakages.

[12] EU Pesticides Database (europa.eu).
[13] Pesticides | CODEXALIMENTARIUS FAO-WHO.
[14] Applicator's manual for Degesch Phostoxin® oekkets and degesch Phostoxin® tables: http://mccloudservices.com/wp-content/uploads/2012/09/Degesch-America-Phostoxin-Pellets-LABEL.pdf.

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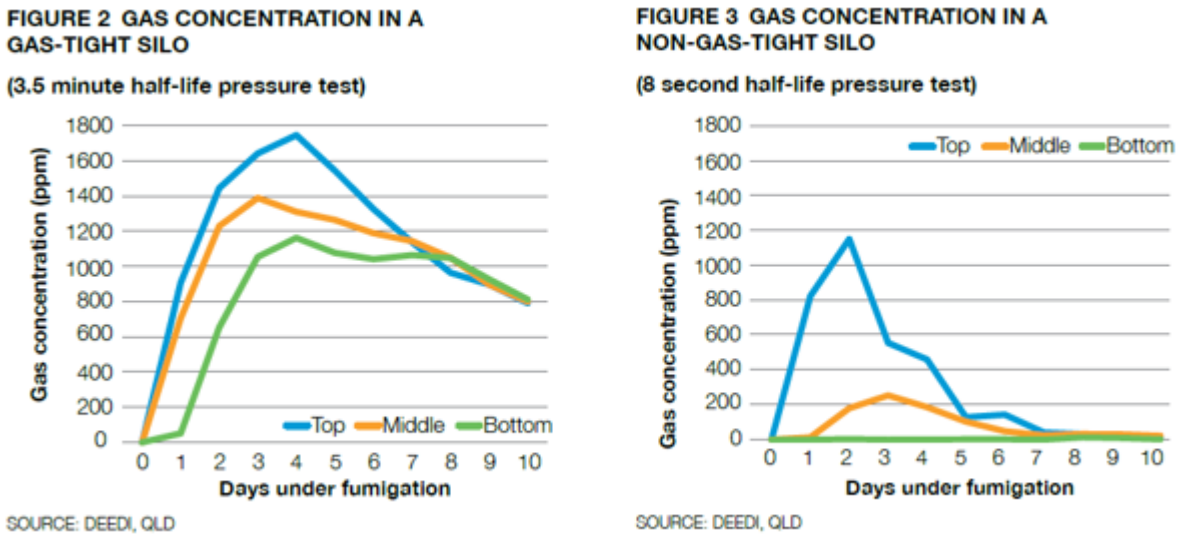

Figure 7 - Concentration levels of phosphine

Research shows that fumigation needs to be applied multiple times because of reinfestation, depending on the duration of the storage and the amount of active substances in the product. Stakeholders also indicated that there are some products that contain an increasingly smaller amount of active substances, causing the need to fumigate more often. Stakeholders described they fumigate on average every 2-3 months for long term storage (annex I and VI-VII). The fact that literature describes full immediate efficiency and the practitioners state they need multiple fumigations when storing grain for a longer period, seems to be contradictory. However, this can be explained by the following elements:

- Some primary insects are able to infest the whole grain bullet and leave their eggs inside the bullet, which makes it possible for these eggs to survive the fumigation, propagate afterwards and reinfest the storage (see also point 3.1.2.1);
- It is not impossible and even more probable that most of the silos are in practice not fully air tight leading to inefficient fumigation;
- There might already be some resistance to phosphine developing in some countries;
- There is external contamination/reinfestation.

An example of aluminium phosphine available in tablets is Phostoxin. The recommended dosage for grain bins is given per tablet[15]:

[15] Applicator's manual for Degesch Phostoxin® oekkets and degesch Phostoxin® tables: http://mccloudservices.com/wp-content/uploads/2012/09/Degesch-America-Phostoxin-Pellets-LABEL.pdf.

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- Per 100 m³: 250-500 tablets;
- Per 100 tons: 360-720 tablets.

Each tablet weighs 3 grams, which gives the following treatment rate:

	Treatment rate	
Curative	0,0108 – 0,0216 kg/t	0,001% - 0,002%

But not only because the desired effectiveness and prevention of resistance, but also because of the safety of the workers applying the fumigation, it is of utmost importance to assure the silo is gas-tight. Fumigations, in comparison with other pest management techniques, is quite hazardous. The gas is colourless and odourless, unless a smell is added for the safety of commercial phosphine (usually garlic-like smell; GRDC, 2011).

- Toxic: when working with phosphine, one should wear protective clothes and equipment because the gas is highly toxic, fatal in low concentrations. At least, one should wear overalls covering from the neck to the wrists, protective glasses, gloves and a self contained breathing apparatus (annex VII). There are portable phosphine monitors on the market that can measure phosphine concentration levels and give alarm when limit values are crossed. When a silo is fumigated, appropriate signs need to be placed. Only after appropriate ventilation it is safe to enter the silo again.
- Flammable: phosphine is not only very toxic, but also highly flammable. When opening containers, one should be very careful and never re-use or re-close a used container. When in contact with moist, the phosphine tablets start to evolve into gas and build up flammability levels.
- Corrosive: phosphine has a corrosive effect on copper materials. The silo needs to be cleared of any copper material or equipment.

The phosphine can be applied from the top of the silo or from the bottom. When added from the bottom, a circulation system is needed to carry the phosphine through the silo and away from the application space at the bottom. Besides this, recirculation with fans can help distributing more effectively through the whole silo. When using such a recirculation system, it is however of utmost importance that the system is monitored closely because when such a system suddenly stops or breaks down, the gas concentration levels can reach explosive levels.

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3.1.1.3 Port silo

Reference scenario: fumigation

See point 3.1.1.2.

3.1.2 France/Spain

For the southern region of France and Spain, it was indicated during the first co-creation workshops that besides ventilation, the use of liquid insecticides is by far the most used pest management technique. This is confirmed by literature and the answers to the questionnaire that was send out. Fumigation is also used but mostly on ships and falls therefore outside the scope of this research.

To identify which active substances were most used as insecticide, we consulted literature and the partners of the novIGRain network. From this research, we could establish that at farm level Deltamethrin is probably the most used insecticide and Pyrimiphos methyl is most used in silos, at the operator's level as well as in ports (Project Quasaprove, 2012; F. Fleurat-Lessard, 2013). This was confirmed during the first co-creation workshop (annex I). Chlorpyriphos-methyl was also found to be one of the most used substances but the approval of the active substance by the EU was not renewed in 2019.[16]

Tab. 1 : ≈ 50% des OS traitent le grain et les locaux ; 27% traitent le grain uniquement

Globalisation des enquêtes 2010 et 2011 (résultats exprimés en %)				
		Traitement du grain et des locaux	Traitement direct du grain	
	Traitement des locaux	Traitement des locaux + traitement grain avant ou pendant stockage	Traitement du grain avant stockage	Traitement du grain pendant stockage
Chlorpyriphos-méthyle	11,8	3,2	2,1	1,1
Deltaméthrine	8	4,3	5,9	3,2
Pyrimiphos-méthyle	12,8	12,3	10,7	4,3
TOTAL	32,6	19,8	18,7	8,6

Figure 8 - Table from the Project Quasaprove[1]

Cypermehthrin in combination with Piperonyl Butoxide was another substance found to be used at port silo level and indicated as second to most used in the study of Coceral in 2019 (Coceral, 2019). However, since then, the approval of the use of Cypermethrin as a plant protection product has been withdrawn[17]. Therefore, this substance will not be researched in light of this project.

[16] Voting on 6 December 2019 of the Standing Committee on Plants, Animals, Food and Feed on the renewal of the approvals of clorpyrifos and chlorpyrifos-methyl, https://ec.europa.eu/food/plants/pesticides/approval-active-substances/renewal-approval/chlorpyrifos-chlorpyrifos-methyl_en.

[17] Commission Implementing Regulation (EU) 2021/795 of 17 May 2021 withdrawing the approval of the active substance alpha-cypermethrin in accordance with Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market, and amending Commission Implementing Regulation (EU) No 540/2011.

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Piperonyl Butoxide (PBO) is as a synergist often used in combination with Pyrethrins, however this combination is more often used as a biocide than as a plant protection product. In addition, it was indicated that products with PBO and Pyrethrins are expensive in comparison to products with Deltamethrin and Pyrimiphos-methyl and are not as effective because of no residual activity.

All things considered, the use of Deltamethrin and Pyrimiphos-methyl are selected as reference scenarios for their use at farm level on the one hand and at the operator silo and port silo level on the other hand.

3.1.2.1 Farm level

Reference scenario: liquid insecticide

Deltamethrin is considered to be the most used insecticide on farm level in the southern European region of France and Spain. This active substance is a non-systemic, contact insecticide and a pyrethroid. Pyrethroids are insecticides which cause the insects death by paralysis. After contact with the product, the membrane of the nerve cells where the transfer of impulses happens, is blocked and causes eventually lethal paralysis. Pyrethroids are in general considered low risk to humans and commonly used as household insecticides. For example, Deltamethrin is also used on mosquito bednets for the prevention of malaria.

In Europe, one of the most used products with Deltamethrin is K-Obiol. This product is actually a combination of Deltamethrin and the synergist PBO. PBO suppresses the detoxification of the insects body and thereby improves the (speed of the) lethality of the Deltamethrin. K-Obiol, like other insecticides, are sprayed upon the grain. The spraying equipment needs to be calibrated depending on the amount of grain and the (flow of the) spray heads/nozzles used. Examples of the spraying equipment for smaller scale and larger scale application of K-Obiol are given below.[18]

[18] Bayer, "Goedepraktijkengids voor de bescherming van granen", https://www.environmentalscience.bayer.be/-/media/prfbelgium/update-2020/201906kobiolbrochurelrvl.ashx.

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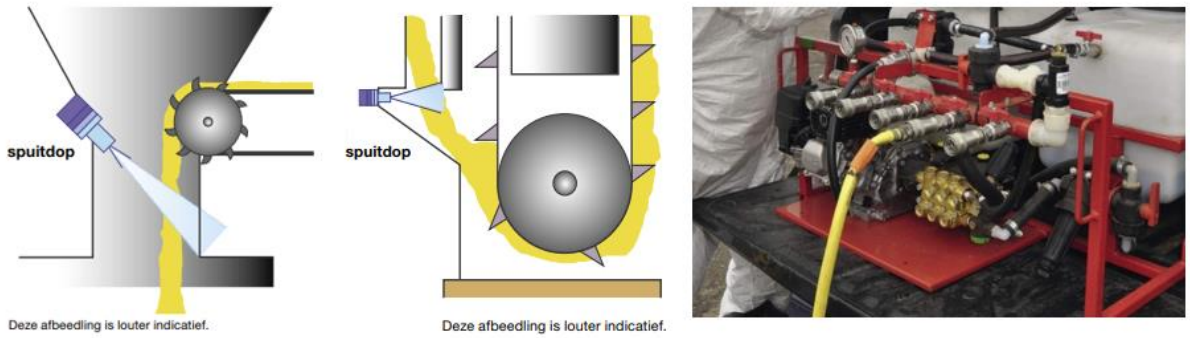

Figure 9 - Application of K-Obiol small scale (one left) and larger scale (two right)

K-Obiol specifically exists in two formulas: one for smaller scale use “K-Obiol EC25” and one for larger scale use “K-Obiol ULV6”. The K-Obiol EC25 formula is commercially available in smaller bottles of 1 liter and contains a concentrate that needs to be mixed with water before applying. The mixture can be applied with any spraying equipment. The K-Obiol ULV6 formula is available in larger barrels of 200 or 1.000 liters that can be connected directly to the spraying equipment. No mixture is needed, but the equipment needs to be compatible.[19]

Depending on the period of protection that is needed, the dosage can be adjusted.

For K-Obiol ULV 6 the manufacturer gives the following indications:

- Protection for 6-10 months: 4,2 liters per 100 tons of grain;
- Protection for 12 months: 8,4 liters per 100 tons of grain.

For K-Obiol EC25:

- Protection of 12 months: 20 ml for 100 tons of grain. [20]

It is described that K-Obiol only has effect upon contact and that preliminary stages of some primary insects within the cereal bulb itself are not affected. Some primary insects, such as the Sitophilus Granarius, Rhyzopertha Dominica or Sitotroga Cerealella, can affect the whole cerial bulb and lay their eggs inside the bulb. These eggs and the early larval stages are not in contact with the product and therefore not affected. On the other hand, K-Obiol is described to be efficient against the eggs and larvae that are nested upon the cereals (or come out the cereal bulb) but it needs to be pointed out that only when a lethal dosage of Deltamethrin is absorbed into the body, the insect will die. For K-Obiol it is described that this is possible after 1 up to 2 months at 15-20 °C.[21] The more the insects move, the faster

[19] Idem.
[20] Idem.
[21] Idem.

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the insects will absorb the Deltamethin. The lower the temperature, the slower this movement goes. The same goes for the eggs and larvae, namely that it is possible that only when they are developed into adult insects their movement increases, and a lethal dosage is absorbed.

The current MRL's for Deltamethrin following the EU authorisation and the International Codex Alimentarius are given in the table below:

	EU MRL mg/kg[22]	CODEX MRL mg/kg[23]
Deltamethrin	1 rice, wheat 2 other cereals	2 cereal grains

Deltamethrin has some health hazards but in comparison to fumigants, the risks are much lower (annex VIII and IX). Depending on the formula containing deltamethrin, the personal protection measures can depend. In general a protective glass, suit and gloves are required (for K-Obiol EC25 a facial screen and a mask with filter are additionally suggested). Exposure to deltamethrine can cause irritation to the eyes, skin and respiratory system and possibly have effect on the nerve system causing a tingling, burning or itchy feeling. When taking appropriate measures, the risks for human life can be limited. Intake of the product on the other hand can be fatal. Deltamethrin is very toxic for the aquatic environment.

3.1.2.2 Operator's silo

Reference scenario: liquid insecticide

Pyrimiphos-Methyl (Pirimiphos-Methyl) is indicated to be the most used insecticide on a larger scale level in the southern European region of France and Spain. Pyrimiphos-Methyl is a contact insecticide and belongs to the group of organophosphates, which means that the active substance breaks down the neurotransmitters carrying the signals to the nerve endings of the body, eventually with a paralysing and suffocating effect. It's effect is in essence the same for insects as for humans and therefore considered to be a risk to human health, especially in developing countries where organophosphate poisoning still occurs (J.V. Peter et. al., 2014). The agricultural use is still allowed around the world but there seems to be more pressure to ban all organophosphate pesticides, also in the EU.[24] The renewal of the approval of the active substance Pyrimiphos-Methyl is therefore not assured.

[22] EU Pesticides Database (europa.eu).
[23] Pesticides | CODEXALIMENTARIUS FAO-WHO.
[24] N. Foote, "EU Commission set to vote on ban of controversial organophosphate pesticides", 4 December 2019, https://www.euractiv.com/section/agriculture-food/news/eu-commission-set-to-vote-on-ban-of-controversial-organophosate-pesticides/.

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In the EU the most commonly used product with Pyrimiphos-Methyl is Pirigrain. This product is as plant protection product available in two formulations: Pirigrain 50 and Pirigrain SLD. The latter has a higher percentage of Pyrimiphos-Methyl, respectively 50 g/l, 72,5 g/l and 250 g/l. Both products are ready to be applied and do not need to be mixed with water or another substance. The application of the product is described to be done best at the place where the grains fall (after transportation) or at the top or foot of a grain elevator (during transportation).

Pyrimiphos-Methyl is effective upon contact with adult insecticides, but also a 100% mortality rate for eggs and larvae are noted for some pests, be it after 6-5 days of exposure (M.C. Boukouvala and N.G. Kavallieratos, 2020).

The advised dosages of Pirigrain 50 are the following: 4-8 liters for 100 tons of grain. For Pirigrain SLD 4-5,5 liters for 100 tons of grain are suggested. Both dosages give protection for 12 monts. In addition, it is also indicated that one application per batch of grains should suffice and is also the maximum of Pyrimiphos-mehtyl application.

The current MRL's for Pyrimiphos-Methyl following the EU authorisation and the International Codex Alimentarius are given in the table below:

	EU MRL mg/kg[25]	CODEX MRL mg/kg[26]
Pyrimiphos-Methyl	0,5 maize, rice and rye 5 other cereals	7 cereal grains

As stated above, there are some health hazards described in literature. More and more, Pyrimiphos-Methyl together with other organophosphates are contested and might be banned from EU approval in the future. Organophosphate poisoning has a series of symptoms from weakness and cramps to paralysis (J.V. Peter et. al., 2014).

For Pirigrain specifically it is advised to wear gloves, a mask with filter (dust mask) and protective clothes. Pirigrain can have an effect on the respiratory system and is toxic for the aquatic environment (annex X and annex XI).

3.1.2.3 Port silo

Reference scenario: liquid insecticide

See point 3.1.2.2.

[25] EU Pesticides Database (europa.eu).
[26] Pesticides | CODEXALIMENTARIUS FAO-WHO.

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3.1.3 Hungary/Romania

Research shows that in Hungary farmers do not use any grain storage management technique in particular, but that the only measure taken is the sweeping and cleaning of the warehouses before storage. Some farmers use some product to treat the warehouses, but not much is known about this by the traders themselves, nor could we find literature on this subject.

Grain trading companies participating in the co-creation workshop, stated they all apply fumigation to treat the grains after the purchase of the farmers. It was indicated that the farmers do not use any insecticide or fumigant because of the price (of the product and equipment), but also because this is not required by the traders. The competition between these traders also withholds them of demanding treatment by the farmers because if they do so, another trader might not and is able to buy the whole lot. Also, it is indicated that if fumigation is applied, it is stated in the purchase contract that the trader bears these costs.

3.1.3.1 Farm level

Reference scenario: cleaning

As mentioned above, the storage management system at farm level is limited to cleaning and swiping.

3.1.3.2 Operator's own silo

Reference scenario: fumigation

The stakeholders at the first co-creation workshop as well as in the questionnaire, indicated that they only use fumigation to treat the stored grains. Therefore it is assumed that fumigation is the reference scenario on a larger scale, for operator's silos as well as for port silos (see below).

The products used are the following (Annex V):

- Phostoxin (aluminium phosphide, see annex VII);
- Megatoxin (magnesium phosphide);
- Quickphos (aluminium phosphide);
- Tekphos (aluminium phosphide).

All of the abovementioned fumigation products contain aluminium phosphide except Megatoxin which contains magnesium phosphide. These products are sold in tablets, pellets or bag blankets.

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For more information on phosphine fumigation, see point 3.1.2.2.

3.1.3.3 Port silo

Reference scenario: fumigation

Although Hungary is a landlocked country, it was indicated by the stakeholders during the first co-creation workshop that bigger silos are located along the river Danube that are comparable to the "port silos" referred to in this report. Hungary was therefore first not considered as a reference country for port silos, but is now added because of this remark by the stakeholders (see also point 1.8.1).

For further information about phosphine fumigation: see point 3.1.1.2.

3.2 Differences with the reference scenarios proposed in the project proposal and alternatives not considered

In the project proposal the following reference framework was given:

Type of storage	Region	Reference Management system	Alternative 1	Alternative 2	*novIGRain* Product
Operator's own silo	Germany / Poland	Fumigation	Insecticide	CO_2, N_2, Cold	X
	France / Spain	Insecticide	Fumigation	CO_2, N_2, Cold	X
	Hungary / Romania	Fumigation	Insecticide		X
Port silo	Germany / Poland	Fumigation	Insecticide		X
	France / Spain	Insecticide	Fumigation		X
	Romania	Fumigation	Insecticide		X
Farm level	Germany / Poland	Fumigation	Insecticide		X
	France / Spain	Insecticide	Fumigation		X
	Hungary / Romania	Nothing	Fumigation		X

3.2.1 Differences: to be described

3.2.1.1 Diatomaceous earth and cleaning added as reference management system

Overall, it can be assessed that most of the reference management systems suggested in the project proposal were withhold after the research performed for the determination of the reference scenarios.

For Germany/Poland the use of diatomaceous earth/Kieselgur was added on the basis of sales numbers. For Hungary/Romania the reference scenario was specified from "nothing" into "cleaning".

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3.2.1.2 *Ventilation, rotation, mineral powders, biological control and early warning systems added as alternatives*

In the project proposal, the alternatives suggested either involved the use of insecticides or fumigation (when the reference scenario was the counterpart) or the consideration to use "CO_2, N_2 or cold". More alternatives were identified during the first co-creation workshops: ventilation, rotation, mineral powders, biological control and early warning systems. These alternatives were described in part I.

3.2.1.3 *Alternative N_2 not considered*

During the first co-creation workshops, nitrogen was not identified as an alternative that is currently considered as an alternative. For France especially, it was identified that nitrogen was known as a fire protection agent, but not as an alternative to an insecticide because of high cost of the product(s).

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4 Visualisation of the reference scenarios

In the first table below, a schematic overview of the research is given. For each storage type and each region, three techniques are defined: one reference management system - pointed out as the most common system and described above - and two alternatives.

Type of storage	region	Reference management system	alternative	alternatives
Farm level	Germany/Poland	Mineral powders (diatomaceaous earth)	Liquid insecticide	Ventilation, biological control
	France/Spain	Liquid insecticide	Ventilation (cooling)	CO2, mineral powders, rotation
	Hungary/Romania	Cleaning	Liquid insecticide	/
Operator's silo	Germany/Poland	Fumigation	Liquid insecticide	Ventilation, biological control, mineral powders
	France/Spain	Liquid insecticide	Ventilation (cooling)	CO2, mineral powders, rotation
	Hungary/Romania	Fumigation	Liquid insecticide	Warning systems
Port silo	Germany/Poland	Fumigation	Liquid insecticide	Ventilation, biological control
	France/Spain	Liquid insecticide	Fumigation	CO2, ventilation (cold and/or warmth), mineral powders
	Hungary/Romania	Fumigation	Liquid insecticide	Warning systems

A second table below gives a more detailed overview.

This project has received funding from the European Union's Horizon 2020 research and innovation programme, under grant agreement No 101000663.

Type of storage	region	Reference management system
Farm level	Germany/Poland	**mineral powders** active substance: diatomaceous earth product example: Silicosec application ratio: 2 kg/t price* estimated protection duration: 12 months
	France/Spain	**liquid insecticide** active substance: Deltamethrin product example: K-Obiol EC25 application ratio: 0,2 ml/t price* estimated protection duration: 12 months
	Hungary/Romania	**cleaning**
Operator's silo	Germany/Poland	**fumigation** active substance: aluminium phosphine product example: Phostoxin tablets application ratio: 0,0108 – 0,0216 kg/t price* duration: 0 days**
	France/Spain	**liquid insecticide** active substance: Pyrimiphos-Methyl product example: Pirigrain 50 or Pirigrain SLD application ratio: 400-800 liter/t price* estimated protection duration: 12 months
	Hungary/Romania	**Fumigation** active substance: aluminium phosphine product example: Phostoxin tablets application ratio: 0,0108 – 0,0216 kg/t price* duration: 0 days**
Port silo	Germany/	**fumigation** active substance: aluminium phosphine product example: Phostoxin tablets application ratio: 0,0108 – 0,0216 kg/t price* duration: 0 days**
	France/Spain	**liquid insecticide** active substance:Pyrimiphos-Methyl product example: Pirigrain 50 or Pirigrain SLD application ratio: 400-800 liter/t price* estimated protection duration: 12 months
	Hungary/Romania	**fumigation** active substance: aluminium phosphine product example: Phostoxin tablets application ratio: 0,0108 – 0,0216 kg/t price* duration: 0 days**

* confidential information of the manufacturers, will be researched for T4.6 with end-users

** fumigation only has effect on the moment itself, on average fumigation must be applied 2-3 times per storage per year to prevent/remedy reinfestation

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5 References

Andersons, The Andersons Center, “Crop Production Technology: The Effect of the Loss of Plant Protection Products on UK Agriculture and Horticulture and the Wider Economy”, commissioned by the Agricultural Industries Confederation (AIC), the Crop Protection Association (CPA) and the National Farmers Union (NFU), October 2011, https://www.nfuonline.com/andersons-final-report/.

C. Newman, “Grain storage: Maintaining grain quality”, 2003, http://storedgrain.com.au/wp-content/uploads/2013/06/WA_grain_quality1.pdf

D. Losic and Z. Korunic, “Diatomaceous earth, a natural insecticide for stored grain protection: recent progress and perspectives”, Nonoscience & Nanotechnology Series, 2018, nr. 44, www.resc.org.

D.J. Greig and M. Reeves, “Prevention of Post-Harvest Food losses: a training manual”, Rome, FAO (Food and Agriculture Organisation of the United Nations), 1985, http://www.fao.org/3/x0039e/x0039e00.htm.

EFSA (European Food Safety Authority), “Peer review of the pesticide risk assessment of the active substance kieselgur (diatomaceous earth), EFSA journal, 21 February 2020, volume 18, issue 3, https://efsa.onlinelibrary.wiley.com/doi/full/10.2903/j.efsa.2020.6054.

EU COM, “Study on storage capacities and logistical infrastructure for EU agricultural commodities trade”, final report, November 2017.

F. Fleurat-Lessard, “Charançons, silvains, capucins, triboliums… ces insectes fréquentent les silos français”, Perspectives Agricoles, October 2013, 38-41.

FAO (Food and Agriculture Organization), “The use of species and medicinals as bioactive protectants for grains”, Rome, FAO Agricultural Services Bulletin, 1999, nr. 137.

GRDC (Grain Research & development corporation), “Fumigating with phosphine, other fumigants and controlled atmospheres – do it right – do it once – a grains industry guide”, January 2011, https://grdc.com.au/__data/assets/pdf_file/0025/206791/fumigating-with-phosphine.pdf.pdf.

GRDC (Grain Research & development corporation), “Grow notes – grain storage”, June 2017, https://grdc.com.au/resources-and-publications/grownotes/technical-manuals/grain-storage.

H. Mortazavi, U. Toprak, M. Emekci, F. Bagci and A.G. Ferizli, “Persistence of diatomaceous earth, Silicosec® against three stored grain beetles”, Journal of Stored

This project has received funding from the European Union's Horizon 2020 research and innovation programme, under grant agreement No 101000663.

Products Research, 6 October 2020, vol. 89, https://www.sciencedirect.com/science/article/abs/pii/S0022474X20304690?via%3Dihub.

H.J. Banks and P.C. Annis , “Comparative advantages of high CO2 and low O2 types of controlled atmospheres for grain storage”. 1990, https://books.google.be/books?hl=nl&lr=&id=_r_8PtOP3AwC&oi=fnd&pg=PA93&dq=use+of+CO2+on+grain+storage&ots=kb-Lwu9j0V&sig=S_mm_B2jb75vuZJS3T110T0vVF8&redir_esc=y#v=onepage&q=use%20of%20CO2%20on%20grain%20storage&f=false

J. Riudavets, “Stored Product Protection Perspectives in Spain”, International European Symposium on Stored Product Protection “Stress on chemical products”, Julius-Kühn-Archiv, 2010, nr. 429, 77-80.

J.V. Peter, T.I. Sudarsan and J.L. Moran, “Clinical features of organophosphate poisoning: a review of different classification systems and approaches”, Indian Journal of Critical Care Medecine, November 2014, 735-745, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4238091/.

K. Bullen, “Insect control in stored grain”, Toowoomba Queensland Australia, Plant Science, DPI&F, 2007.

M. Erb-Brinkmann, “Application of amorphous silica dust (SilicoSec®) in Germany – practical experiences, Integratied Protection of Stored Products, IOB Bulletin, Vol. 23 (10), pp. 239-242.

M. Johnson, B. Luukinen, K. Buhl and D. Stone, “Deltamethrin General Fact Sheet”; National Pesticide Information Center, Oregon State University Extension Services, 2010, http://npic.orst.edu/factsheets/DeltaGen.html.

M. Schöller, “Prospects for biological control of stored-product pests”, International European Symposium on Stored Product Protection “Stess on chemical products”, Julius-K¨uhn-Archiv, 2010, nr. 429, 25-31.

M.C. Boukouvala and N.G. Kavallierators, “Effect of Six Insecticides on Egg Hatching and Larval Mortality of Trogoderme granarium Everts (Coleoptera: Dermedtidae)”, Insects, 2020, www.mdpi.com/journal/insects.

N. Bareil, K. Crépon, F. Piraux, “Prediction of insect mortality in cooled stored garin”, Journal of Stored Products Research, September 2018, pp. 110-117.

P. Harein and Bh. Subramanyam, “fumigating stored grain”, University of Minnesota, Minnesota Extension service, 1990.

This project has received funding from the European Union's Horizon 2020 research and innovation programme, under grant agreement No 101000663.

Project Quasaprove (FranceAgriMer, INRA, ARVALIS-Institut du Végétal, CETIOM, Anses, IFBM, ITERG, and DGAI), “Chantier 4 : Reduction des risues sanitaires en post-reécolte”, synthesis of deliverables 4.1 to 4.5, January 2012, http://www.quasaprove.org/moodle/course/view.php?id=17.

R. Hulasare, B. Subramanyam and A.Y. Abdelghany, “Heat treatment: a viable methyl bromide alternative for managing stored-product insects in food-processing facilities”, 10th International Working Conference on Stored Product Protection, 2010, https://www.grains.k-state.edu/spirel/docs/publications/non-referred/Heat%20treatment%20A%20viable%20methyl%20bromide%20alternative%20for%20managing%20stored-product%20insects%20in%20food%20processing%20facilities.pdf.

S. Ignatowicz and P. Olejarski, “Reduction of pesticides suitable for stored product protection and reaction of Polish industry to a new situation”, conference paper, march 2010, https://www.cabdirect.org/cabdirect/abstract/20113192779.

S.W. Bailey & H.J. Banks, “The use of controlled atmospheres for the storage of grain”, http://bru.gmprc.ksu.edu/proj/iwcspp/pdf2/1/362.pdf.

Toynton, K.; Luukinen, B.; Buhl, K.; Stone, D., “Permethirn General Fact Sheet”, Oregon State University Extension Services, National Pesticide Information Center, 2009, http://npic.orst.edu/factsheets/PermGen.html.

W.G. Jean, N.E. Nchiwan, N. Dieudonné, S. Christopher and C. Adler, “Efficacy of diatomaceous earth and wood ash for the control of sitophilus zeamais in stored maize”, Journal of Entomology and Zoology Studies, 2015, 390-397, https://www.entomoljournal.com/archives/2015/vol3issue5/PartF/3-5-106.pdf.

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6 Annexes

Annex I: Minutes of the first co-creation workshop Hungary
Annex II: Minutes of the first co-creation workshop France
Annex III: Minutes of the first co-creation workshop Germany
Annex IV: Draft of the digital questionnaire
Annex V: Data retrieved from the distributed questionnaire
Annex VI: Safety data sheet Silicosec
Annex VII: Safety data sheet Phostoxin.
Annex VIII: Safety data sheet K-Obiol ULV6
Annex IX: Safety data sheet K-Obiol EC25
Annex X: Safety data sheet Pirigrain 50
Annex XI: Safety data sheet Pirigrain SLD

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Annex I: Minutes of the first co-creation workshop Hungary

MOM – novIGRain co-creation workshop
HUNGARY

Lead presentation of the workshop by Lies Bamelis (UnitedExperts).

Assistance during the presentation by Astrid Croes (UnitedExperts).

Participants (online): Marie Engelbert (Maxiline/Novigrain), Arnaud Poyelle (Sojam), Janos Szilágyi (Balbona Bio), Krisztina Gráner (Balbona Bio), Kósa-Tass Anna Emöke (Balbona Bio), Lucile Rametti (Izinovation), Benoit Roure (Izinovation), Istvan Kovacs (Cargill), Krisztina Pósvári (UBM)

Before starting question whether everyone is ok with recording the workshop: unanimous.

Introduction of the workshop

- Focus on interaction;
- Minutes of the workshop will be drafted and report of the workshop will be drawn up and distributed;
- Some important remarks on GDPR: no comments by the participants;
- If someone would like the recording, it can be forwarded (this is not standard because it is understood that not a lot of people watch is). The recording will only be used internally to process the information.
- Tour de table: quick presentation of the partners and participants.

Introduction of the consortium

Combination of expertise makes a strong consortium.

Introduction of the project

Focus is multiple:

1. develop a novel product for grain storage: product that will be applied on the grains because nowadays still a loss of grains (production), grain protection an good conservation is an important issue. European legislation narrows down the active substances that can be use. Will be a larvicide and a ULV-product (ultra low volume) – hope that it can be a good alternative.

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2. ULV spraying machine: spraying of the product in ultra low volumes and technique where two products can be used at the same time, ex. a larvicide and an adulticide.
3. Decision making tool: research on management and pests and how these can be managed. Partner that works on the comparison of resistances of products, the new products will be assed as well. The research will be made accessible in an easy way for the users.

Focus: less or no losses in grain storage management.

Important: the impact assessment or "LCA assessments" of the innovations.

But also much more: also important that the product is what the market wants and will be used

Therefore: Demo trials (field, bigger scale), co-creation workshops, regional conferences, communications, abstracts, international (!) expert committee (Australia), policy proposals (scientific support for a possible change of the legal framework), articles (scientific and regular for sector communication channels), …

⇨ All to assure the project has a good and useful outcome

⇨ Impact is central

<u>The product:</u>

- Plant oil based
- ULV: residu level can be low(er)
- Specific attack, specific interference in the insect development cycle

⇨ EU approval

What will be delivered

- Final tested prototype: will be tested on all things necessary, researched which impact along the EU guidelines

<u>The application technology</u>

- Simultaneous application of two products
- Adjustable so stakeholder can decide which product and which volumes
- Equipped with buffer tanks etc

What will be delivered

- Prototypes for trials but also upscaling to full scale equipment

<u>Assessment of resistance</u>

- Research on the main products and their resistance
- Supporting tool based upon the research: best practices and accessibility
- 6 target species taken into account

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- New product will be assed as well

⇨ Clear overview

Impact assessment

- Different sizes of scale
- Different types of storage

⇨ SWOT overview: which management which benefits

⇨ Ecological impact: LCA

⇨ Economic impact: CBA, business plan development and market study

⇨ Social impact: LCA (wellbeing, health issues, job creation, …)

⇨ Legal impact: policy proposals

In order to create impact, we need to know the **reference scenarios**. To be able to measure the possible impact, we should know where we start from. This is one of the main things to be discussed in this workshop.

Feedback on reference scenarios

novIGRain selection:

⇨ 3 main reference regions

⇨ Reference management systems per selected region

⇨ Different types of storage

⇨ Comparison to alternative and the new product

Type of storage	Region	Reference Management system	Alternative 1	Alternative 2	*novIGRain* Product
Operator's own silo	Germany / Poland	Fumigation	Insecticide	CO_2, N_2, Cold	X
	France / Spain	Insecticide	Fumigation	CO_2, N_2, Cold	X
	Hungary / Romania	Fumigation	Insecticide		X
Port silo	Germany / Poland	Fumigation	Insecticide		X
	France / Spain	Insecticide	Fumigation		X
	Romania	Fumigation	Insecticide		X
Farm level	Germany / Poland	Fumigation	Insecticide		X
	France / Spain	Insecticide	Fumigation		X
	Hungary / Romania	Nothing	Fumigation		X

- Arnaud Poyelle:
  - For France the reference scenarios seme OK
  - Remark for the reference scenario on farm level: fumigation is difficult and dangerous to use, but more and more useful and possibly it will be used in the future (ex under the influence of the disappearance of the insecticides)
  - Right now fumigation is not used, only insecticides or no products but with ventilation

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- Lies Bamelis: *do you think is about the economic impact or health impact? If not, only taken into account the costs of the products because there are also other economic factors (additional equipment etc)?*
    - Not economic because fumigation is less expensive (which makes it very interesting), but more about dangers, harmful to apply it, the farmers have to protect themselves (quarantine the grain, grain is not approachable for a few days, …)
    - Therefore: only used in very big silos and in box silos where the fumigant can be put directly in the vessel
    - Not economic, more about the "use"
    - Different kind of treatment:
        - Insecticide long term protection (very interesting argument)
        - Fumigation although very efficient (nearly 100% of the bugs killed), only protection when the treatment is done, afterwards not anymore
        - Real difference between the two!
        - Ex. in Russia where they use fumigation and the are very interested in ULV products because of this argument
- Janos Szilágyi (Balbona Bio):
    - Interested in the opinion of UBM and Cargill because not much information about the situation on farm level in Hungary
    - Remark about the selected reference scenarios: port silo as a type of storage is only mentioned for Romania and not for Hungary, which is ok because it is a land-locked country, but a lot of the major silos are situated along the Danube river
- Lies Bamelis: *we will include Hungary again as a region for port silos*
- Krisztina Pósvári (UBM)
    - Farmers: don't do any preventative treatment in the silos or on the goods, they only stock and act "very surprised" when they see bugs appearing
    - Some plants do use treatment, minority
    - Mostly to save money
    - Some companies even have changed and now favour to pick up the harvest without any treatment and then apply more advanced treatment (abroad)
    - UBM applies fumigation afterwards (when bugs are noticed)
- Janos Szilágyi (Balbona Bio): *does this mean that the zero tolerance is only on paper in Hungary? When grain is sold it has to be pest free, right?*
    - Correct, even one bug is a problem so zero tolerance.
- Arnaud Poyelle (Sojam):
    - Input regarding the alternative products and experience of Sojam with these alternative products:
        - N2: not really well used in France, known to prevent fire but not for insect treatment because very pricy

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    - CO2: two silos in France which are using this method but is very difficult
    - Cold: very well know in France, a lot have stopped with pesticide treatment and introduced cold air flow at the bottom of the silo,
        - not really a product
        - is good ventilation but doesn't kill insects
        - only freezes at the best, only asleep
    - Warmth: there is one company developing a warm system, works with an oil product, very slow system because otherwise loss of germination
    - Silicium (diatomea): big silos are trying this, positive effect is that there is no residu, but difficult to apply because when you dissolve it into water it is like very "fine earth" (granule) and therefore there are problems with the application because it clogs the nosals and breaks the pumps (Sojam is developing a system for this)

- Lies Bamelis: *are these alternatives used only in the bigger silos?*
    - Port silos: very difficult to do trials because the silos are so big (> 2 million tons a year)
        - In France one port silo with cold (Axéréal)
    - Smaller scale:
        - Cold systems are too expensive
        - Also electricity for this system(s) is too expensive
- Istvan Kovacs (Cargill):
    - Agrees with UBM, same experiences
    - Farmers do "sweeping and white washing" in the beginning of the season, but no insecticides because of the cost
        - When there is a bug infestation Cargill also applies fumigation (time and time again)
    - Cargill is also researching new opportunities: cooperation with another company on new techniques/warning systems (beginning stage of development)
        - sensor development and data collection on temperature, humidity, …
        - drones to scan heat
- Lies Bamelis: *if the grains are stored as they are now, there are often infestations, but the income of the farmer – does it depend on these infestations? Is there an economical positive impact if they would apply an insecticide? F.ex. that they can sell their grains more expensively?*
- Istvan Kovacs (Cargill): at this moment no, not directly for them because the system is now that the buyer has the responsibility to handle the product
    - Daily/visual check – if they find something than they have the obligation to inform the buyer and afterwards the buyer is responsible
- Arnaud Poyelle (Sojam): confirmation that it is the same in France

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Conclusion:

- ⇨ Fumigation is definitely the "reference scenario' as it is most wide spread in the region. The use of insecticide is definitely not;
- ⇨ There is no use of insecticide nor fumigation at farm level. Farmers do not treat the grains before the storage of the grain, which (often) results in infestations with insects. When collecting the grain from the farmers, it is required to do fumigation (for a couple of times) to assure reaching the required levels of insects in the storage;
- ⇨ Also the cleaning of the silos prior to storage is not always decent at farm level; o It would be interesting to evaluate the installation of a "small scale" application technology for using the insecticides at farm level (paid then by the grain traders), and compare it with the total costs of all the fumigation steps that now would follow given (in the reference scenario);
- ⇨ The use of fumigation has serious risks for health – that should also be taken into account; o Using fumigation has only impact at the moment of the application – there is no "prolonged" prevention of infestation as there is with the use of insecticides;
- ⇨ The grain-silos along the Danube-river can also be considered as "port-silos", non given the fact that they are not really harbours; o Alternatives that might be considered are warmth, N2 (though expensive), CO2 (though difficult), cold (though it does not kill the insect which means that it might be "reactivated" when further handled);
- ⇨ There are also new methods for detecting grain infestations (e.g. drones).

The information that we need:

- indicators for ecological, economic and social impact

- literature review on these topics, but not all information is available
- a **questionnaire** will be send out after the three workshops to help define the reference scenarios (indicators)
    - for the participants
    - to forward to other farmers, buyers, players in "the field"

<u>Feedback on the innovations</u>

- Lies Bamelis: *what products are used now and why? We already know now that fumigation is applied a lot by Cargill and UBM?*
    - Arnaud Poyelle (Sojam):
        - economic reasons

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    - treatment on oily grains is difficult to eliminate, difficult to reach no residues, pressure from EU and picture towards the customer
    - zero treatment is not possible
  - Janos Szilágyi (Balbona): in his experience - in quantity/preference, not based on figures
    - Nr.1 "Deltamethrin"
    - Nr.2 "Permethrin"
  - Arnaud Poyelle (Sojam): some figures for France
    - Nr.1 "Permethrin"
    - Nr.2 "Deltamethrin"
    - Nr.3 "…"
  - In Germany it is different, not possible to treat with Deltamethrin
  - In Italy this product is used, but in very low quantity (compared to France)
  - In Belgium it is used
  - Not convinced it is used that often because it is very expensive
  - When farm level is taken into account, Deltamethrin is the predominant product
  - Depends on the region, trigger to use the one or the other is mostly the cost and the (efficiency of) the distribution

- Lies Bamelis: *do you have issues with resistances?*
- Krisztina Pósvári (UBM):
  - Yes
  - Also some other Chinese products are on the market but the active ingredients are not in the same dosages
  - Fumigation product companies cannot keep changing the prices of the fumigation products, reason why they stretch the amount of product needed (less effective products)
  - This is also the reason why UBM does so much more fumigation
- Lies Bamelis: *research on the economic aspect, to make a comparison between a lot (which is an expense as well) of fumigation or the switch to an insecticide with fewer applications?*
  - Confirmation that this would be interesting

Shifting habits is always difficult, but might be possible if sustained with enough scientific info.

<u>Feedback on the application technology</u>

- Lies Bamelis: *How is the application done now?*

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- Istvan Kovacs (Cargill) and Krisztina Pósvári (UBM)
    - Most of the time the same products are used
    - Not common practice to use insecticides

- Lies Bamelis: *What would be the added value in the use of the new technology (apart from the economics)*
- Krisztina Kovacs (UBM):
    - If the protection can be longer
    - Cannot be pushed to the farmer because there is a big market so there will always be another company buying the goods from the farmer as it is
    - Lies Bamelis: *maybe possible for the buyer to do the investment to install the technology?*
        - Krisztina Kovacs (UBM): In some situations this might be true, but most of the farmer have large warehouses with storage for multiple buyers and although UBM would want to keep their harvest/stock safe, if the other won't join than it will not be possible
    - Lies Bamelis: *looking for a possibility to have a cooperation with the farmers*
        - *Krisztina Kovacs (UBM): Confirmation that this is something to look into*
- Istvan Kovacs (Cargill):
    - Is the active ingredient authorized in EU?
    - Krisztina Gráner (Balbona Bio):
        - S-methoprene is the active substance, it is not authorized right now but under investigation to meet all the EU requirements
        - Worldwide there are already several approvals
        - Already a lot of knowledge, but a lot of additional research is planned

<u>Feedback on the supporting tool</u>

Not like an app on your smartphone, but like a decision tree where you can go through questions and end up with the management systems the project thinks is the best to use.

- *How is it done now ?*
    - We have already learned in this workshop that it heavily depends on the region and that it is not really an active decision by the farmers, operators, …

- Arnaud Poyelle (Arnaud): not only regulation and registration in EU, but problem for customers is also the registration in export countries (China, Japan, Russia, …)

⇨ *To include in decision supporting tool?*

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  - Not easy to include in the supporting tool because this is always evolving
  - Not easy because it is a "very strong business" and to get the needed information on this subject
  - Not that the novIGRain product needs to be approved, but that s-methoprene needs to be regulated/approved as a **residu (residu levels) in the export country** (f.ex. in China)

Future steps

- Upcoming co-creation workshops
  - Jan 22? Additional one?
  - Jan 23
  - Feb 25
- Questionnaires will be launched after the first three workshops. Can be forwarded to other contacts.
- Website
- Newsletter

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Annex II: Minutes of the first co-creation workshop France

MOM – novIGRain Atelier de co-création
FRANCE

Présentation principale de l'atelier par Lies Bamelis (UnitedExperts).

Assistance pendant la présentation par Astrid Croes (UnitedExperts).

Assistance pendant la présentation par Arnaud Poyelle (Sojam).

Participants (en ligne): Laura Napolitano (Simarex), Marie Englebert (Maxiline), Antoni Banasiak (Sojam), Igazgatóság (Balbona Bio), Benoit Confuron (Groupe Carre), Emannuel Perdrix (Groupe Soufflet), Krisztina Graner (Balbona Bio) , Jean Michel Aubert (Cooperative Uneal), Michel Koralewski Axéréal), Bruno Paillaud Cooperative Invivo), Pierre Toussaint (Axéréal), Romain Lefebvre (Simarex), Simon Aimar (Cooperative St Pierre de Juillers)

Avant de commencer, il faut demander si tout le monde est d'accord pour enregistrer l'atelier : ok à l'unanimité.

Introduction à l'atelier :

- L'accent sur l'interaction ;
- Des notes de l'atelier seront prises et un report sera rédigé et distribué ;
- Quelques remarques importantes sur le GDPR : aucun commentaire de la part des participants ;
- Si quelqu'un souhaite recevoir l'enregistrement, celui-ci peut être transmis. L'enregistrement ne sera utilisé qu'en interne pour traiter l'information.
- Tour de table : présentation rapide des partenaires et participants.

Présentation du consortium

La combinaison de l'expertise constitue un consortium solide.

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Présentation du projet :

L'accent est mis sur deux développements techniques et un outil supplémentaire :

1. Développement d'un nouveau produit pour le stockage des céréales (Babolna Bio)
2. Technologie d'application (Sojam)
3. Outil de prise de décision : pour prendre des décisions sur la gestion des céréales

Le projet vise à créer un réel impact sur le marché.

Outre ces développements, d'autres tâches sont également prévues : essais de démonstration (sur le terrain, à plus grande échelle), ateliers de co-création, conférences régionales, communications, résumés, comité d'experts international (!) (Australie), propositions politiques (soutien scientifique pour un éventuel changement du cadre juridique), articles (scientifiques et réguliers pour les canaux de communication du secteur), ...

⇨ Pour assurer une bonne interaction.

Le produit (présentation par Babolna Bio) :

Présentation de la société Babolna Bio, basée en Hongrie :

- La société
- Les activités

Introduction du S-méthoprène :

- Attaque spécifique, interférence spécifique dans le cycle de développement de l'insecte
- Larvicide
- Efficace contre un certain nombre d'insectes qui ruinent la récolte de céréales

⇨ Auparavant, un larvicide n'avait jamais été utilisé pour protéger les céréales dans l'UE : "l'heure du changement !"

- Vente en Australie

Les objectifs du projet :

- Développement et recherche de produits avec la substance active S-méthoprène
- Recevoir l'autorisation nécessaire dans l'UE
- Nouvelle formulation "ULV" (ultra low volume)
- Nouvelle technique de pulvérisation
- Recherche sur la résistance aux insectes
- La préparation d'un nouveau produit sur le marché de l'UE

Le produit :

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- Dénomination temporaire : "Methograin IGR ULV".
- Nouvelle substance active dans l'UE
- A base d'huile (biodiesel ou similaire)
- Produit unique car c'est un larvicide
- Pour traiter le stockage des céréales (stockage intérieur)
- Grand éventail
- Le délai de protection : 6 à 12 mois
- Produit toxicologiquement sûr pour les mammifères
- Bonnes valeurs résiduelles
- Pas d'odeur
- D'origine végétale
- Technique ULV et possibilité d'appliquer le larvicide en parallèle avec un adulticide

⇨ Nouveau produit plus efficace et plus économique

Q : Possibilité de mélange ?

R Babolna : Cela dépend du pays et nous n'avons pas la possibilité de développer maintenant un produit qui soit à la fois un larvicide et un insecticide. Il sera possible de l'utiliser en même temps qu'un insecticide, mais peut-être qu'à l'avenir, dans une troisième phase, nous pourrons mettre au point un mélange.

R Sojam : En France, les mélanges sont possibles. La combinaison de deux substances actives complique beaucoup le produit. L'objectif est maintenant d'obtenir l'approbation de la substance active S-méthoprène dans l'UE et peut-être qu'un mélange pourra être développé plus tard. Cependant, la flexibilité est déjà présente grâce à la technologie d'application - possibilité de combiner le larvicide avec un insecticide.

Q : Y a-t-il des problèmes à prévoir avec les niveaux de résidus et la santé des consommateurs ?

R Babolna : Les résidus sont recherchés et en dessous du seuil. Aucun préjudice pour les consommateurs.

R Sojam : Il existe de nombreuses directives différentes et pour nous, l'UE est celle qui guide ce projet. La réglementation est très restrictive et protège suffisamment les consommateurs.

Q : La formule existe-t-elle déjà dans l'UE ?

R Babolna : La molécule n'existe pas encore.

Q : Combien de temps faut-il pour mettre un tel nouveau produit sur le marché ?

R Babolna : Cela prend 5 à 6 ans.

Q : L'utilisation a un long temps de travail mais ne tue pas les insectes ?

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R Babolna : Il ne peut être utilisé qu'à titre préventif. Si le grain est déjà infesté, le produit ne sera pas suffisamment efficace.

R Sojam : C'est un produit préventif, il ne peut pas être curatif.

Q : *L'approche pourrait être de combiner les deux ? Une approche préventive avec le nouveau produit, puis éventuellement avec un insecticide si des insectes apparaissent ?*

R Babolna : Oui, cela est tout à fait possible.

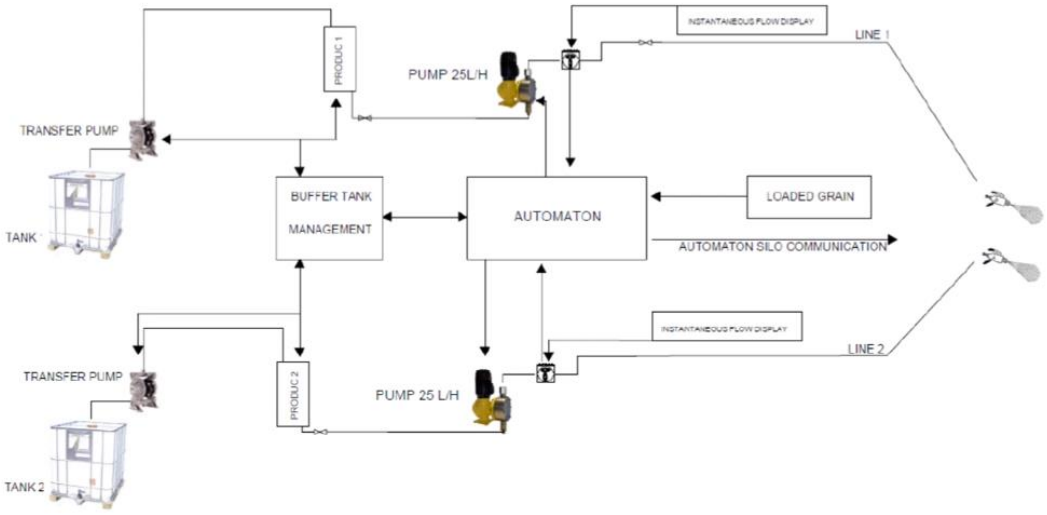
Q : Niveau de résidu zéro ? De plus en plus la question du marché ?

R à regarder :

- Le projet est en phase de réflexion
- En combinaison avec d'autres traitements pour atteindre une pleine efficacité
- Larvicide et ULV donc essentiellement négligeable

<u>La technologie d'application (présentation par Sojam) :</u>

- Combinaison de ce qui existe déjà et de ce qui est nouveau
- Deux produits, deux tampons distincts et deux pulvérisateurs distincts (ne pas faire de mélange de produits).
- Les produits sont pulvérisés séparément les uns des autres en même temps.
- Recherche d'un partenaire avec lequel la technologie peut être testée
- Premiers prototypes pour tester à petite échelle, puis vente à grande échelle
- L'ULV est un concept/mode d'utilisation déjà connu en France, mais pas tellement dans d'autres pays.



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- Pour l'instant, il ne s'agit pas encore de savoir comment installer cette technique d'application (nous en parlerons plus tard dans d'autres ateliers), mais seulement du problème lui-même
    - Il est possible que la technique change au cours du projet, mais pour l'instant, on pulvérise séparément en même temps.
- Le schéma n'est pas représentatif, l'idée est d'avoir une technique totalement intégrée (plus simple) mais c'est encore "un secret de la recherche".

Q : pourcentage de l'insecticide ?

R : des tests seront effectués sur l'efficacité et il sera ensuite possible de mesurer la quantité/réduction de l'insecticide.

Évaluation de la résistance

- Recherche sur les principaux produits et leur résistance en coopération avec notre partenaire tchèque
    - Différentes espèces
    - Différentes substances actives
    - Différents types de stockage

⇨ Outil de soutien basé sur la recherche

⇨ Vue d'ensemble SWOT : quelle gestion, quels avantages

Remarque : dernière étude réalisée en Belgique (universités de Gembloux et de Louvain-la-Neuve) sur la résistance

Il est également important d'évaluer l'impact du projet :

⇨ Impact écologique : LCA

⇨ Impact économique : CBA, élaboration d'un plan d'affaires et étude de marché

⇨ Impact social : LCA (bien-être, questions de santé, création d'emplois, ...)

⇨ Impact juridique : propositions de politiques

Afin de créer un impact, nous devons connaître **les scénarios de référence.** C'est l'un des principaux points abordés lors de cet atelier - il sera également évalué sur la base d'un questionnaire qui sera distribué après l'atelier (dans +- 2 semaines).

Feedback sur les scénarios de référence

Sélection novIGRain :

⇨ 3 principales régions de référence

⇨ Systèmes de gestion de référence par région sélectionnée

⇨ Différents types de stockage

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⇨ Comparaison entre l'alternative et le nouveau produit et évaluation de la meilleure solution.

Type of storage	Region	Reference Management system	Alternative 1	Alternative 2	*novIGRain* Product
Operator's own silo	Germany / Poland	Fumigation	Insecticide	CO_2, N_2, Cold	X
	France / Spain	Insecticide	Fumigation	CO_2, N_2, Cold	X
	Hungary / Romania	Fumigation	Insecticide		X
Port silo	Germany / Poland	Fumigation	Insecticide		X
	France / Spain	Insecticide	Fumigation		X
	Romania	Fumigation	Insecticide		X
Farm level	Germany / Poland	Fumigation	Insecticide		X
	France / Spain	Insecticide	Fumigation		X
	Hungary / Romania	Nothing	Fumigation		X

Q : avez-vous recherché d'autres alternatives et êtes-vous d'accord avec le scénario de référence pour la France ?

- Jean Michel Aubert (coopérative Uneal) :
  - Insecticides dans les silos, pas de fumigation à ce niveau
  - Nettoyage/désinfection avant le stockage
  - Éventuellement utiliser le froid, mais pas d'autres alternatives pour le moment
- Bruno Paillaud (coopérative Invivo, silos) :
  - Insecticides
  - Fumigation ?
  - Le froid (surtout pour les récoltes plus sensibles)
  - Le CO2 est considéré comme intéressant, mais les coûts doivent être examinés
  - Ouvert à toutes les solutions
- Romain Lefebre (Simarex) :
  - Insecticides
  - **Nettoyage approfondi => à ajouter comme alternative**
- Emmanuel Perdrix (groupe Soufflet) :
  - Insecticides dans les silos
  - Le nettoyage comme mesure préventive (!)
  - La fumigation est plus utilisée ces dernières années, les questions spécifiques, le problème avec la fumigation est que la technologie adaptée doit être trouvée
  - Le froid
  - **Les minéraux,** mais seulement pour des situations très spécifiques et à petite échelle
  - Pour les agriculteurs, la fumigation n'est pas vraiment une alternative.
  - **La ventilation** est très utilisée par les agriculteurs dans les régions traditionnelles
- Benoit Confuron (groupe Carre) :
  - Fumigation dans des bâtiments spécifiques

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  - Les poudres inertes sont testées
  - Rotation
  - Ventilation (mais pas la technique du froid)
- Simon Aimar (coopérative St Pierre de Juillers) :
  - Insecticides pour certains silos
  - Bon nettoyage
  - La fumigation sera difficile (elle nécessiterait une très bonne information des travailleurs, etc. - pas encore au niveau requis).
  - **Poudres minérales => à ajouter comme alternative**

Les informations que l'on a besoin :

- Indicateurs pour un impact écologique, économique et social

- Revue de la littérature sur ces sujets là, mais toutes les informations n'y sont pas.
- Un **questionnaire** sera envoyé après les trois ateliers pour aider à définir les scénarios de référence (indicateurs).
  - De cette façon, nous aurons toutes les informations nécessaires.

<u>Feedback sur les innovations</u>

Beaucoup de questions (que nous avons préparées) et de réponses ont déjà été posées et répondues.

<u>Feedback sur la technologie de l'application</u>

Beaucoup de questions (que nous avons préparées) et de réponses ont déjà été posées et répondues.

<u>Feedback sur l'outil de soutien</u>

Pas comme une application sur votre smartphone, mais comme un arbre de décision où vous pouvez passer par des questions et aboutir aux systèmes de gestion que le projet pense être le meilleur à utiliser.

Lors des prochains ateliers, nous présenterons un projet sur lequel les participants pourront donner leur avis.

<u>Les étapes futures</u>

- Ateliers de co-création à venir

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  - Jan 2022 ? Un supplémentaire ?
  - Jan 2023
  - Feb 2025
- Le but est de maintenir l'interaction.
- Des questionnaires seront lancés après les trois premiers ateliers. Ils peuvent être transmis à d'autres contacts.
- Site internet
- Newsletter

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Annex III: Minutes of the first co-creation workshop Germany

MOM – novIGRain co-creation workshop
GERMANY

Lead presentation of the workshop by Lies Bamelis (United Experts).

Assistance during the presentation by Astrid Croes (United Experts).

Participants (online): Jenny Richter (Bundesverband Agrarhandel e.V.), Caroline Potel (Cargill), Oceane Parquet (Izinovation), Lucile Rametti (Izinovation), Yann Ciesla (Izinovation), Anna Emőke Kósa-Tass (Babolna Bio), János Szilágyi (Babolna Bio), Marie Engelbert (Maxiline).

Before starting question whether everyone is ok with recording the workshop: unanimous.

Introduction of the workshop

- Focus on interaction;
- Minutes of the workshop will be drafted and report of the workshop will be drawn up and distributed, ppt as well;
- Referral to GDPR: no comments by the participants;

Introduction of the consortium

Combination of expertise makes a strong consortium.

Introduction of the project

Focus is multiple:

1. develop a novel product for grain storage: product that will be applied on the grains because nowadays still a loss of grains (production), grain protection an good conservation is an important issue. European legislation narrows down the active substances that can be use. Will be a larvicide and a ULV-product (ultra low volume) – hope that it can be a good alternative.
2. ULV spraying machine: spraying of the product in ultra low volumes and technique where two products can be used at the same time, ex. a larvicide and an adulticide.
3. Decision making tool: research on management and pests and how these can be managed. Partner that works on the comparison of resistances of products, the new products will be assed as well. The research will be made accessible in an easy way for the users.

Hope to create some real impact on the sector.

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But also focus on communication: demo trials (field, bigger scale), co-creation workshops, regional conferences, communications, abstracts, international (!) expert committee (Australia), policy proposals (scientific support for a possible change of the legal framework), articles (scientific and regular for sector communication channels), …

- ⇨ All to assure the project has a good and useful outcome
- ⇨ Impact is central
- ⇨ To become more sustainable

The product:

- Plant oil based
- ULV formulation: residu level can be low(er)
- S-metoprene: new substance that is tested
- ⇨ EU approval

The application technology

- Simultaneous application of two products
- Adjustable so stakeholder can decide which product and which volumes, expected and hope is that lower volumes need to be used

Assessment of resistance

- Research on the main products and their resistance
- Supporting tool based upon the research: best practices and accessibility
- In easy to use manual
- 6 target species taken into account
- New product will be assed as well

Impact assessment

- Different sizes of scale
- Different types of storage
- SWOT overview
- ⇨ Ecological impact: LCA
- ⇨ Economic impact: CBA, business plan development and market study
- ⇨ Social impact: LCA (wellbeing, health issues, job creation, …)
- ⇨ Legal impact: policy proposals

In order to create impact, we need to know the **reference scenarios**, this is how it is done today.

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[no questions up until now]

Feedback on reference scenarios

novIGRain selection:

- ⇨ 3 main reference regions
- ⇨ Reference management systems per selected region
- ⇨ Different types of storage
- ⇨ Comparison to alternative and the new product

Type of storage	Region	Reference Management system	Alternative 1	Alternative 2	*novIGRain* Product
Operator's own silo	Germany / Poland	Fumigation	Insecticide	CO_2, N_2, Cold	X
	France / Spain	Insecticide	Fumigation	CO_2, N_2, Cold	X
	Hungary / Romania	Fumigation	Insecticide		X
Port silo	Germany / Poland	Fumigation	Insecticide		X
	France / Spain	Insecticide	Fumigation		X
	Romania	Fumigation	Insecticide		X
Farm level	Germany / Poland	Fumigation	Insecticide		X
	France / Spain	Insecticide	Fumigation		X
	Hungary / Romania	Nothing	Fumigation		X

For Germany:

- Jenny Richter (Bundesverband Agrarhandel):
  - insecticides and fumigation are both used, not really a differentiation between farmers or traders level, more question on size of storage;
  - alternatives: biological control of insects - using beneficial insects (predetors)
    - Janos Szilágyi (Balbona Bio) and Yann Ciesla (Izipest): not in bigger silos
    - Jenny: tests and projects trying to develop because less products approved and more bio grains produced
    - Yann Ciesla (Izipest): product like Cilicosec (active substande amorphous diatomaceous earth) for operators in silos
- Caroline Potel (Cargill): Spinosad (for France yes)? – not approved in Germany
- Janos Szilágyi (Balbona Bio) : letting in air "aeration" (number 1)
- Legal framework is already quite stringent

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The information that we need:

- indicators for ecological, economic and social impact

- literature review on these topics, but not all information is available
- a **questionnaire** will be send out after the three workshops to help define the reference scenarios (indicators)

Feedback on the product

- Jenny Richter (Bundesverband Agrarhandel):
  - +- 8-9 substances approved, at least 3 of them are phosphites
  - Number will decrease in the next years so definitely interest from farmers in innovations
  - Trying to get info on resistancy, but difficult to know whether it is bad application or resistancy (no exact numbers known)
  - Important to take into account information towards end customer (residu level)
- Janos Szilágyi (Balbona Bio): export countries?
  - Jenny Richter (Bundesverband Agrarhandel):
    - Other EU countries mainly
    - Egypt
  - Therefore: is important to have S-metoprene approved in all EU MS

Feedback on the application technology

- Jenny Richter (Bundesverband Agrarhandel):
  - Application of two products at the same time is not already done in Germany
- Janos Szilágyi (Balbona Bio):
  - At farm level tank mixers are used – Jenny Richter agrees but does not know whether this is also used at a bigger scale (silos)
- *Other issues to take into account?* Jenny Richter (Bundesverband Agrarhandel)
  - new technology with lower application rate and therefore other products might be approved

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Feedback on the supporting tool

- Jenny Richter (Bundesverband Agrarhandel): in the national action plan sustainable use of insecticides guideline on storage but still working on more use and more feasible
    - Up until now still difficult to work with it
- *Keep each other informed on this – join and improve forces*

Future steps

- Only upon invitation
- Upcoming co-creation workshops
    - Jan 22? Additional one?
    - Jan 23
    - Feb 25
- Benefit: interaction and feedback
- Open for extra participants – suggestions?
- All kind of activities organised
    - Website
    - Newsletter

If someone would like the recording, it can be forwarded (this is not standard because it is understood that not a lot of people watch is). The recording will only be used internally to process the information.

[taking group picture]

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Annex IV: Draft of the digital questionnaire

QUESTIONNAIRE
grain storage and pest management in Europe

Introduction of the project

The past years, a lot of effort was done to increase the storage capacity for cereals, oilseed complex and protein crops. Nevertheless, there is still a risk of capacity shortage in a number of member states. In order to ensure that the demands of the EU market are met, investments should not only be done in the logistic system itself, but should also focus on the actual storage quality of the cereals. Therefore, to minimize the risk of grain shortage in the EU, the NovIGRain project aims to battle storage losses by developing a new grain protection product, application technique and decision supporting tool for storage management.

As the EU is ongoingly adjusting the regulatory framework for plant protection products, fewer and fewer insecticides are still allowed on the market. In addition to the decreasing number of approved active substances, resistance to the existing grain protectants is becoming widespread. This evolution will result in an unvaried application of plant protection products and therefore an increased risk of resistance development. Within the NovIGRain project the aim is to start from a scientific resistance assessment and develop a new product for larvicide treatment in combination with a versatile, dual and ultra low volume application technology. The benefits of this new product and application technology are multiple, amongst which the broadening of the market with a product that targets a broad species spectrum and the possibility to apply multiple plant protection products in combination, which reduces the risk of resistance.

Purpose of the questionnaire

The project will include an assessment of the ecological, economic and social impact. However, to assess the performance of the new product and application technology, the reference scenario's need to be defined. The project will try to identify one or two reference scenario's for each of the regions studied in this project. The scenario's will be included in every analysis and help define the performance of the project's developments.

The reference scenarios will be based upon a literature study of the grain storage management systems in Europe, on the basis of workshops with invited stakeholders in each region, but also on the basis of this questionnaire.

GDPR

The questionnaire below is anonymous. However, if you are interested in the project and want to be part of upcoming events and/or workshops, we leave the possibility to give us your **contact information**. We would like to underline the importance of your feedback for the project and would like to encourage you to let us get in touch with you. This way, we can inform you about the results of the reference scenarios and keep you updated about further results of the project research. We believe that you, as a stakeholder, could benefit from this information as well.

Your personal (contact) information will only be used for the purpose of the novIGRain project and will not be shared with third parties.

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Guidelines

This questionnaire should not be answered in full sentences, bullet points suffice.

If you don't know the answer, please give an estimation. If you give an estimation, please indicate this (f.ex. with "+-" in front of your answer.

Please fill in the questionnaire by **June 15th**.

We would like to ask you to **forward** this questionnaire to any other relevant stakeholder in the grain storage sector, there are absolutely no limits to this.

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Questionnaire

I. Identification

1. Contact information (not obligatory)
    - Name …
    - Company name …
    - Function …
    - E-mail address …
    - Phone number …
2. Choose your region
    - Germany/Poland
    - France/Spain
    - Hungary/Romania
    - Other: …
3. Choose which description suits you best
    - I represent a grain producing farm
        - Small scale – meaning approximately …tons of grain produced per year
        - Larger scale – meaning approximately … tons of grain produced per year

      Using the following grain storage facility
        - Warehouse
        - Silo inside
        - Silo outside
        - Other: …
    - I represent a local storage facility
        - Private
        - Cooperative

      And
        - Small scale – meaning approximately … tons of grain stored per year
        - Larger scale – meaning approximately … tons of grain stored per year
    - I represent a grain trading company
        - Small scale – meaning approximately … tons of grain stored per year
        - Larger scale – meaning approximately … tons of grain stored per year

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- I represent a port silo facility
    - Small scale – meaning approximately … tons of grain stored per year
    - Larger scale – meaning approximately … tons of grain stored per year
- I represent an agricultural research institute/consultancy company (go to part III of this questionnaire)
- Other (go to part III of this questionnaire): …

II. Questions on grain storage management

The questions below are formulated towards the respondent directly but refer as well to the company the respondent works for.

1. What grain storage/pest management system do you use now? If several, rank from most used to less used.
2. Is the abovementioned technique applied multiple times? If yes, describe the duration of the effectiveness of the technique and how often the technique is applied. If multiple techniques are used, describe for each technique.
3. What products do you use for the abovementioned grain storage/pest management technique? If several, rank from most used to less used. Please give if possible the product name (1), the active substance (2) and the yearly use (3).
    1) Product name
    2) Active substance
    3) Yearly use
4. Has there been a previous treatment of the grain? What treatment and by who?
5. Will there be a follow-up treatment? What treatment and by who?
6. Do you switch between products? If yes, give the reason why and an estimate of the frequency.
7. Do you consider one or more upcoming alternative? If yes, which alternative(s)?
8. Do you know of or have identified resistancy? If yes, for which product(s)/active substance(s)?
9. Can you give an estimation of your storage losses (for each management technique)?
10. How is the application of the abovementioned products (question 3) done right now (application equipment)?
11. How many products are applied at the same time? If several, how does the application technology work (separate, mixed or other)?
12. What is the most important element to assess which grain storage/pest management technique is best used?
    1) Price of the product, the profitability, the cost-benefit analysis
    2) Price of the application technique or installation, the profitability, the cost-benefit analysis

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3) Time management and easy use
4) Environmental concerns
5) Safe use
6) Existing knowledge
7) Way of operation and efficiency of the product or technique

III. Questions on grain storage management for research institutes/consultancy firms and others

1. What grain storage/pest management system is most common in your region? If several, rank from most used to less used. Indicate by who this (these) technique(s) are used (farmer, cooperative, trader, port silo, …)?
2. Does the abovementioned technique needs to be applied multiple times? If yes, describe the duration of the effectiveness of the technique and how often the technique is applied. If multiple techniques are used, describe for each technique.
3. What products are used for the abovementioned grain storage/pest management technique(s)? If several, rank from most used to less used.
4. Are several techniques used after each other in the process chain? If yes, describe the chain.
5. Do users of the abovementioned product(s) switch between products? If yes, give the reason why and an estimate of the frequency.
6. What are the upcoming alternatives and are they considered by the users?
7. Is there a problem with resistancy in your region? If yes, for which product(s)/active substance(s)?
8. How is the application of the abovementioned products done right now (application equipment)?
9. Can you give an estimation of the storage losses (for each management technique)?
10. How many products are applied at the same time? If several, how does the application technology work (separate, mixed or other)?
11. Which is the most important element to assess which grain storage/pest management technique is best used?
    - Price of the product, the profitability, the cost-benefit analysis
    - Price of the application technique or installation, the profitability, the cost-benefit analysis
    - Time management and easy use
    - Environmental concerns
    - Safe use
    - Existing knowledge
    - Way of operation and efficiency of the product or technique

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Annex V: Data retrieved from the distributed questionnaire

QUESTIONNAIRE
grain storage and pest management in Europe

The data retrieved from the digital questionnaire are given below. The introduction to the project and the description of some guidelines are left out from this document, as well as some questions of part "*I. Identification*" because of confidentiality (privacy of the respondents). For this part we refer to annex IV.

For the digitalisation of the questionnaire the program Microsoft Forms was used. As a result of the digitalisation the numbering of the questions might differ from the written questionnaire in annex IV.

I. Identification

6. Choose your region

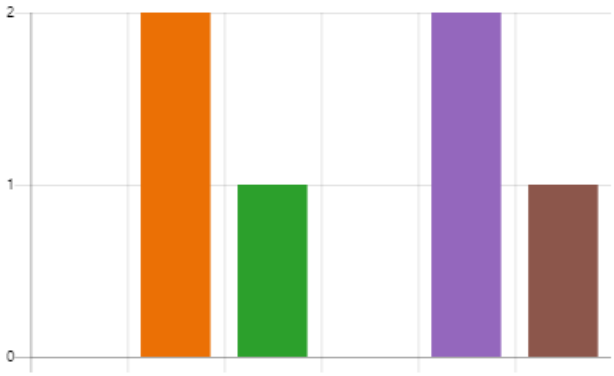
Meer details

Germany/Poland	0
France/Spain	4
Hungary/Romania	0
Andere	2

7. Choose which description suits you best

Meer details

I represent a grain producing f...	0
I represent a local storage faci...	2
I represent a grain trading co...	1
I represent a port silo facility	0
I represent an agricultural rese...	2
Andere	1



8. On what scale?

Meer details

small scale	1
large scale	2

9. How many tons of grain per year?

3 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	800.000
2	anonymous	900 000
3	anonymous	40000

10. Using the following grain storage facility

Meer details

Warehouse	0
Silo inside	2
Silo outside	0
Andere	0

II. Questions on grain storage management

11. What grain storage/pest management system do you use now? If several, rank from most used to less used.

3 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	fumigation of storage area prior to intake, fumigation of stocks by tablets or sachets (depending on type of storage and the commodity)
2	anonymous	ventilation, thermométrie, désinsectisation curatif , tamis, contrôle
3	anonymous	Ventilation / Insecticide

12. Does the abovementioned technique needs to be applied multiple times? If yes, describe the duration of the effectiveness of the technique and how often the technique is applied. If multiple techniques are used, describe for each technique.

3 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	as often as needed, unfo larger stocks often get infested again and again
2	anonymous	ventilation par palier
3	anonymous	Ventilation : several steps according to outside temperature. Insecticide : only once

13. What products do you use for the abovementioned grain storage/pest management technique? If several, rank from most used to less used. Please give if possible the product name (1), the active substance (2) and the yearly use (3).

2 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	we usually use phostoxin or magtoxin for the fumigation
2	anonymous	talisma

14. Has there been a previous treatment of the grain? What treatment and by who?

3 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	some farmers treat the goods/storage place during intake but we usually do not get much information on details of this
2	anonymous	no
3	anonymous	No

15. Will there be a follow-up treatment? What treatment and by who?

2 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	do not have the info
2	anonymous	No (only exception : insecticide at export elevator in case of live insects in the grain)

16. Do you switch between products? If yes, give the reason why and an estimate of the frequency.

3 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	not consciously, we usually leave it with the fumigation company to decide and offer what to use
2	anonymous	no, we don't need it
3	anonymous	No

17. Do you consider one or more upcoming alternative? If yes, which alternative(s)?

3 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	no information on this
2	anonymous	yes we will try to apply préventif traitement only on the top of grain
3	anonymous	Yes : grain cooling, mineral powder

18. Do you know of or have identified resistancy? If yes, for which product(s)/active substance(s)?

3 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	eventually bugs seem to develop a resistancy against any fumigant used, but we have not studied this
2	anonymous	no
3	anonymous	Do not know

19. Can you give an estimation of your storage losses (for each management technique)?

2 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	20%
2	anonymous	No idea. Very few problems encountered.

20. How is the application of the abovementioned products (question 13) done right now (application equipment)?

3 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	carried out by fumigation company basis their own instructions
2	anonymous	by pump
3	anonymous	Insecticide : spraying nozzles. Grain aeration : electric fans.

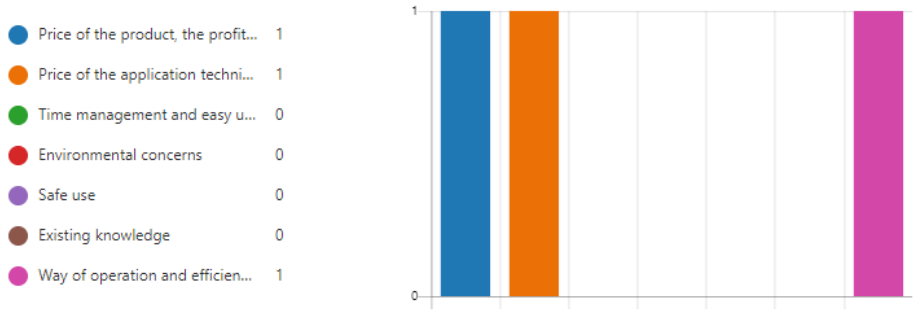
21. How many products are applied at the same time? If several, how does the application technology work (separate, mixed or other)?

3 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	no idea
2	anonymous	1
3	anonymous	One product only

22. What is the most important element to assess which grain storage/pest management technique is best used?

Meer details



III. Questions on grain storage management for research institutes/consultancy firms and others

23. What grain storage/pest management technique is most common in your region? If several, rank from most used to less used. Indicate by who this (these) technique(s) are used (farmer, cooperative, trader, port silo, ...)?

4 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	pre treatment K-Obiol, fumigation tablets/sachets by phostoxin/magtoxin - the bearer of costs is usually regulated under the purchase contract of the goods
2	anonymous	Coop, trader, port = silos (concrete, metal), farmer = concrete pavement covered by a shed All prefer fumigation. The number of pesticide sprays is by far less.
3	anonymous	port silo
4	anonymous	France : 1) Protectants (contact insecticides) 2) Fumigation 3) Alternatives (cooling, freezing, inert dusts). The 1) is used by everybody, the 2) is used by silos & cooperatives, fumigation companies the 3) is used by silos & cooperatives

24. Does the abovementioned technique needs to be applied multiple times? If yes, describe how often.

4 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	after harvest the goods usually last one or more months (depending on type of goods) before bugs start to appear, from that point usually fumigation needs to be done every 2-3 months if goods are stored for longer periods
2	anonymous	2 - 3 x per year, pending on storage, infestation rate and the fate of the commodity
3	anonymous	never
4	anonymous	France : contact insecticides: 1 time but for long storage 2 times ; fumigation: could be reused several times ; Alternatives: 1 time

25. What products are used for the abovementioned grain storage/pest management technique(s)? If several, rank from most used to less used.

4 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	same as point 21
2	anonymous	Phostoxin, Quickphos, , Tekphos tablets, Deltamethrin
3	anonymous	talisma
4	anonymous	France : contact insecticides: Deltamethrin, cypermethrin, pyrimiphos methyl ; fumigation: phosphine ; alternatives: silicoses, spinosad

26. Are several techniques used after each other in the process chain? If yes, describe the chain.

4 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	no information on this
2	anonymous	No exact knowledge on that
3	anonymous	no
4	anonymous	France: Different possibilities: contact insecticides and then (later on time): fumigation; fumigation and then fumigation again (long term storage); alternatives and then fumigation (if non organic cereals)

27. Do users of the abovementioned product(s) switch between products? If yes, give the reason why and an estimate of the frequency.

4 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	no information on this
2	anonymous	No idea, not fully understand the question though.
3	anonymous	never
4	anonymous	France: Fumigation: for absence of residues; contact insecticides: for persistence effet (but there are residues); alternatives: for organic products or products without residues

28. What are the upcoming alternatives and are they considered by the users?

3 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	no information on this
2	anonymous	Do not believe that consumers are highly educated on the future. An alternative is hot air treatment, or IGRs
3	anonymous	France: gas: carbon dioxide, phosphine; powders. The alternatives are not considered by the users, for example the powders are expensive : silicosec around 15euros/T, fumigation around 30cts/T, contact insecticides around 60-70 cts/T, spinosad: 1euros50/T

29. Is there a problem with resistancy in your region? If yes, for which product(s)/active substance(s)?

4 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	yes, but not for something specifically, could be against any fumigant
2	anonymous	Yes there is eg. in case of Tribolium sp against phosphor-hydrogene.
3	anonymous	no, only when insectes are sleeping and weather is cold
4	anonymous	France: yes: cypermethrin & deltamethrin suspected, phosphine suspected in EU (demonstrated in some countries in the world) - spinosad: too recent in the market to be suspected

30. How is the application of the abovementioned products done right now (application technique)?

4 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	usually 8-10 grams/ton dosage, 7+7 days waiting time before delivery
2	anonymous	Tablets are placed within the grain.
3	anonymous	nebulization
4	anonymous	France: contact insecticides: nebulisation and the grains have to be in movement. for fumigation: gas mixed with or without generators. for spinosad: nebulisation. for powders: no official technique, application by compressed air, mix with the grains or surface treatment

31. How many products are applied at the same time? If several, how does the application technology work (separate, mixed or other)?

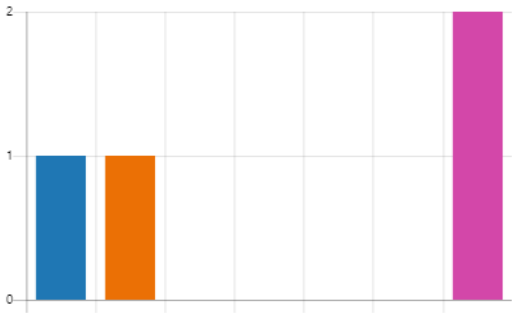
4 Antwoorden

Id ↑	Naam	Antwoorden
1	anonymous	as far as I know only 1
2	anonymous	The most common is to use one product at a time at one silo.
3	anonymous	1
4	anonymous	France: it's forbidden normally, but sometimes you can find several residues of insecticides (1 or 3)

32. Which is the most important element to assess which grain storage/pest management technique is best used?

Meer details

Price of the product, the profit...	1
Price of the application techni...	1
Time management and easy u...	0
Environmental concerns	0
Safe use	0
Existing knowledge	0
Way of operation and efficien...	2



Annex VI: Safety data sheet Silicosec

Safety data sheet
according to Regulation (EC) No 1907/2006, Annex II

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

SilicoSec®
Uncalcined diatomite
Registration number (ECHA): --
Index: ---
EINECS, ELINCS, NLP: ---
CAS: 61790-53-2

1.2 Relevant identified uses of the substance or mixture and uses advised against
Relevant identified uses of the substance or mixture:
Insecticide
Agricultural control chemical
Uses advised against:
No information available at present.

1.3 Details of the supplier of the safety data sheet
GB

Biofa AG
Rudolf-Diesel-Str. 2
72525 Münsingen
Telefon: 07381/9354-0
Fax: 07381/9354-54
www.biofa-profi.de

Qualified person's e-mail address: info@chemical-check.de, k.schnurbusch@chemical-check.de Please DO NOT use for requesting Safety Data Sheets.

1.4 Emergency telephone number
Emergency information services / official advisory body:
GB

+49 (0) 30 / 30686-700 (Berlin)
Telephone number of the company in case of emergencies:

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
Classification according to Regulation (EC) 1272/2008 (CLP)
Not applicable

2.2 Label elements
Labeling according to Regulation (EC) 1272/2008 (CLP)

Uncalcined diatomite
CAS: 61790-53-2, Index:--- EC: ---

EUH401-To avoid risks to human health and the environment, comply with the instructions for use.

2.3 Other hazards
No vPvB substance
No PBT substance
Not applicable

SECTION 3: Composition/information on ingredients

3.1 Substance

Uncalcined diatomite	
Registration number (REACH)	---
Index	---
EINECS, ELINCS, NLP	---
CAS	61790-53-2
content %	
Classification according to Regulation (EC) 1272/2008 (CLP)	---

3.2 Mixture
n.a.

For the text of the H-phrases and classification codes (GHS/CLP), see Section 16.
The substances named in this section are given with their actual, appropriate classification!
For substances that are listed in appendix VI, table 3.1 of the regulation (EC) no. 1272/2008 (CLP regulation) this means that all notes that may be given here for the named classification have been taken into account.

SECTION 4: First aid measures

4.1 Description of first aid measures
First-aiders should ensure they are protected!
Never pour anything into the mouth of an unconscious person!

Inhalation
Remove person from danger area.
Supply person with fresh air and consult doctor according to symptoms.

Skin contact
Remove polluted, soaked clothing immediately, wash thoroughly with plenty of water and soap, in case of irritation of the skin (flare), consult a doctor.

Eye contact
Wash thoroughly for several minutes using copious water. Seek medical help if necessary.
Do not rub.
Product is mechanically abrasive.

Ingestion
Rinse the mouth thoroughly with water.
Give copious water to drink. Consult doctor if necessary.

4.2 Most important symptoms and effects, both acute and delayed
If applicable delayed symptoms and effects can be found in section 11 and the absorption route in section 4.1.
In certain cases, the symptoms of poisoning may only appear after an extended period / after several hours.

4.3 Indication of any immediate medical attention and special treatment needed
n.c.

Safety data sheet according to Regulation (EC) No 1907/2006, Annex II
Revision date / version: 18.03.2020 / 0008
Replacing version dated / version: 21.05.2019 / 0007
Valid from: 18.03.2020
PDF print date: 19.03.2020
SilicoSec®

SECTION 5: Firefighting measures

5.1 Extinguishing media
Suitable extinguishing media
Adapt to the nature and extent of fire.
Product is not combustible.
Unsuitable extinguishing media
n.c.
5.2 Special hazards arising from the substance or mixture
In case of fire the following can develop:
n.a.
5.3 Advice for firefighters
According to size of fire
Protective respirator with independent air supply.
Dispose of contaminated extinction water according to official regulations.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Ensure sufficient supply of air.
Avoid build up of dust.
Avoid contact with eyes or skin.
6.2 Environmental precautions
If leakage occurs, dam up.
Resolve leaks if this possible without risk.
Prevent from entering drainage system.
Prevent surface and ground-water infiltration, as well as ground penetration.
6.3 Methods and material for containment and cleaning up
Pick up mechanically and dispose of according to Section 13.
6.4 Reference to other sections
For personal protective equipment see Section 8 and for disposal instructions see Section 13.

SECTION 7: Handling and storage

In addition to information given in this section, relevant information can also be found in section 8 and 6.1.
7.1 Precautions for safe handling
7.1.1 General recommendations
Avoid build up of dust.
Ensure good ventilation.
Eating, drinking, smoking, as well as food-storage, is prohibited in work-room.
Observe directions on label and instructions for use.
During transfer operations:
Switch on available suction system.
7.1.2 Notes on general hygiene measures at the workplace
General hygiene measures for the handling of chemicals are applicable.
Wash hands before breaks and at end of work.
Keep away from food, drink and animal feedingstuffs.
Remove contaminated clothing and protective equipment before entering areas in which food is consumed.
7.2 Conditions for safe storage, including any incompatibilities
Not to be stored in gangways or stair wells.
Store product closed and only in original packing.
Store in a dry place.
Do not store near substances with strong odours.
7.3 Specific end use(s)
No information available at present.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

GB	Chemical Name	Uncalcined diatomite		Content %:
WEL-TWA: 1,2 mg/m3 (natural, resp. dust)		WEL-STEL: ---		---
Monitoring procedures:		---		
BMGV: ---			Other information: ---	

GB	Chemical Name	general dust limit		Content %:
WEL-TWA: 10 mg/m3 (inhal. dust), 4 mg/m3 (respir. dust)		WEL-STEL: ---		---
Monitoring procedures:		---		
BMGV: ---			Other information: ---	

GB WEL-TWA = Workplace Exposure Limit - Long-term exposure limit (8-hour TWA (= time weighted average) reference period) EH40. AGW = "Arbeitsplatzgrenzwert" (workplace limit value, Germany).
(8) = Inhalable fraction (Directive 2017/164/EU, Directive 2004/37/CE). (9) = Respirable fraction (Directive 2017/164/EU, Directive 2004/37/CE). (11) = Inhalable fraction (Directive 2004/37/CE). (12) = Inhalable fraction. Respirable fraction in those Member States that implement, on the date of the entry into force of this Directive, a biomonitoring system with a biological limit value not exceeding 0,002 mg Cd/g creatinine in urine (Directive 2004/37/CE). | WEL-STEL = Workplace Exposure Limit - Short-term exposure limit (15-minute reference period).
(8) = Inhalable fraction (2017/164/EU, 2017/2398/EU). (9) = Respirable fraction (2017/164/EU, 2017/2398/EU). (10) = Short-term exposure limit value in relation to a reference period of 1 minute (2017/164/EU). | BMGV = Biological monitoring guidance value EH40. BGW = "Biologischer Grenzwert" (biological limit value, Germany) | Other information: Sen = Capable of causing occupational asthma. Sk = Can be absorbed through skin. Carc = Capable of causing cancer and/or heritable genetic damage.
** = The exposure limit for this substance is repealed through the TRGS 900 (Germany) of January 2006 with the goal of revision.
(13) = The substance can cause sensitisation of the skin and of the respiratory tract (Directive 2004/37/CE), (14) = The substance can cause sensitisation of the skin (Directive 2004/37/CE).

8.2 Exposure controls
8.2.1 Appropriate engineering controls

Ensure good ventilation. This can be achieved by local suction or general air extraction.
If this is insufficient to maintain the concentration under the WEL or AGW values, suitable breathing protection should be worn.
Applies only if maximum permissible exposure values are listed here.
Suitable assessment methods for reviewing the effectiveness of protection measures adopted include metrological and non-metrological investigative techniques.
These are specified by e.g. BS EN 14042.
BS EN 14042 "Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents".

8.2.2 Individual protection measures, such as personal protective equipment

General hygiene measures for the handling of chemicals are applicable.
Wash hands before breaks and at end of work.
Keep away from food, drink and animal feedingstuffs.
Remove contaminated clothing and protective equipment before entering areas in which food is consumed.

Eye/face protection:
Tight fitting protective goggles with side protection (EN 166).

Skin protection - Hand protection:
Recommended
Rubber gloves (EN 374).
Permeation time (penetration time) in minutes:
> 480
Protective hand cream recommended.
The breakthrough times determined in accordance with EN 16523-1 were not obtained under practical conditions.
The recommended maximum wearing time is 50% of breakthrough time.

Skin protection - Other:
Protective working garments (e.g. safety shoes EN ISO 20345, long-sleeved protective working garments).

Respiratory protection:
If OES or MEL is exceeded.
Breathing mask with fine-dust filter (EN 143), code colour white.
Observe wearing time limitations for respiratory protection equipment.

Thermal hazards:
If applicable, these are included in the individual protective measures (eye/face protection, skin protection, respiratory protection).

Additional information on hand protection - No tests have been performed.
In the case of mixtures, the selection has been made according to the knowledge available and the information about the contents.
Selection of materials derived from glove manufacturer's indications.
Final selection of glove material must be made taking the breakthrough times, permeation rates and degradation into account.
Selection of a suitable glove depends not only on the material but also on other quality characteristics and varies from manufacturer to manufacturer.
In the case of mixtures, the resistance of glove materials cannot be predicted and must therefore be tested before use.
The exact breakthrough time of the glove material can be requested from the protective glove manufacturer and must be observed.

8.2.3 Environmental exposure controls
No information available at present.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state:	Solid, powder
Colour:	White
Odour:	Odourless
Odour threshold:	Not determined
pH-value:	n.a.
Melting point/freezing point:	1710 °C
Initial boiling point and boiling range:	>2200 °C
Flash point:	n.a.
Evaporation rate:	Not determined
Flammability (solid, gas):	No
Lower explosive limit:	Not determined
Upper explosive limit:	Not determined
Vapour pressure:	Not determined
Vapour density (air = 1):	Not determined
Density:	Not determined
Bulk density:	80-230 g/l
Solubility(ies):	Not determined
Water solubility:	Insoluble
Partition coefficient (n-octanol/water):	Not determined
Auto-ignition temperature:	Not determined
Decomposition temperature:	Not determined
Viscosity:	Not determined
Explosive properties:	Product is not explosive.
Oxidising properties:	No

9.2 Other information

Miscibility:	Not determined
Fat solubility / solvent:	Not determined
Conductivity:	Not determined
Surface tension:	Not determined
Solvents content:	Not determined

SECTION 10: Stability and reactivity

10.1 Reactivity

The product has not been tested.

10.2 Chemical stability
Stable with proper storage and handling.

10.3 Possibility of hazardous reactions
None known

10.4 Conditions to avoid
Strong heat

10.5 Incompatible materials
None known

10.6 Hazardous decomposition products
None known

SECTION 11: Toxicological information

11.1 Information on toxicological effects
Possibly more information on health effects, see Section 2.1 (classification).

Uncalcined diatomite						
Toxicity / effect	**Endpoint**	**Value**	**Unit**	**Organism**	**Test method**	**Notes**
Acute toxicity, by oral route:	LD50	>2000	mg/kg			Analogous conclusion
Acute toxicity, by dermal route:	LD50	>2000	mg/kg			Analogous conclusion
Acute toxicity, by inhalation:						n.d.a.
Skin corrosion/irritation:						Not irritant
Serious eye damage/irritation:						Not irritant
Respiratory or skin sensitisation:						No (skin contact)
Germ cell mutagenicity:						No indications of such an effect.
Carcinogenicity:						No indications of such an effect.
Reproductive toxicity:						No indications of such an effect.
Specific target organ toxicity - single exposure (STOT-SE):						n.d.a.
Specific target organ toxicity - repeated exposure (STOT-RE):						n.d.a.
Aspiration hazard:						No
Symptoms:						n.d.a.

SECTION 12: Ecological information

Possibly more information on environmental effects, see Section 2.1 (classification).

Uncalcined diatomite							
Toxicity / effect	**Endpoint**	**Time**	**Value**	**Unit**	**Organism**	**Test method**	**Notes**
Water solubility:							Insoluble
12.1. Toxicity to fish:							n.d.a.
12.1. Toxicity to daphnia:							n.d.a.
12.1. Toxicity to algae:							n.d.a.

12.2. Persistence and degradability:							Inorganic products cannot be eliminated from water through biological purification methods.
12.2. Persistence and degradability:							Not relevant for inorganic substances.
12.3. Bioaccumulative potential:							Not to be expected
12.4. Mobility in soil:							Not to be expected
12.5. Results of PBT and vPvB assessment							No PBT substance, No vPvB substance
12.6. Other adverse effects:							n.d.a.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

For the substance / mixture / residual amounts

EC disposal code no.:
The waste codes are recommendations based on the scheduled use of this product.
Owing to the user's specific conditions for use and disposal, other waste codes may be allocated under certain circumstances. (2014/955/EU)
06 08 wastes from the MFSU of silicon and silicon derivatives
06 08 99 wastes not otherwise specified
Recommendation:
Sewage disposal shall be discouraged.
Pay attention to local and national official regulations.
E.g. dispose at suitable refuse site.

For contaminated packing material

Pay attention to local and national official regulations.
Empty container completely.
Uncontaminated packaging can be recycled.

SECTION 14: Transport information

General statements

14.1. UN number: n.a.

Transport by road/by rail (ADR/RID)

14.2. UN proper shipping name:
14.3. Transport hazard class(es): n.a.
14.4. Packing group: n.a.
Classification code: n.a.
LQ: n.a.
14.5. Environmental hazards: Not applicable
Tunnel restriction code:

Transport by sea (IMDG-code)

14.2. UN proper shipping name:
14.3. Transport hazard class(es): n.a.
14.4. Packing group: n.a.
Marine Pollutant: n.a
14.5. Environmental hazards: Not applicable

14.6. Special precautions for user
Unless specified otherwise, general measures for safe transport must be followed.

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code
Non-dangerous material according to Transport Regulations.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Observe restrictions:
General hygiene measures for the handling of chemicals are applicable.

Directive 2010/75/EU (VOC): 0 %

15.2 Chemical safety assessment
There is no chemical safety report available.

SECTION 16: Other information

Revised sections: 8
The following phrases represent the posted Hazard Class and Risk Category Code (GHS/CLP) of the product and the constituents (specified in Section 2 and 3).

Any abbreviations and acronyms used in this document:

acc., acc. to according, according to
ADR Accord européen relatif au transport international des marchandises Dangereuses par Route (= European Agreement concerning the International Carriage of Dangerous Goods by Road)
AOX Adsorbable organic halogen compounds
approx. approximately
Art., Art. no. Article number
ASTM ASTM International (American Society for Testing and Materials)
BAM Bundesanstalt für Materialforschung und -prüfung (Federal Institute for Materials Research and Testing, Germany)
BAuA Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (= Federal Institute for Occupational Health and Safety, Germany)
BSEF The International Bromine Council
bw body weight
CAS Chemical Abstracts Service
CLP Classification, Labelling and Packaging (REGULATION (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures)
CMR carcinogenic, mutagenic, reproductive toxic
DMEL Derived Minimum Effect Level
DNEL Derived No Effect Level
dw dry weight
e.g. for example (abbreviation of Latin 'exempli gratia'), for instance
EC European Community
ECHA European Chemicals Agency
EEC European Economic Community
EINECS European Inventory of Existing Commercial Chemical Substances
ELINCS European List of Notified Chemical Substances
EN European Norms
EPA United States Environmental Protection Agency (United States of America)
etc. et cetera
EU European Union
EVAL Ethylene-vinyl alcohol copolymer
Fax. Fax number
gen. general
GHS Globally Harmonized System of Classification and Labelling of Chemicals

GWP Global warming potential
IARC International Agency for Research on Cancer
IATA International Air Transport Association
IBC (Code) International Bulk Chemical (Code)
IMDG-code International Maritime Code for Dangerous Goods
incl. including, inclusive
IUCLID International Uniform Chemical Information Database
LQ Limited Quantities
MARPOL International Convention for the Prevention of Marine Pollution from Ships
n.a. not applicable
n.av. not available
n.c. not checked
n.d.a. no data available
OECD Organisation for Economic Co-operation and Development
org. organic
PBT persistent, bioaccumulative and toxic
PE Polyethylene
PNEC Predicted No Effect Concentration
ppm parts per million
PVC Polyvinylchloride
REACH Registration, Evaluation, Authorisation and Restriction of Chemicals (REGULATION (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals)
REACH-IT List-No. 9xx-xxx-x No. is automatically assigned, e.g. to pre-registrations without a CAS No. or other numerical identifier. List Numbers do not have any legal significance, rather they are purely technical identifiers for processing a submission via REACH-IT.
RID Règlement concernant le transport International ferroviaire de marchandises Dangereuses (= Regulation concerning the International Carriage of Dangerous Goods by Rail)
SVHC Substances of Very High Concern
Tel. Telephone
UN RTDG United Nations Recommendations on the Transport of Dangerous Goods
VOC Volatile organic compounds
vPvB very persistent and very bioaccumulative
wwt wet weight

The statements made here should describe the product with regard to the necessary safety precautions - they are not meant to guarantee definite characteristics - but they are based on our present up-to-date knowledge.
No responsibility.
These statements were made by:

Chemical Check GmbH, Chemical Check Platz 1-7, D-32839 Steinheim, Tel.: +49 5233 94 17 0, Fax: +49 5233 94 17 90

Annex VII: Safety data sheet Phostoxin

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Trade name: PHOSTOXIN PELLET**

· **Authorisation No.:** 052569-60
· **UFI:** DHM7-0J6F-E10N-AT6Q

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.

· **Application of the substance / the mixture** Plant protection product

· **1.3 Details of the supplier of the safety data sheet**

· **Manufacturer/Supplier:**
Detia Freyberg GmbH
Dr.Werner-Freyberg-Str. 11
D-69514 LAUDENBACH
GERMANY

· **Further information obtainable from:**
Detia Freyberg GmbH - Regulatory Affairs
telephone: +49-6201-708-0
e-mail: sicherheitsdatenblaetter@Detia-Freyberg.de

· **1.4 Emergency telephone number:**
Medical Emergency information in case of poisoning: Poison Infomation Center Mainz - Phone: +49 (0) 6131 19240 (advisory service 24/7 in German or English language)
General emergency number: 112

SECTION 2: Hazards identification

· **2.1 Classification of the substance or mixture**

· **Classification according to Regulation (EC) No 1272/2008**

GHS02 flame

Water-react. 1 H260 In contact with water releases flammable gases which may ignite spontaneously.

GHS06 skull and crossbones

Acute Tox. 2 H300 Fatal if swallowed.
Acute Tox. 2 H310 Fatal in contact with skin.
Acute Tox. 2 H330 Fatal if inhaled.

GHS09 environment

Aquatic Acute 1 H400 Very toxic to aquatic life.

GHS07

Eye Irrit. 2 H319 Causes serious eye irritation.

· **2.2 Label elements**

· **Labelling according to Regulation (EC) No 1272/2008**
The product is classified and labelled according to the CLP regulation.

(Contd. on page 2)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 1)

· **Hazard pictograms**

GHS02 GHS06 GHS09

· **Signal word** Danger

· **Hazard-determining components of labelling:**
aluminium phosphide
ammonium carbamate

· **Hazard statements**

H260	In contact with water releases flammable gases which may ignite spontaneously.
H300+H310+H330	Fatal if swallowed, in contact with skin or if inhaled.
H319	Causes serious eye irritation.
H400	Very toxic to aquatic life.

· **Precautionary statements**

P101	If medical advice is needed, have product container or label at hand.
P102	Keep out of reach of children.
P223	Do not allow contact with water.
P232	Protect from moisture.
P234	Keep only in original packaging.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/protective clothing/eye protection/face protection/hearing protection.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P311	IF exposed or concerned: Call a POISON CENTER/doctor.
P370+P378	In case of fire: Use for extinction: CO2, sand, extinguishing powder.
P391	Collect spillage.
P402+P404	Store in a dry place. Store in a closed container.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/container in accordance with local/regional/national/ international regulations.

· **Additional information:**
EUH029 Contact with water liberates toxic gas.
EUH032 Contact with acids liberates very toxic gas.
EUH070 Toxic by eye contact.
EUH401 To avoid risks to human health and the environment, comply with the instructions for use.

· **2.3 Other hazards**

· **Results of PBT and vPvB assessment**

· **PBT:** Aluminum phosphide meets the T criterion, but not the P or B criterion.

· **vPvB:**
This mixture does not contain any substances that are considered to be very persistent or very bioaccumulative (vPvB).

SECTION 3: Composition/information on ingredients

· **3.2 Mixtures**

· **Description:** Mixture of substances listed below with nonhazardous additions.

(Contd. on page 3)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 2)

· **Dangerous components:**

CAS: 20859-73-8 EINECS: 244-088-0	aluminium phosphide Water-react. 1, H260; Acute Tox. 2, H300; Acute Tox. 3, H311; Acute Tox. 1, H330; Aquatic Acute 1, H400 (M=100), EUH029, EUH032	56,0%
CAS: 1111-78-0 EINECS: 214-185-2	ammonium carbamate Eye Dam. 1, H318; Acute Tox. 4, H302	21,0%

· **Additional information:** For the wording of the listed hazard phrases refer to section 16.

SECTION 4: First aid measures

· **4.1 Description of first aid measures**

· **General information:**
Avoid any unnecessary contact with the product.
Call a doctor immediately in the event of an accident or if you feel unwell.
Remove contaminated clothing immediately. Only remove respiratory protection after removing contaminated clothing. Apply artificial respiration if breathing is irregular or has stopped. Supply fresh air. Consult a doctor immediately. Tell the doctor hydrogen phosphide as cause and, if possible, show the safety data sheet or label.
Do not leave affected persons unattended and take them to fresh air or out of the danger zone.
Immediately knock out any clothing soiled by the product in a well-ventilated place and then remove it.
Remove breathing equipment only after contaminated clothing have been completely removed.
Allow contaminated clothing to ventilate well before washing and do not store in closed rooms without ventilation!

· **After inhalation:**
Seek immediate medical advice.
Immediate removal from the danger area!
A supply of fresh air or oxygen must be provided.
Provide artificial respiration if breathing is irregular or has stopped breathing.

· **After skin contact:**
Brush off loose particles from the skin. Wash skin with plenty of soap and water. If skin irritation or rash occurs: Get medical advice / attention.

· **After eye contact:**
Rinse eyes under running water for several minutes with the eyelid wide open. Remove any contact lenses that may be present and continue rinsing.
Consult a doctor for control and if eye irritation persists.

· **After swallowing:**
Do not induce vomiting; call for medical help immediately.
Bring vomit that has already been vomited by the affected person outside.

· **4.2 Most important symptoms and effects, both acute and delayed**
Breathing difficulty
Headache
Dizziness
Gastric or intestinal disorders
Nausea

· **4.3 Indication of any immediate medical attention and special treatment needed**
Symptomatic treatment. Symptoms may be delayed after exposure (up to 48 hours later). Avoid acidosis and prevent pulmonary edema.
No antidote available.

(Contd. on page 4)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 3)

SECTION 5: Firefighting measures

· **5.1 Extinguishing media**

· **Suitable extinguishing agents:**
Use fire extinguishing methods suitable to surrounding conditions.
Extinguishing powder. Do not use water.
Sand. Do not use water.
CO2. Do not use water.
Fire-extinguishing powder
Carbon dioxide
Dry sand
Use a fire blanket for smaller fires.

· **For safety reasons unsuitable extinguishing agents:**
Water
Foam

· **5.2 Special hazards arising from the substance or mixture**
In contact with water, highly flammable and very toxic gases are released.

· **5.3 Advice for firefighters**
Do not inhale explosion and fire gases. Co-ordinate fire-fighting measures to the surroundings. Fight fire with normal precautions from a reasonable distance.

· **Protective equipment:** Wear self-contained respiratory protective device.

SECTION 6: Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Observe the information on exposure limitation and put on personal protective equipment (Section 8).
Ensure adequate ventilation.
Have measuring devices and first aid kit ready.
Keep unprotected persons not working in the area away from the danger area. The danger area is to be made clear by warning signs.
Keep away from ignition sources.

· **6.2 Environmental precautions:**
Do not allow product to reach sewage system or any water course.
Inform respective authorities in case of seepage into water course or sewage system.

· **6.3 Methods and material for containment and cleaning up:**
Pick up mechanically.
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
Do not flush with water or aqueous cleansing agents

· **6.4 Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

SECTION 7: Handling and storage

· **7.1 Precautions for safe handling**
Please observe the regulations of GefStoffV and TRGS 500!
Use of the product only by knowledgeable and trained persons.
Ensure good ventilation/exhaustion at the workplace.
Open and handle receptacle with care.

(Contd. on page 5)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 4)

Avoid any contact of the product with water!
Do not breathe the product dust.

Advice on general hygiene in the workplace:
Take off contaminated clothing immediately. Wash hands after use. Do not eat, drink or smoke in work areas. Remove contaminated clothing and protective equipment before entering any eating area. Do not store food and drinks with chemicals. Do not use containers for chemicals that are normally intended for holding food. Keep away from food, drink and animal feed. Do not breathe gas / vapor / aerosol. Avoid contact with eyes and skin.

· **Information about fire - and explosion protection:**
Avoid dust formation.
If the product is handled openly, devices with local exhaust ventilation must be used.
Protect against electrostatic charges.
Keep away from sources of ignition. Do not smoke!

· **7.2 Conditions for safe storage, including any incompatibilities**

· **Storage:**

· **Requirements to be met by storerooms and receptacles:**
Keep container tightly closed and store in a cool, well-ventilated place.
Keep inaccessible to non-operational and non-specialist persons.

· **Information about storage in one common storage facility:**
Please observe the regulations of TRGS 510!
Do not store together with acids, water, oxidizing substances and self-igniting substances.
Do not store food and drinks with chemicals. Do not use containers for chemicals that are normally intended for holding food. Keep away from food, drink and animal feed.

· **Further information about storage conditions:** None.

· **Storage class:**
4.3 (hazardous substances that form flammable gases in contact with water)

· **7.3 Specific end use(s)** No further relevant information available.

SECTION 8: Exposure controls/personal protection

· **8.1 Control parameters**

· **Ingredients with limit values that require monitoring at the workplace:**
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

· **Regulatory information**

· **Additional Occupational Exposure Limit Values for possible hazards during processing:**	
7803-51-2 phosphine	
AGW (Germany)	Long-term value: 0,14 mg/m³, 0,1 ppm 2(II);EU, DFG, Y

· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**

· **Appropriate engineering controls** No further data; see item 7.

· **Individual protection measures, such as personal protective equipment**

· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing
Wash hands before breaks and at the end of work.
Store protective clothing separately.

(Contd. on page 6)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 5)

Avoid contact with the eyes.
Avoid contact with the eyes and skin.

· **Respiratory protection:**
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.

· **Hand protection**

Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.

· **Material of gloves**
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

· **Eye/face protection**

Tightly sealed goggles

SECTION 9: Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Physical state**	Solid
· **Colour:**	Grey
· **Odour:**	Characteristic
· **Odour threshold:**	Not applicable as substance is toxic to inhalation.
· **Melting point/freezing point:**	Undetermined.
· **Boiling point or initial boiling point and boiling range**	Undetermined.
· **Flammability**	Contact with water liberates extremely flammable gases.
· **Lower and upper explosion limit**	
· **Lower:**	Not determined.
· **Upper:**	Not determined.
· **Flash point:**	Not applicable.
· **Auto-ignition temperature:**	Product is not selfigniting.
· **Decomposition temperature:**	Not determined.
· **pH**	Not applicable.
· **Viscosity:**	
· **Kinematic viscosity**	Not applicable.
· **Dynamic:**	Not applicable.

(Contd. on page 7)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 6)

· **Solubility**	
· **water:**	Not applicable (reaction with water leads to decomposition).
· **Partition coefficient n-octanol/water (log value)**	Not applicable (reaction with water leads to decomposition).
· **Vapour pressure:**	Not applicable.
· **Density and/or relative density**	
· **Density at 20 °C:**	2,01505 g/cm³ 1,791-1,857 g/cm³
· **Relative density**	1,87864-2,01470
· **Bulk density:**	1.983 kg/m³
· **Vapour density**	Not applicable.
· **Particle characteristics**	See item 3.
· **9.2 Other information**	
· **Appearance:**	
· **Form:**	Solid
· **Important information on protection of health and environment, and on safety.**	
· **Explosive properties:**	Product does not present an explosion hazard.
· **Solvent content:**	
· **Solids content:**	100,0 %
· **Change in condition**	
· **Evaporation rate**	Not applicable.
· **Information with regard to physical hazard classes**	
· **Explosives**	Void
· **Flammable gases**	Void
· **Aerosols**	Void
· **Oxidising gases**	Void
· **Gases under pressure**	Void
· **Flammable liquids**	Void
· **Flammable solids**	Void
· **Self-reactive substances and mixtures**	Void
· **Pyrophoric liquids**	Void
· **Pyrophoric solids**	Void
· **Self-heating substances and mixtures**	Void
· **Substances and mixtures, which emit flammable gases in contact with water**	In contact with water releases flammable gases which may ignite spontaneously.
· **Oxidising liquids**	Void
· **Oxidising solids**	Void
· **Organic peroxides**	Void
· **Corrosive to metals**	Void
· **Desensitised explosives**	Void

SECTION 10: Stability and reactivity

· **10.1 Reactivity** Reactive with water and acids.
· **10.2 Chemical stability**
· **Information on the shelf life** 60 months, max. 30 ° C
· **Thermal decomposition / conditions to be avoided:** Release of ammonia and carbon dioxide
· **10.3 Possibility of hazardous reactions**
Contact with water releases flammable gases.

(Contd. on page 8)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 7)

Contact with water releases toxic gases.

· **10.4 Conditions to avoid**
Protect from moisture.
Avoid high temperatures.
Protect from contact with acids.

· **10.5 Incompatible materials:**
Protect from moisture.
Protect from contact with acids.

· **10.6 Hazardous decomposition products:**
Ammonia
Hydrogen phosphide
Contact with water releases flammable gases.
Contact with water releases toxic gases.

SECTION 11: Toxicological information

· **11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008**
· **Acute toxicity** Fatal if swallowed, in contact with skin or if inhaled.

· **LD/LC50 values:**		
20859-73-8 aluminium phosphide		
Oral	LD50	8,7 mg/kg (Rat (Rattus spec.))
Dermal	LD50	460–900 mg/kg (Rat (Rattus spec.))
Inhalative	LC50/4 h	0,048 mg/l (Rat (Rattus spec.)) (phosphine generated from aluminium phosphide)
	LC50/4 h	0,015 mg/l (Rat (Rattus spec.)) 11 ppm phosphine (equivalent to 0.015 mg phosphine/L air or 2.8 mg/kg bw))
1111-78-0 ammonium carbamate		
Oral	LD50	>681 mg/kg (Rat (Rattus spec.))
Dermal	LD50	>2.000 mg/kg (Rat (Rattus spec.))
Inhalative	LC50/4 h	6,6 mg/l (Rat (Rattus spec.))

· **Skin corrosion/irritation** Based on available data, the classification criteria are not met.
· **Serious eye damage/irritation** Causes serious eye irritation.
· **Respiratory or skin sensitisation** Based on available data, the classification criteria are not met.
· **Germ cell mutagenicity** Based on available data, the classification criteria are not met.
· **Carcinogenicity** Based on available data, the classification criteria are not met.
· **Reproductive toxicity** Based on available data, the classification criteria are not met.
· **STOT-single exposure** Based on available data, the classification criteria are not met.
· **STOT-repeated exposure** Based on available data, the classification criteria are not met.
· **Aspiration hazard** Based on available data, the classification criteria are not met.
· **11.2 Information on other hazards**

· **Endocrine disrupting properties**
None of the ingredients is listed.

SECTION 12: Ecological information

· **12.1 Toxicity**

· **Aquatic toxicity:**	
20859-73-8 aluminium phosphide	
ErC50/ 48h	1,44 mg/l (Algae)
LC50/ 96h	0,00798 mg/l (Rainbow trout (Oncorhynchus mykiss))
EC50/ 24h	0,00018 mg/l (Daphnia magna)

(Contd. on page 9)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 8)

· **12.2 Persistence and degradability** Decomposes in contact with water.
· **12.3 Bioaccumulative potential** No further relevant information available.
· **Bioconcentration factor (BCF)**
Phosphine (calculated on the basis of log POW = 0.9):
BCF fish = 1.16 L / kg
BCF earthworm = 0.94 L / kg
· **12.4 Mobility in soil** No further relevant information available.
· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Aluminum phosphide meets the T criterion, but not the P or B criterion.
· **vPvB:**
This mixture does not contain any substances that are considered to be very persistent or very bioaccumulative (vPvB).
· **12.6 Endocrine disrupting properties**
The product does not contain substances with endocrine disrupting properties.
· **12.7 Other adverse effects**
· **Remark:** Very toxic for fish
· **Additional ecological information:**
· **General notes:**
Very toxic for aquatic organisms
Water hazard class 3 (German Regulation) (Self-assessment): extremely hazardous for water
Do not allow product to reach ground water, water course or sewage system, even in small quantities.

SECTION 13: Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**
Waste from fumigant residues must be disposed of in accordance with the legal waste regulations / provisions, in particular in compliance with the ordinance on the determination of waste (AbfBestV), the recycling and waste laws (KrW- / AbfG) and the waste directory ordinance (AVV).
TRGS 512 Chapter 9: Disposal of fumigant residues
· **European waste catalogue**
The disposal of the contents / container is to be carried out in consultation with the regional disposal company in accordance with official regulations according to the waste code number in accordance with the European waste catalog. Waste codes are not related to the product but to the application.
Product: 061301 * - inorganic plant protection products, wood-preserving agents and other biocides.

Product residues after fumigation: 060316 - metallic oxides other than those mentioned in 06 03 15

Container: 15 01 10 - packaging containing residues of or contaminated by dangerous substances

HP3	Flammable
HP4	Irritant - skin irritation and eye damage
HP6	Acute Toxicity
HP12	Release of an acute toxic gas
HP14	Ecotoxic

· **Uncleaned packaging:**
· **Recommendation:**
Empty completely empty containers for local recycling, recovery or waste disposal.

SECTION 14: Transport information

· **14.1 UN number or ID number**
· **ADR, IMDG, IATA** UN1397

(Contd. on page 10)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 9)

· **14.2 UN proper shipping name**

· **ADR**	UN1397 ALUMINIUM PHOSPHIDE
· **IMDG**	ALUMINIUM PHOSPHIDE, MARINE POLLUTANT
· **IATA**	ALUMINIUM PHOSPHIDE

· **14.3 Transport hazard class(es)**

· **ADR**

· **Class**	4.3 Substances which, in contact with water, emit flammable gases.
· **Label**	4.3+6.1

· **IMDG**

· **Class**	4.3 Substances which, in contact with water, emit flammable gases.
· **Label**	4.3/6.1

· **IATA**

· **Class**	4.3 Substances which, in contact with water, emit flammable gases.
· **Label**	4.3 (6.1)

· **14.4 Packing group**

· **ADR, IMDG, IATA**	I

· **14.5 Environmental hazards:**

· **Marine pollutant:**	Yes Symbol (fish and tree)
· **Special marking (ADR):**	Symbol (fish and tree)

· **14.6 Special precautions for user**	Warning: Substances which, in contact with water, emit flammable gases.
· **Hazard identification number (Kemler code):**	-
· **EMS Number:**	F-G,S-N
· **Stowage Code**	SW2 Clear of living quarters. SW5 If under deck, stow in a mechanically ventilated space.
· **Handling Code**	H1 Keep as dry as reasonably practicable
· **Segregation Code**	SG26 In addition: from goods of classes 2.1 and 3 when stowed on deck of a containership a minimum distance of two container spaces athwartship shall be maintained, when stowed on ro-ro ships a distance of 6 m athwartship shall be maintained. SG35 Stow "separated from" SGG1-acids

(Contd. on page 11)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 10)

· **14.7 Maritime transport in bulk according to IMO instruments**	Not applicable.
· **Transport/Additional information:**	
· **ADR**	
· **Limited quantities (LQ)**	0
· **Excepted quantities (EQ)**	Code: E0 Not permitted as Excepted Quantity
· **Transport category**	1
· **Tunnel restriction code**	E
· **IMDG**	
· **Limited quantities (LQ)**	0
· **Excepted quantities (EQ)**	Code: E0 Not permitted as Excepted Quantity
· **UN "Model Regulation":**	UN 1397 ALUMINIUM PHOSPHIDE, 4.3 (6.1), I, ENVIRONMENTALLY HAZARDOUS

SECTION 15: Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006
REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

· **Directive 2012/18/EU**
· **Named dangerous substances - ANNEX I** None of the ingredients is listed.
· **Seveso category**
H2 ACUTE TOXIC
O3 Substances or mixtures with hazard statement EUH029
E1 Hazardous to the Aquatic Environment
· **Qualifying quantity (tonnes) for the application of lower-tier requirements** 50 t
· **Qualifying quantity (tonnes) for the application of upper-tier requirements** 200 t
· **REGULATION (EC) No 1907/2006 ANNEX XVII** Conditions of restriction: 40

· **DIRECTIVE 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment – Annex II**
None of the ingredients is listed.

· **REGULATION (EU) 2019/1148**

· **Annex I - RESTRICTED EXPLOSIVES PRECURSORS (Upper limit value for the purpose of licensing under Article 5(3))**
None of the ingredients is listed.

· **Annex II - REPORTABLE EXPLOSIVES PRECURSORS**
None of the ingredients is listed.

(Contd. on page 12)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 17.05.2021 Version number 1 Revision: 17.05.2021

Trade name: PHOSTOXIN PELLET

(Contd. of page 11)

· **National regulations:**

· **Information about limitation of use:**
Employment restrictions concerning juveniles must be observed.

· **Waterhazard class:** Water hazard class 3 (Self-assessment): extremely hazardous for water.
· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

SECTION 16: Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H260 In contact with water releases flammable gases which may ignite spontaneously.
H300 Fatal if swallowed.
H302 Harmful if swallowed.
H311 Toxic in contact with skin.
H318 Causes serious eye damage.
H330 Fatal if inhaled.
H400 Very toxic to aquatic life.
EUH029 Contact with water liberates toxic gas.
EUH032 Contact with acids liberates very toxic gas.
· **Classification according to Regulation (EC) No 1272/2008**
The classification of the mixture is generally based on the calculation method using substance data according to Regulation (EC) No 1272/2008.

· **Department issuing SDS:** Regulatory Affairs
· **Contact:** sicherheitsdatenblaetter@detia-freyberg.de
· **Date of previous version:** 17.05.2021
· **Abbreviations and acronyms:**
UFI: Unique Formular Identifier
ADR: Accord relatif au transport international des marchandises dangereuses par route (European Agreement Concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
IATA: International Air Transport Association
GHS: Globally Harmonised System of Classification and Labelling of Chemicals
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
Water-react. 1: Substances and mixtures which in contact with water emit flammable gases – Category 1
Acute Tox. 2: Acute toxicity – Category 2
Acute Tox. 4: Acute toxicity – Category 4
Acute Tox. 3: Acute toxicity – Category 3
Acute Tox. 1: Acute toxicity – Category 1
Eye Dam. 1: Serious eye damage/eye irritation – Category 1
Eye Irrit. 2: Serious eye damage/eye irritation – Category 2
Aquatic Acute 1: Hazardous to the aquatic environment - acute aquatic hazard – Category 1

Annex VIII: Safety data sheet K-Obiol ULV6

RUBRIEK 1: IDENTIFICATIE VAN DE STOF OF HET MENGSEL EN VAN DE VENNOOTSCHAP/ONDERNEMING

1.1 Productidentificatie

Handelsnaam K-OBIOL ULV 6, K-OBIOL ULV 6

Productcode (UVP) 05939666

1.2 Relevant geïdentificeerd gebruik van de stof of het mengsel en ontraden gebruik

Gebruik Insecticide

1.3 Details betreffende de verstrekker van het veiligheidsinformatieblad

Leverancier Bayer CropScience SA-NV
BG Bayer Environmental Science
J.E. Mommaertslaan 14
1831 Diegem (Machelen)
België

Telefoon +32(0)2/535 63 11 (24 h / 7 d)

Telefax +32(0)2/534 35 76

Verantwoordelijke afdeling Email: riek.rombaut@bayer.com

1.4 Telefoonnummer voor noodgevallen

Bayer CropScience SA-NV +32(0)2/535 63 11 (24 h / 7 d)

Antigifcentrum (België) +32(0)70/245 245 (24 h / 7 d)

Antigifcentrum (Groothertogdom Luxemburg) +352 8002 5500 (24 h / 7 d)

RUBRIEK 2: IDENTIFICATIE VAN DE GEVAREN

2.1 Indeling van de stof of het mengsel

Indeling volgens Verordening (EG) nr. 1272/2008 betreffende de indeling, etikettering en verpakking van stoffen en mengsels, en navolgende wijzigingen.

Acute aquatische toxiciteit: Categorie 1
H400 Zeer giftig voor in het water levende organismen.

Chronische aquatische toxiciteit: Categorie 1
H410 Zeer giftig voor in het water levende organismen, met langdurige gevolgen.

2.2 Etiketteringselementen

Etikettering volgens de Belgische en Luxemburgse wetgeving:

Gevarenetikettering voor levering en gebruik verplicht.

Gevaarlijke bestanddelen die op het etiket vermeld moeten worden:

- Deltamethrin
- Piperonyl butoxide

Signaalwoord: Waarschuwing

Gevarenaanduidingen

H410 Zeer giftig voor in het water levende organismen, met langdurige gevolgen.
EUH401 Volg de gebruiksaanwijzing om gevaar voor de menselijke gezondheid en het milieu te voorkomen.

Veiligheidsaanbevelingen

P391 Gelekte/gemorste stof opruimen.

2.3 Andere gevaren

Een prikkelend ev. brandend/stekend gevoel aan huid of slijmvliezen kan optreden. Dit veroorzaakt geen letsel en houdt slechts tijdelijk aan (max. 24 uur).

RUBRIEK 3: SAMENSTELLING EN INFORMATIE OVER DE BESTANDDELEN

3.2 Mengsels

Chemische omschrijving

Oplossing voor ULV toepassing (UL)
Deltamethrin/Piperonylbutoxide 6:54 g/l

Gevaarlijke bestanddelen

Gevarenaanduidingen volgens Verordening (EG) Nr. 1272/2008

Naam	**CAS-Nr. / EG-Nr. / REACH Reg. No.**	**Indeling VERORDENING (EG) Nr. 1272/2008**	**Conc. [%]**
Deltamethrin	52918-63-5 258-256-6	Aquatic Chronic 1, H410 Acute Tox. 3, H331 Aquatic Acute 1, H400 Acute Tox. 3, H301	0,68
Piperonyl butoxide	51-03-6 200-076-7 01-2119537431-46-xxxx	Aquatic Acute 1, H400 Aquatic Chronic 1, H410	6,10

Nadere informatie

Deltamethrin	52918-63-5	M-factor: 1.000.000 (acute), 1.000.000 (chronic)
Piperonyl butoxide	51-03-6	M-factor: 1 (acute)

Voor de volledige text van H-zinnen zoals vermeld in deze rubriek, zie rubriek 16.

RUBRIEK 4: EERSTEHULPMAATREGELEN

4.1 Beschrijving van de eerstehulpmaatregelen

Algemeen advies	Buiten de gevaarlijke zone brengen. Ligging en vervoer van het slachtoffer in stabiele zijligging. Verontreinigde kleding onmiddellijk uittrekken en veilig verwijderen.
Inademing	In de frisse lucht brengen. Slachtoffer warm en rustig houden. Onmiddellijk een arts of gifinformatiecentrum waarschuwen.
Aanraking met de huid	Onmiddellijk met veel water en zeep gedurende minstens 15 minuten afwassen. Warm water kan de hevigheid van de irritatie/paresthesie subjectief verhogen. Dit is geen teken van een systemische vergiftiging. Bij huidirritatie een huidolie of huidlotion met Vitamine E gebruiken. Indien symptomen aanhouden, een arts raadplegen.
Aanraking met de ogen	Onmiddellijk spoelen met veel water, ook onder de oogleden, gedurende tenminste 15 minuten. Eventueel aanwezige contactlenzen pas na 5 minuten verwijderen. Daarna de oogspoeling weer voortzetten. Warm water kan de hevigheid van de irritatie/paresthesie subjectief verhogen. Dit is geen teken van een systemische vergiftiging. Kalmerende oogdruppels, eventueel verdovende oogdruppels toedienen. Medische hulp inroepen als irritatie optreedt en aanhoudt.
Inslikken	Mond spoelen en vervolgens water met kleine slokken laten drinken. GEEN braken opwekken. Slachtoffer niet alleen laten. Onmiddellijk een arts of gifinformatiecentrum waarschuwen.

4.2 Belangrijkste acute en uitgestelde symptomen en effecten

Verschijnselen	Plaatselijk:, Kan bij huid- en oog-contact mogelijk ernstige paresthesie veroorzaken, Dit effect is van voorbijgaande aard en meestal bínnen 24 uur verdwenen, Irritatie van huid, ogen en slijmvlies, Hoesten, Niezen Systemisch:, onbehaaglijk gevoel in de borst, tachycardie, Hypotonie, Misselijkheid, Buikpijn, Diarree, Braken, Troebel zicht, Hoofdpijn, Anorexia, Somnolentie, Coma, Stuiptrekkingen, Sidderingen, Prostratie, Hyperreactie van de luchtwegen, Longoedeem, Hartklopping, Musculaire fasciculatie, Apathie, Duizeligheid

4.3 Vermelding van de vereiste onmiddellijke medische verzorging en speciale behandeling

Gevaren	Dit product bevat een pyrethroid. Een pyrethroid-vergiftiging moet anders behandeld worden als een of carbamaat- of organofosfaat-vergiftiging!
Behandeling	Systemische behandeling: Behandel symptomatisch. Bewaken: ademhaling en hartfunctie. Alleen binnen 2 uur na opname van een grote hoeveelheid door de mond een maagspoeling doorvoeren. In alle gevallen is toedienen van actief kool (norit) met natriumsulfaat aanbevolen. Ademhalingswegen vrijhouden. Indien nodig zuurstof of kunstmatige ademhaling. Bij krampen een benzodiapezine (bijv. diazepam) in standaard doseringen geven. Als dit niet werkzaam is, phenobarbital geven. Contra-indicatie: atropine. Contra-indicatie: adrenaline derivaten. Een specifiek tegengif is niet bekend. Herstel volgt doorgaans spontaan zonder gevolgen.

Bij huidirritatie een huidolie of huidlotion met Vitamine E gebruiken.

RUBRIEK 5: BRANDBESTRIJDINGSMAATREGELEN

5.1 Blusmiddelen

Geschikt	Gebruik waternevel, alcoholbestendig schuim, droogpoeder, of kooldioxide.
Niet geschikt	Sterke waterstraal
5.2 Speciale gevaren die door de stof of het mengsel worden veroorzaakt	Bij brand ontstaan gevaarlijke dampen.

5.3 Advies voor brandweerlieden

Speciale beschermende uitrusting voor brandweerlieden	Bij brand en/of explosie inademen van rook vermijden. Bij brand een persluchtmasker dragen.
Verdere informatie	Produkt uit de brandzone verwijderen of vaten met water afkoelen. Warmte afvoeren om drukverhoging te vermijden. Indien mogelijk, bluswater met zand of aarde indammen.

RUBRIEK 6: MAATREGELEN BIJ HET ACCIDENTEEL VRIJKOMEN VAN DE STOF OF HET MENGSEL

6.1 Persoonlijke voorzorgsmaatregelen, beschermingsmiddelen en noodprocedures

Voorzorgsmaatregelen	Vermijd contact met gemorst produkt of verontreinigde oppervlakken. Persoonlijke beschermingsmiddelen gebruiken.
6.2 Milieuvoorzorgs-maatregelen	Niet in oppervlaktewater, riolering en grondwater laten terechtkomen.

6.3 Insluitings- en reinigingsmethoden en -materiaal

Reinigingsmethoden	Opnemen in inert absorberend materiaal (b.v. zand, kiezelgur, zuurbindingsmiddel, universeel bindingsmiddel, zaagsel). In geschikte en gesloten containers bewaren voor verwijdering. Vloer en verontreinigde voorwerpen met veel water reinigen.
Aanvullend advies	Ook alle interne bedrijfsprocedures in acht nemen.
6.4 Verwijzing naar andere rubrieken	Informatie over veilige omgang zie rubriek 7. Informatie over persoonlijke beschermende uitrusting zie rubriek 8. Informatie over afvalverwijdering zie rubriek 13.

RUBRIEK 7: HANTERING EN OPSLAG

7.1 Voorzorgsmaatregelen voor het veilig hanteren van de stof of het mengsel

Advies voor veilige hantering	Uitsluitend op plaatsen met voldoende afzuiging gebruiken.
Advies voor bescherming tegen brand en explosie	Verwijderd houden van warmte en ontstekingsbronnen.
Hygiënische maatregelen	Aanraking met ogen, huid en kleding vermijden. Werkkleding apart houden. Handen wassen voor elke werkonderbreking en direct na gebruik van het product. Verontreinigde kleding direct uittrekken en alleen na grondige reiniging weer gebruiken. Niet meer te reinigen kledingstukken vernietigen (verbranden).

7.2 Voorwaarden voor een veilige opslag, met inbegrip van incompatibele producten

Eisen aan opslagruimten en containers	Containers goed gesloten bewaren op een droge, koele en goed geventileerde plaats. Bewaren in originele container. Opslaan in een ruimte die alleen toegankelijk is voor bevoegden. Niet blootstellen aan direct zonlicht. Tegen bevriezing beschermen.
Advies voor gemengde opslag	Verwijderd houden van eet- en drinkwaren en diervoer.
Geschikte materialen	Coex EVOH (1000L IBC)
7.3 Specifiek eindgebruik	Zie de aanwijzingen op het etiket.

RUBRIEK 8: MAATREGELEN TER BEHEERSING VAN BLOOTSTELLING/PERSOONLIJKE BESCHERMING

8.1 Controleparameters

Bestanddelen	CAS-Nr.	Controleparameters	Revisie	Basis
Deltamethrin	52918-63-5	0,01 mg/m3 (TWA)		OES BCS*
Piperonyl butoxide	51-03-6	50 ppm (TWA)		OES BCS*

*OES BCS: Interne Bayer AG, Crop Science Division blootstellingsgrenswaarde (Occupational Exposure Standard)

8.2 Maatregelen ter beheersing van blootstelling

Persoonlijke beschermingsmiddelen
Bij normale omgang met en gebruik van dit product de aanwijzingen op het etiket volgen. In alle andere gevallen volgende persoonlijke beschermingsmiddelen gebruiken.

Bescherming van de ademhalingswegen	Persoonlijke adembescherming is niet vereist bij de te verwachten blootstelling. Adembescherming behoort alleen gebruikt te worden ter beheersing van een restrisiko bij activiteiten van korte duur, nadat alle stappen om blootstelling ter plekke te beperken zijn genomen, zoals afsluiting en/of plaatselijke luchtafzuiging. De aanwijzingen van de fabrikant voor gebruik en onderhoud van het ademhalingstoestel altijd nauwkeurig aanhouden.
Bescherming van de handen	Neem de voorschriften in acht over doorlaatbaarheid en doordrenkingstijd, zoals aangeleverd door de leverancier van de handschoenen. Houd ook rekening met specifieke plaatselijke

	gebruiksomstandigheden, zoals gevaar voor insnijdingen, slijtage en aanrakingstijd. Handschoenen wassen indien verontreinigd. Gooi weg indien stuk, vervuild aan de binnenzijde of wanneer verontreiniging aan de buitenzijde niet kan worden verwijderd. Was handen vaak en altijd voor eten, drinken, roken en gebruik van het toilet. Materiaal: Nitrilrubber Permeabiliteitsnelheid: > 480 min Handschoendikte: > 0,4 mm Richtlijn: Beschermhandschoenen volgens EN 374.
Bescherming van de ogen	Veiligheidsbril dragen (volgens EN166, toepassingsgebied = 5 of gelijkwaardig).
Huid- en lichaams-bescherming	Standaard overalls met beschermingspak categorie 3 type 6 dragen. Als er een risico op significante blootstelling bestaat, overweeg dan een pak dat meer bescherming biedt. Waar mogelijk kleding in twee lagen dragen: Onder het beschermende pak een overall van polyester/katoen of alleen katoen dragen. Overalls regelmatig professioneel laten reinigen. Bij significante verontreiniging het beschermingspak zo goed mogelijk dekontamineren en zorgvuldig volgens aanwijzing van de fabrikant als afval verwijderen.

RUBRIEK 9: FYSISCHE EN CHEMISCHE EIGENSCHAPPEN

9.1 Informatie over fysische en chemische basiseigenschappen

Vorm	Vloeistof, helder
Kleur	kleurloos tot lichtgeel
Geur	zwak, kenmerkend
Vlampunt	> 137 °C
Ontstekingstemperatuur	245 °C
Dichtheid	circa 0,88 g/cm³ (20 °C)
Oplosbaarheid in water	niet mengbaar
Verdelingscoëfficiënt: n-octanol/water	Deltamethrin: log Pow: 6,4 (25 °C) Piperonyl butoxide: log Pow: 4,75
Oppervlaktespanning	29,5 mN/m (20 °C)
Explosiviteit	Niet explosief
9.2 Overige informatie	Verdere veiligheidsgerelateerde fysisch-chemische gegevens zijn niet bekend.

RUBRIEK 10: STABILITEIT EN REACTIVITEIT

10.1 Reactiviteit

Thermische ontleding	Stabiel onder normale omstandigheden.
10.2 Chemische stabiliteit	Stabiel onder de aanbevolen opslagomstandigheden.
10.3 Mogelijke gevaarlijke reacties	Geen gevaarlijke reacties indien veiligheidsvoorschriften voor opslag en behandeling nageleefd worden.
10.4 Te vermijden omstandigheden	Extreme temperaturen en direct zonlicht.
10.5 Chemisch op elkaar inwerkende materialen	Uitsluitend in de oorspronkelijke verpakking bewaren.
10.6 Gevaarlijke ontledingsproducten	Gevaarlijke ontledingsproducten zijn niet te verwachten bij normaal gebruik.

RUBRIEK 11: TOXICOLOGISCHE INFORMATIE

11.1 Informatie over toxicologische effecten

Acute orale toxiciteit	LD50 (Rat) > 2.000 mg/kg
Acute toxiciteit bij inademing	LC50 (Rat) > 5,04 mg/l Blootstellingstijd: 4 h Onderzocht in de vorm van een respirabele aerosol.
Acute dermale toxiciteit	LD50 (Konijn) > 4.000 mg/kg
Huidcorrosie/-irritatie	Geringe irriterende werking - niet aan de etikettering onderworpen. (Konijn)
Ernstig oogletsel/oogirritatie	Geen oogirritatie (Konijn)
Sensibilisatie van de luchtwegen/de huid	Niet sensibiliserend. (Cavia) OECD Testrichtlijn 406, Magnusson & Kligman test Test werd met een soortgelijke formulering uitgevoerd.

Beoordeling specifieke doelorgaantoxiciteit (STOT) - eenmalige blootstelling

Deltamethrin: Gebaseerd op beschikbare gegevens; aan de indelingscriteria is niet voldaan.
Piperonyl butoxide: Gebaseerd op beschikbare gegevens; aan de indelingscriteria is niet voldaan.

Beoordeling specifieke doelorgaantoxiciteit (STOT) - herhaalde blootstelling

Deltamethrin veroorzaakte neurologische effecten en neuropathologische veranderingen in dierexperimenten. De giftige effecten waargenomen bij Deltamethrin zijn verbonden met voorbijgaande hyperactiviteit verbonden aan pyrethroide neurotoxiciteit.
Piperonyl butoxide veroorzaakte geen specifieke doelorgaantoxiciteit in dierstudies.

Beoordeling van de mutageniteit

Deltamethrin was niet mutageen of genotoxisch in een reeks in-vitro and in-vivo mutageniteitstests.
Piperonyl butoxide was niet mutageen of genotoxisch in een reeks in-vitro and in-vivo mutageniteitstests.

Beoordeling carcinogeniteit

Deltamethrin was niet carcinogeen in levenslange voedingsstudies met ratten en muizen.
Piperonyl butoxide was niet carcinogeen in levenslange voedingsstudies met ratten en muizen.

Beoordeling reproductietoxiciteit

Deltamethrin veroorzaakte geen reproductietoxiciteit in een 2-generatiestudie in de rat.
Piperonyl butoxide veroorzaakte geen reproductietoxiciteit in een 2-generatiestudie in de rat.

Beoordeling van de ontwikkelingstoxiteit

Deltamethrin veroorzaakte ontwikkelingstoxiciteit alleen bij doseringen die ook systemische toxiciteit in de moederdieren veroorzaakten. De effecten op de ontwikkeling waargenomen bij Deltamethrin, hangen samen met de maternale toxiciteit.
Piperonyl butoxide veroorzaakte geen ontwikkelingsstoornissen in ratten en konijnen.

Gevaar bij inademing

Gebaseerd op beschikbare gegevens; aan de indelingscriteria is niet voldaan.

Verdere informatie

Een prikkelend ev. brandend/stekend gevoel aan huid of slijmvliezen kan optreden. Dit veroorzaakt geen letsel en houdt slechts tijdelijk aan (max. 24 uur).

RUBRIEK 12: ECOLOGISCHE INFORMATIE

12.1 Toxiciteit

Toxiciteit voor vissen	LC50 (Oncorhynchus mykiss (regenboogforel)) 0,15 µg/l Blootstellingstijd: 96 h De aangegeven waarde geldt voor de technische werkstof deltamethrin. LC50 (Cyprinodon variegatus (edelsteentandkarper)) 3,94 mg/l Blootstellingstijd: 96 h De aangegeven waarde geldt voor de technische werkstof piperonyl butoxide.
Toxiciteit voor ongewervelde waterdieren	EC50 (Daphnia magna (grote watervlo)) 0,0131 µg/l Blootstellingstijd: 48 h De aangegeven waarde geldt voor de technische werkstof deltamethrin. EC50 (Daphnia magna (grote watervlo)) 0,51 mg/l Blootstellingstijd: 48 h De aangegeven waarde geldt voor de technische werkstof piperonyl butoxide.
Toxiciteit voor waterplanten	EC50 (Algen) > 9,1 mg/l Blootstellingstijd: 96 h De aangegeven waarde geldt voor de technische werkstof deltamethrin.

12.2 Persistentie en afbreekbaarheid

Biologische afbreekbaarheid	Deltamethrin: Niet snel biologisch afbreekbaar Piperonyl butoxide: Niet snel biologisch afbreekbaar

Koc	Deltamethrin: Koc: 10240000 Piperonyl butoxide: Koc: 399 - 830

12.3 Bioaccumulatie

Bioaccumulatie	Deltamethrin: Bioconcentratiefactor (BCF) 1.400 Bioaccumuleert niet. Piperonyl butoxide: Potentiële bioaccumulatie

12.4 Mobiliteit in de bodem

Mobiliteit in de bodem	Deltamethrin: Niet mobiel in bodemsoorten Piperonyl butoxide: Middelmatig mobiel in bodemsoorten

12.5 Resultaten van PBT- en zPzB-beoordeling

PBT- en zPzB-beoordeling	Deltamethrin: Deze stof wordt niet beschouwd als persistent, bioaccumulerend en toxisch (PBT). Deze stof wordt niet beschouwd als zeer persistent en zeer bioaccumulerend (zPzB). Piperonyl butoxide: Deze stof wordt niet beschouwd als persistent, bioaccumulerend en toxisch (PBT). Deze stof wordt niet beschouwd als zeer persistent en zeer bioaccumulerend (zPzB).

12.6 Andere schadelijke effecten

Aanvullende ecologische informatie	Geen andere noemenswaardige effecten.

RUBRIEK 13: INSTRUCTIES VOOR VERWIJDERING

13.1 Afvalverwerkingsmethoden

Product	Kan met inachtneming van de geldende voorschriften en eventueel na overleg met een afvalverwerker of de bevoegde instanties naar een stortplaats of verbrandingsinstallatie afgevoerd worden.
Verontreinigde verpakking	Niet totaal lege verpakkingen moeten als klein chemisch afval verwerkt worden.
Afvalstofnummer van de ongebruikte stof.	**02 01 08*** agrochemisch afval dat gevaarlijke stoffen bevat

RUBRIEK 14: INFORMATIE MET BETREKKING TOT HET VERVOER

ADR/RID/ADN

14.1 UN nummer	**3082**
14.2 Juiste ladingnaam overeenkomstig de modelreglementen van de VN	MILIEUGEVAARLIJKE VLOEISTOF, N.E.G. (DELTAMETHRIN OPLOSSING)
14.3 Transportgevarenklasse(n)	9
14.4 Verpakkingsgroep	III
14.5 Etiket milieugevaarlijke stoffen	JA
Gevarenidentificatie-nr.	90

Deze classificatie geldt in principe niet voor vervoer per tankschip over binnenwater. Meer informatie hierover kan bij de producent aangevraagd worden.

IMDG

14.1 UN nummer	**3082**
14.2 Juiste ladingnaam overeenkomstig de modelreglementen van de VN	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (DELTAMETHRIN SOLUTION)
14.3 Transportgevarenklasse(n)	9
14.4 Verpakkingsgroep	III
14.5 Mariene verontreiniging	JA

IATA

14.1 UN nummer	**3082**
14.2 Juiste ladingnaam overeenkomstig de modelreglementen van de VN	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (DELTAMETHRIN SOLUTION)
14.3 Transportgevarenklasse(n)	9
14.4 Verpakkingsgroep	III
14.5 Etiket milieugevaarlijke stoffen	JA

14.6 Bijzondere voorzorgen voor de gebruiker
Zie rubriek 6 tot 8 van dit veiligheidsinformatieblad.

14.7 Vervoer in bulk overeenkomstig bijlage II bij MARPOL en de IBC-code
Geen transport in bulk overeenkomstig de IBC-code.

RUBRIEK 15: REGELGEVING

15.1 Specifieke veiligheids-, gezondheids- en milieureglementen en -wetgeving voor de stof of het mengsel

Verdere informatie

WHO-classificatie: III (Slightly hazardous)

Erkenningsnummer / België	9637P/B
Goedkeuringsnummer (G.H. Luxemburg)	L01899-017

Giftigheidsklasse (België) B

15.2 Chemischeveiligheidsbeoordeling

Een chemische veiligheidsbeoordeling is niet nodig voor deze stof.

RUBRIEK 16: OVERIGE INFORMATIE

Tekst van de gevarenaanduidingen genoemd in Sectie 3

H301	Giftig bij inslikken.
H331	Giftig bij inademing.
H400	Zeer giftig voor in het water levende organismen.
H410	Zeer giftig voor in het water levende organismen, met langdurige gevolgen.

Afkortingen en acroniemen

ADN	Europese overeenkomst voor het internationale vervoer van gevaarlijke goederen over de binnenwateren
ADR	Europese overeenkomst voor het internationale vervoer van gevaarlijke goederen over de weg
ATE	Inschatting acute giftigheid
CAS-Nr.	Chemisch abstract service nummer
Conc.	Concentratie
EG-Nr.	Europese Gemeenschap nummer
ECx	Effectieve concentratie naar x %
EINECS	Europese inventaris van bestaande chemische handelsstoffen
ELINCS	Europese lijst van stoffen waarvan kennisgeving is gedaan
EN	Europese Norm
EU	Europese Unie
IATA	International Air Transport Association
IBC	International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code)
ICx	Inhibitie concentratie van x%
IMDG	International Maritime Dangerous Goods
LCx	Lethale concentratie van x%
LDx	Lethale dosis van x%
LOEC/LOEL	Laagst geobserveerde effectconcentratie/ effectniveau
M	De vermelding “M” duidt aan dat bij de blootstelling boven de grenswaarde irritatie optreedt of er gevaar bestaat voor acute vergiftiging. Het werkprocédé moet zo zijn ontworpen dat de blootstelling de grenswaarde nooit overschrijdt. Bij een controle geldt dat de bemonsterde periode zo kort mogelijk moet zijn om een betrouwbare meting te kunnen verrichten. het meetresultaat wordt dan gerelateerd aan de beschouwde periode.
MARPOL	MARPOL: International Convention for the prevention of marine pollution from ships
N.O.S.	Not otherwise specified
NOEC/NOEL	Concentratie/niveau waarbij er geen waargenomen effecten zijn
OECD	Organisatie voor Economische samenwerking en Ontwikkeling
RID	Reglement betreffende het internationale spoorwegvervoer van gevaarlijke goederen
TWA	Tijdgewogen gemiddelde
UN	Verenigde Naties
WHO	Wereld gezondheidsorganisatie

De gegevens in dit veiligheidsinformatieblad voldoen aan de eisen gesteld in de Verordening (EU) Nr. 1907/2006 en de Wijziging (EU) Nr. 2015/830 (en eventuele navolgende wijzigingen) van Verordening (EU) Nr. 1907/2006. Dit veiligheidsinformatieblad is een aanvulling op en geen vervanging van de gebruiksaanwijzingen van de fabrikant. De gegevens erin berusten op kennis beschikbaar ten tijde van het opstellen van dit informatieblad op de aangegeven datum. Gebruikers worden verder opmerkzaam gemaakt op gevaren bij gebruik voor niet bedoelde toepassingen voor dit product. De vereiste gegevens voldoen aan de geldige EG-wetgeving. Verdergaande nationale eisen dienen ook in acht genomen te worden.

Reden voor herziening: Veiligheidsinformatieblad volgens Verordening (EG) nr. 2015/830. De volgende rubrieken werden herzien: Rubriek 2: Identificatie van de gevaren. Rubriek 8: Maatregelen ter beheersing van blootstelling/persoonlijke bescherming.

Wijzigingen aangebracht na het verschijnen van de vorige uitgave zijn gemarkeerd in de kantlijn. Deze uitgave vervangt alle vorige uitgaven.

Annex IX: Safety data sheet K-Obiol EC25

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier

Trade name	K-OBIOL EC 25
Product code (UVP)	05939488

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use	Insecticide

1.3 Details of the supplier of the safety data sheet

Supplier	Bayer Environmental Science 230 Cambridge Science Park Milton Road Cambridge Cambridgeshire CB4 0WB United Kingdom
Telephone	00800-1214 9451
Telefax	+44(0)1223 426240
Responsible Department	Email: ukinfo@bayercropscience.com

1.4 Emergency telephone no.

Emergency telephone no.	0800-220876 (UK 24 hr)

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification in accordance with Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, as amended.

Flammable liquids: Category 3
H226 Flammable liquid and vapour.

Acute toxicity: Category 4
H302 Harmful if swallowed.

Aspiration hazard: Category 1
H304 May be fatal if swallowed and enters airways.

Serious eye damage: Category 1
H318 Causes serious eye damage.

Acute toxicity: Category 4
H332 Harmful if inhaled.

Specific target organ toxicity - single exposure: Category 3
H335 May cause respiratory irritation.

Specific target organ toxicity - single exposure: Category 3
H336 May cause drowsiness or dizziness.

Acute aquatic toxicity: Category 1
H400 Very toxic to aquatic life.

Chronic aquatic toxicity: Category 1
H410 Very toxic to aquatic life with long lasting effects.

2.2 Label elements

Labelling in accordance with Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, as amended.

Hazard label for supply/use required.

Hazardous components which must be listed on the label:

- Deltamethrin
- Piperonyl butoxide
- Solvent Naphtha (petroleum), light aromatic

Signal word: Danger

Hazard statements

H226	Flammable liquid and vapour.
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H318	Causes serious eye damage.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H410	Very toxic to aquatic life with long lasting effects.
EUH066	Repeated exposure may cause skin dryness or cracking.
EUH401	To avoid risks to human health and the environment, comply with the instructions for use.

Precautionary statements

P240	Ground/bond container and receiving equipment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P311	IF exposed or concerned: Call a POISON CENTER/ doctor/ physician.
P501	Dispose of contents/container to a licensed waste disposal contractor or collection site, except for triple rinsed empty containers which can be disposed of as non-hazardous waste.

2.3 Other hazards

Cutaneous sensations may occur, such as burning or stinging on the face and mucosae. However, these sensations cause no lesions and are of a transitory nature (max. 24 hours).

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Chemical nature

Emulsifiable concentrate (EC)
Deltamethrin/Piperonyl butoxide 25:225 g/l

Hazardous components

Hazard statements according to Regulation (EC) No. 1272/2008

Name	CAS-No. / EC-No. / REACH Reg. No.	Classification REGULATION (EC) No 1272/2008	Conc. [%]
Deltamethrin	52918-63-5 258-256-6	Aquatic Chronic 1, H410 Aquatic Acute 1, H400 Acute Tox. 3, H301 Acute Tox. 3, H331	2.70
Piperonyl butoxide	51-03-6 200-076-7 01-2119537431-46-xxxx	Aquatic Acute 1, H400 Aquatic Chronic 1, H410	23.90
Tetrapropylene benzene sulfonate, calcium salt	11117-11-6 234-360-7	Acute Tox. 4, H312 Skin Irrit. 2, H315 Eye Dam. 1, H318 Aquatic Chronic 3, H412	> 1.00 – < 25.00
2-Methylpropan-1-ol	78-83-1 201-148-0	Flam. Liq. 3, H226 STOT SE 3, H335 Skin Irrit. 2, H315 Eye Dam. 1, H318 STOT SE 3, H336	> 1.00 – < 5.00
Solvent Naphtha (petroleum), light aromatic	64742-95-6 265-199-0 01-2119486773-24-xxxx	Flam. Liq. 3, H226 STOT SE 3, H336 STOT SE 3, H335 Asp. Tox. 1, H304 Aquatic Chronic 2, H411	> 25.00

Further information

Deltamethrin	52918-63-5	M-Factor: 1,000,000 (acute), 1,000,000 (chronic)
Piperonyl butoxide	51-03-6	M-Factor: 1 (acute)

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

General advice Move out of dangerous area. Place and transport victim in stable position (lying sideways). Remove contaminated clothing immediately and dispose of safely.

Inhalation Move to fresh air. Keep patient warm and at rest. Call a physician or poison control center immediately.

Skin contact Immediately wash with plenty of soap and water for at least 15 minutes. Warm water may increase the subjective severity of the irritation/paresthesia. This is not a sign of systemic poisoning. In case of skin irritation, application of oils or lotions containing vitamin E may be considered. If symptoms persist, call a physician.

Eye contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Warm water may increase the subjective severity of the irritation/paresthesia. This is not a sign of systemic poisoning. Apply soothing eye drops, if needed anaesthetic eye drops. Call a physician or poison control center immediately.
Ingestion	Rinse out mouth and give water in small sips to drink. Do NOT induce vomiting. Do not leave victim unattended. Call a physician or poison control center immediately.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms	Local:, Skin and eye paraesthesia which may be severe, Usually transient with resolution within 24 hours, Skin, eye and mucous membrane irritation, Cough, Sneezing
	Systemic:, discomfort in the chest, Tachycardia, Hypotension, Nausea, Abdominal pain, Diarrhoea, Vomiting, Blurred vision, Headache, Anorexia, Somnolence, Coma, Convulsions, Tremors, Prostration, Airway hyperreaction, Pulmonary oedema, Palpitation, Muscular fasciculation, Apathy, Dizziness

4.3 Indication of any immediate medical attention and special treatment needed

Risks	This product contains a pyrethroid. Pyrethroid poisoning should not be confused with carbamate or organophosphate poisoning.
Treatment	Systemic treatment: Initial treatment: symptomatic. Monitor: respiratory and cardiac functions. In case of ingestion gastric lavage should be considered in cases of significant ingestions only within the first 2 hours. However, the application of activated charcoal and sodium sulphate is always advisable. Keep respiratory tract clear. Oxygen or artificial respiration if needed. In case of convulsions, a benzodiazepine (e.g. diazepam) should be given according to standard regimens. If not effective, phenobarbital may be used. Contraindication: atropine. Contraindication: derivatives of adrenaline. There is no specific antidote. Recovery is spontaneous and without sequelae.
	In case of skin irritation, application of oils or lotions containing vitamin E may be considered.

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Unsuitable	High volume water jet

5.2 Special hazards arising from the substance or mixture	Dangerous gases are evolved in the event of a fire.
5.3 Advice for firefighters	
Special protective equipment for firefighters	In the event of fire and/or explosion do not breathe fumes. In the event of fire, wear self-contained breathing apparatus.
Further information	Contain the spread of the fire-fighting media. Do not allow run-off from fire fighting to enter drains or water courses.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Precautions	Avoid contact with spilled product or contaminated surfaces. Remove all sources of ignition. Use personal protective equipment.
6.2 Environmental precautions	Do not allow to get into surface water, drains and ground water. If spillage enters drains leading to sewage works inform local water company immediately. If spillage enters rivers or watercourses, inform the Environment Agency (emergency telephone number 0800 807060).

6.3 Methods and materials for containment and cleaning up

Methods for cleaning up	Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Collect and transfer the product into a properly labelled and tightly closed container. Clean contaminated floors and objects thoroughly, observing environmental regulations.
Additional advice	Check also for any local site procedures.
6.4 Reference to other sections	Information regarding safe handling, see section 7. Information regarding personal protective equipment, see section 8. Information regarding waste disposal, see section 13.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

Advice on safe handling	No specific precautions required when handling unopened packs/containers; follow relevant manual handling advice. Ensure adequate ventilation.
Advice on protection against fire and explosion	Keep away from heat and sources of ignition. Vapours may form explosive mixture with air. Take measures to prevent the build up of electrostatic charge.
Hygiene measures	Avoid contact with skin, eyes and clothing. Keep working clothes separately. Wash hands before breaks and immediately after handling the product. Remove soiled clothing immediately and clean thoroughly before using again. Garments that cannot be cleaned must be destroyed (burnt).

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers	Keep containers tightly closed in a dry, cool and well-ventilated place. Store in a place accessible by authorized persons only. Store in original container. Keep away from direct sunlight. Protect from freezing.
Advice on common storage	Keep away from food, drink and animal feedingstuffs.
Suitable materials	Coex EVOH (1000L IBC)
7.3 Specific end use(s)	Refer to the label and/or leaflet.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components	CAS-No.	Control parameters	Update	Basis
Deltamethrin	52918-63-5	0.02 mg/m3 (TWA)		OES BCS*
Piperonyl butoxide	51-03-6	50 ppm (TWA)		OES BCS*
2-Methylpropan-1-ol	78-83-1	231 mg/m3/75 ppm (STEL)	12 2011	EH40 WEL
2-Methylpropan-1-ol	78-83-1	154 mg/m3/50 ppm (TWA)	12 2011	EH40 WEL
Solvent Naphtha (petroleum), light aromatic	64742-95-6	116 mg/m3/20 ppm (TWA)	2014	EU SCOELS
Solvent Naphtha (petroleum), light aromatic	64742-95-6	290 mg/m3/50 ppm (STEL)	2014	EU SCOELS

*OES BCS: Internal Bayer AG, Crop Science Division "Occupational Exposure Standard"

8.2 Exposure controls

Refer to COSHH assessment (Control of Substances Hazardous to Health (Amendment) Regulations 2004). Engineering controls should be used in preference to personal protective equipment wherever practicable. Refer also to COSHH Essentials.

Personal protective equipment
In normal use and handling conditions please refer to the label and/or leaflet. In all other cases the following recommendations would apply.

Respiratory protection
Wear respirator with an organic vapours and gas filter mask (protection factor 10) conforming to EN140 type A or equivalent. Respiratory protection should only be used to control residual risk of short duration activities, when all reasonably practicable steps have been taken to reduce exposure at source e.g. containment and/or local extract ventilation. Always follow respirator manufacturer's instructions regarding wearing and maintenance.

Hand protection
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time.

Wash gloves when contaminated. Dispose of when contaminated inside, when perforated or when contamination on the outside cannot be removed. Wash hands frequently and always before eating, drinking, smoking or using the toilet.

Material	Nitrile rubber
Rate of permeability	> 480 min
Glove thickness	> 0.4 mm
Protective index	Class 6
Directive	Protective gloves complying with EN 374.

Eye protection

Wear goggles (conforming to EN166, Field of Use = 5 or equivalent) and faceshield (conforming to EN166, Field of Use = 3 or equivalent).

Skin and body protection

Wear standard coveralls and Category 3 Type 6 suit.
If there is a risk of significant exposure, consider a higher protective type suit.
Wear two layers of clothing wherever possible. Polyester/cotton or cotton overalls should be worn under chemical protection suit and should be professionally laundered frequently.
If chemical protection suit is splashed, sprayed or significantly contaminated, decontaminate as far as possible, then carefully remove and dispose of as advised by manufacturer.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Form	Liquid, clear
Colour	yellow
pH	4.5 - 7.0 at 1 % (23 °C) (deionized water)
Flash point	44 °C
Density	ca. 0.94 g/cm³ at 20 °C
Water solubility	miscible
Partition coefficient: n-octanol/water	Deltamethrin: log Pow: 6.4 at 25 °C Piperonyl butoxide: log Pow: 4.75 Solvent Naphtha (petroleum), light aromatic: Not applicable
Surface tension	ca. 27.7 mN/m at 40 °C
9.2 Other information	Further safety related physical-chemical data are not known.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

Thermal decomposition	Stable under normal conditions.
10.2 Chemical stability	Stable under recommended storage conditions.
10.3 Possibility of hazardous reactions	No hazardous reactions when stored and handled according to prescribed instructions.
10.4 Conditions to avoid	Extremes of temperature and direct sunlight.
10.5 Incompatible materials	Store only in the original container.
10.6 Hazardous decomposition products	No decomposition products expected under normal conditions of use.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute oral toxicity	LD50 (Rat) 710 mg/kg
Acute inhalation toxicity	LC50 (Rat) 2.69 mg/l Exposure time: 4 h Irritating to respiratory system.
Acute dermal toxicity	LD50 (Rat) > 2,000 mg/kg
Skin irritation	No skin irritation (Rabbit)
Eye irritation	Severe eye irritation. (Rabbit)
Sensitisation	Non-sensitizing. (Mouse) OECD Test Guideline 429, local lymph node assay (LLNA)

Assessment STOT Specific target organ toxicity – single exposure

Deltamethrin: Based on available data, the classification criteria are not met.

Piperonyl butoxide: Based on available data, the classification criteria are not met.

Solvent Naphtha (petroleum), light aromatic: May cause respiratory irritation.,Solvent Naphtha (petroleum), light aromatic: May cause drowsiness or dizziness.

Assessment STOT Specific target organ toxicity – repeated exposure

Deltamethrin caused neurobehavioral effects and/or neuropathological changes in animal studies. The toxic effects of Deltamethrin are related to transient hyperactivity typical for pyrethroid neurotoxicity.
Piperonyl butoxide did not cause specific target organ toxicity in experimental animal studies.
Solvent Naphtha (petroleum), light aromatic: Based on available data, the classification criteria are not met.

Assessment mutagenicity

Deltamethrin was not mutagenic or genotoxic in a battery of in vitro and in vivo tests.
Piperonyl butoxide was not mutagenic or genotoxic in a battery of in vitro and in vivo tests.
Solvent Naphtha (petroleum), light aromatic is not considered mutagenic.

Assessment carcinogenicity

Deltamethrin was not carcinogenic in lifetime feeding studies in rats and mice.
Piperonyl butoxide was not carcinogenic in lifetime feeding studies in rats and mice.
Solvent Naphtha (petroleum), light aromatic: Based on available data, the classification criteria are not met.

Assessment toxicity to reproduction

Deltamethrin did not cause reproductive toxicity in a two-generation study in rats.
Piperonyl butoxide did not cause reproductive toxicity in a two-generation study in rats.
Solvent Naphtha (petroleum), light aromatic: Based on available data, the classification criteria are not met.

Assessment developmental toxicity

Deltamethrin caused developmental toxicity only at dose levels toxic to the dams. The developmental effects seen with Deltamethrin are related to maternal toxicity.
Piperonyl butoxide did not cause developmental toxicity in rats and rabbits.
Solvent Naphtha (petroleum), light aromatic: This information is not available.

Aspiration hazard

May be fatal if swallowed and enters airways.

Further information

Cutaneous sensations may occur, such as burning or stinging on the face and mucosae. However, these sensations cause no lesions and are of a transitory nature (max. 24 hours).
Irritating to respiratory system.

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 (Danio rerio (Zebra fish)) 0.06 mg/l Exposure time: 96 h
Toxicity to aquatic invertebrates	EC50 (Daphnia magna (Water flea)) 0.0075 mg/l Exposure time: 48 h
Toxicity to aquatic plants	EC50 (Algae) > 9.1 mg/l Exposure time: 96 h The value mentioned relates to the active ingredient deltamethrin.

12.2 Persistence and degradability

Biodegradability	Deltamethrin: Not rapidly biodegradable Piperonyl butoxide: Not rapidly biodegradable Solvent Naphtha (petroleum), light aromatic: rapidly biodegradable
Koc	Deltamethrin: Koc: 10240000 Piperonyl butoxide: Koc: 399 - 830

12.3 Bioaccumulative potential

Bioaccumulation	Deltamethrin: Bioconcentration factor (BCF) 1,400

Does not bioaccumulate.
Piperonyl butoxide:
Potential bioaccumulation
Solvent Naphtha (petroleum), light aromatic:
No data available

12.4 Mobility in soil

Mobility in soil Deltamethrin: Immobile in soil
Piperonyl butoxide: Moderately mobile in soils
Solvent Naphtha (petroleum), light aromatic: Slightly mobile in soils

12.5 Results of PBT and vPvB assessment

PBT and vPvB assessment Deltamethrin: This substance is not considered to be persistent, bioaccumulative and toxic (PBT). This substance is not considered to be very persistent and very bioaccumulative (vPvB).
Piperonyl butoxide: This substance is not considered to be persistent, bioaccumulative and toxic (PBT). This substance is not considered to be very persistent and very bioaccumulative (vPvB).
Solvent Naphtha (petroleum), light aromatic: This substance is not considered to be persistent, bioaccumulative and toxic (PBT). This substance is not considered to be very persistent and very bioaccumulative (vPvB).

12.6 Other adverse effects

Additional ecological information No other effects to be mentioned.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product In accordance with current regulations and, if necessary, after consultation with the site operator and/or with the responsible authority, the product may be taken to a waste disposal site or incineration plant. Advice may be obtained from the local waste regulation authority (part of the Environment Agency in the UK).

Contaminated packaging Small containers (< 10 l or < 10 kg) should be rinsed thoroughly using an integrated pressure rinsing device, or, by manually rinsing three times.
Add washings to sprayer at time of filling.
Dispose of empty and cleaned packaging safely.
Large containers (> 25 l or > 25 kg) should not be rinsed or re-used for any other purpose.
Return large containers to supplier.
Follow advice on product label and/or leaflet.

Waste key for the unused product **02 01 08*** agrochemical waste containing hazardous substances

SECTION 14: TRANSPORT INFORMATION

ADR/RID/ADN

14.1 UN number	**1993**
14.2 Proper shipping name	FLAMMABLE LIQUID, N.O.S. (DELTAMETHRIN, SOLVENT NAPHTHA (PETROLEUM) LIGHT AROMATIC SOLUTION)
14.3 Transport hazard class(es)	3
14.4 Packing group	III
14.5 Environm. Hazardous Mark	YES
Hazard no.	30
Tunnel Code	D/E

This classification is in principle not valid for carriage by tank vessel on inland waterways. Please refer to the manufacturer for further information.

IMDG

14.1 UN number	**1993**
14.2 Proper shipping name	FLAMMABLE LIQUID, N.O.S. (DELTAMETHRIN, SOLVENT NAPHTHA (PETROLEUM) LIGHT AROMATIC SOLUTION)
14.3 Transport hazard class(es)	3
14.4 Packing group	III
14.5 Marine pollutant	YES

IATA

14.1 UN number	**1993**
14.2 Proper shipping name	FLAMMABLE LIQUID, N.O.S. (DELTAMETHRIN, SOLVENT NAPHTHA (PETROLEUM) LIGHT AROMATIC SOLUTION)
14.3 Transport hazard class(es)	3
14.4 Packing group	III
14.5 Environm. Hazardous Mark	NO

UK 'Carriage' Regulations

14.1 UN number	**1993**
14.2 Proper shipping name	FLAMMABLE LIQUID, N.O.S. (DELTAMETHRIN, SOLVENT NAPHTHA (PETROLEUM) LIGHT AROMATIC SOLUTION)
14.3 Transport hazard class(es)	3
14.4 Packing group	III
14.5 Environm. Hazardous Mark	YES
Emergency action code	3Y

14.6 Special precautions for user
See sections 6 to 8 of this Safety Data Sheet.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code
No transport in bulk according to the IBC Code.

SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK and Northern Ireland Regulatory References

This material may be subject to some or all of the following regulations (and any subsequent amendments). Users must ensure that any uses and restrictions as indicated on the label and/or leaflet are followed.

Transport

Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (SI 2009 No 1348)
Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 (SI 1997 No 2367)
Air Navigation Dangerous Goods Regulations 2002 (SI 2002 No 2786)

Supply and Use

Chemical (Hazard Information and Packaging for Supply) Regulations 2009 (SI 2009 No 716)
Chemical (Hazard Information and Packaging for Supply) (Northern Ireland) Regulations 2009
Control of Substances Hazardous to Health Regulations 2002 (SI 2002 No 2677)
EH40 Occupational Exposure Limits - Table 1 List of approved workplace exposure limits
Control of Pesticide Regulations 1986
Dangerous Substances and Explosive Atmospheres Regulations 2002

Waste Treatment

Environmental Protection Act 1990, Part II
Environmental Protection (Duty of Care) Regulations 1991
The Waste Management Licensing Regulations 1994 (as amended)
Hazardous Waste Regulations 2005 (Replacing Special Waste Regulations 1996 as amended)
Landfill Directive
Regulation on Substances That Deplete the Ozone Layer 1994 (EEC/3093/94)
Water Resources Act 1991
Anti-Pollution Works Regulations 1999

Further information

WHO-classification: II (Moderately hazardous)

15.2 Chemical safety assessment

A Chemical Safety Assessment is not required for this substance.

SECTION 16: OTHER INFORMATION

Text of the hazard statements mentioned in Section 3

H226	Flammable liquid and vapour.
H301	Toxic if swallowed.
H304	May be fatal if swallowed and enters airways.
H312	Harmful in contact with skin.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H331	Toxic if inhaled.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H411	Toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.

Abbreviations and acronyms

ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE	Acute toxicity estimate
CAS-Nr.	Chemical Abstracts Service number
Conc.	Concentration
EC-No.	European community number
ECx	Effective concentration to x %
EH40 WEL	Worker Exposure Limit
EINECS	European inventory of existing commercial substances
ELINCS	European list of notified chemical substances
EN	European Standard
EU	European Union
IATA	International Air Transport Association
IBC	International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code)
ICx	Inhibition concentration to x %
IMDG	International Maritime Dangerous Goods
LCx	Lethal concentration to x %
LDx	Lethal dose to x %
LOEC/LOEL	Lowest observed effect concentration/level
MARPOL	MARPOL: International Convention for the prevention of marine pollution from ships
N.O.S.	Not otherwise specified
NOEC/NOEL	No observed effect concentration/level
OECD	Organization for Economic Co-operation and Development
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SI	Statutory Instrument
TWA	Time weighted average
UN	United Nations
WHO	World health organisation

The above information is intended to give general health and safety guidance on the storage and transport of the product.
It is not intended to apply to the use of the product for which purposes the product label and any appropriate technical usage literature available should be consulted and any relevant licenses, consents or approvals complied with.
The requirements or recommendations of any relevant site or working procedure, system or policy in force or arising from any risk assessment involving the substance or product should take precedence over any of the guidance contained in this safety data sheet where there is a difference in the information given.
The information provided in this safety data sheet is accurate at the date of publication and will be updated as and when appropriate.
No liability will be accepted for any injury, loss or damage resulting from any failure to take account of information or advice contained in this safety data sheet.

Reason for Revision: Safety Data Sheet according to Regulation (EU) No. 2015/830. The following sections have been revised: Section 2: Hazards Identification. Section 4: First Aid Measures. Section 8: Exposure Controls / Personal Protection. Section 11: Toxicological Information. Section 12. Ecological information.

Changes since the last version are highlighted in the margin. This version replaces all previous versions.

Annex X: Safety data sheet Pirigrain 50

PIRIGRAIN 50

Fiche de données de sécurité conforme au Règlement (CE) n°1907/2006

Emission : 09/03/1994 ; Révision n°22 : 11/06/2021 ; Version n°23

1. IDENTIFICATION DE LA SUBSTANCE/DU MELANGE ET DE LA SOCIETE/L'ENTREPRISE

1.1. Identificateur de produit :

Nom commercial : PIRIGRAIN 50.
N° UFI : P310-A05R-X00R-SJQ9.

1.2. Utilisations identifiées pertinentes de la substance ou du mélange et utilisations déconseillées :

Utilisation conseillée : Formulation liquide prête à l'emploi, appliquée par nébulisation à froid (KN), pour la protection préventive et curative des grains stockés (uniquement blé, avoine, orge, millet et sorgho) contre les acariens et les insectes. AMM n° 7700703 délivrée en 1977.
Utilisation déconseillée : Autres que celles indiquées.
Type d'utilisateurs : Réservé à un usage exclusivement professionnel.

1.3. Renseignements concernant le fournisseur de la fiche de données de sécurité :

SOJAM
2, Mail des Cerclades – CS 20808 Cergy – 95015 CERGY-PONTOISE CEDEX
Téléphone : 01 34 02 46 60 – Fax : 01 30 37 15 90
E-mail : contact@sojam.fr
E-mail rédacteur de la FDS : s.laboratoire@sojam.fr
Agrément distribution de produits phytopharmaceutiques N° IF01739.

1.4. Numéro d'appel d'urgence :

Numéro ORPHILA (INRS) : 01 45 42 59 59
Site internet : www.centres-antipoison.net
En cas d'urgence, composer le 15 ou le 112 ou contacter le centre antipoison le plus proche. Puis signaler vos symptômes au réseau Phyt'Attitude, N° vert : 0 800 887 887 (appel gratuit depuis un poste fixe).

2. IDENTIFICATION DES DANGERS

2.1. Classification de la substance ou du mélange :

Conformément au Règlement (CE) n°1272/2008 et ses adaptations :
H304 Peut être mortel en cas d'ingestion et de pénétration dans les voies respiratoires (Asp. Tox. 1).
H315 Provoque une irritation cutanée (Skin Corr. 2).
H373 Risque présumé d'effets graves pour le système nerveux à la suite d'expositions répétées ou d'une exposition prolongée (STOT RE 2).
H410 Très toxique pour les organismes aquatiques, entraîne des effets néfastes à long terme (Aquatic Chronic 1).
EUH066 L'exposition répétée peut provoquer des dessèchement ou gerçures de la peau.

2.2. Eléments d'étiquetage :

Conformément au Règlement (CE) n°1272/2008 et ses adaptations :
Pictogrammes de danger :

GHS07 GHS08 GHS09

Mention d'avertissement :
DANGER.
Mentions de danger :
Contient : Hydrocarbures, C11-C14, n-alcanes, isoalcanes, cycliques, < 2% aromatiques.
H304 Peut être mortel en cas d'ingestion et de pénétration dans les voies respiratoires.

H315 Provoque une irritation cutanée.
H373 Risque présumé d'effets graves pour le système nerveux à la suite d'expositions répétées ou d'une exposition prolongée.
H410 Très toxique pour les organismes aquatiques, entraîne des effets néfastes à long terme.
EUH066 L'exposition répétée peut provoquer dessèchement ou gerçures de la peau.

P260 Ne pas respirer les vapeurs.
P264 Se laver soigneusement les mains après manipulation.
P270 Ne pas manger, boire ou fumer en manipulant le produit.
P301 + P310 EN CAS D'INGESTION : Appeler immédiatement un CENTRE ANTIPOISON ou un médecin.
P331 NE PAS faire vomir.
P273 Eviter le rejet dans l'environnement.
P391 Recueillir le produit répandu.
P501 Eliminer le contenu/récipient conformément à la réglementation en vigueur ou dans une installation d'élimination des déchets agréée.
SP1 Ne pas polluer l'eau avec le produit ou son emballage. Ne pas nettoyer le matériel d'application près des eaux de surface. Eviter la contamination via les systèmes d'évacuation des eaux à partir des cours de ferme ou des routes.
EUH401 Respectez les instructions d'utilisation pour éviter les risques pour la santé humaine et l'environnement.
EUH210 Fiche de données de sécurité disponible sur demande.

2.3. Autres dangers :
Le mélange ne répond pas aux critères applicables aux mélanges PBT ou vPvB, conformément à l'annexe XIII du Règlement (CE) n°1907/2006.

3. COMPOSITION/INFORMATIONS SUR LES COMPOSANTS

3.2. Mélange :

Substances	% (m/m)	Classification selon le Règlement (CE) n°1272/2008
N° CE : 926-141-6 N° REACH : 01-2119456620-43 *Hydrocarbures, C11-C14, n-alcanes, isoalcanes, cycliques, < 2 % aromatiques*	> 50,0	GHS08 Dgr Asp. Tox. 1, H304 EUH066
N° CE : 252-104-2 N° CAS : 34590-94-8 N° REACH : 01-2119450011-60-XXXX *(2-méthoxyméthyléthoxy)propanol**	10,0 – 25,0	Non classé
N° CE : 249-528-5 N° CAS : 29232-93-7 N° INDEX : 015-134-00-5 *Pyrimiphos-méthyl**	5,8 % (m/m) Soit 50,0 g/L	GHS02 GHS07 GHS08 GHS09 Dgr Flam. Liq. 3, H226 Acute Tox. 4, H302 STOT RE 1, H372 Aquatic Acute 1, H400 (M = 1) Aquatic Chronic 1, H410 (M = 1)

* Substances pour lesquelles il existe des valeurs limites d'exposition sur le lieu de travail.

Informations complémentaires : Pour le libellé des phrases de risques citées, se référer à la rubrique 16.

4. PREMIERS SECOURS

LA RAPIDITE EST ESSENTIELLE.
NE JAMAIS LAISSER SEULE LA PERSONNE INTOXIQUEE.

4.1. Description des premiers secours :
En cas de contact avec la peau : Enlever immédiatement tout vêtement souillé ou éclaboussé et se laver immédiatement et abondamment avec de l'eau et du savon. En cas d'irritation persistante, consulter un médecin.
En cas de contact avec les yeux : Rincer soigneusement et abondamment avec une douche oculaire ou de l'eau pendant

10 minutes au moins, en maintenant les paupières écartées. Enlever les lentilles de contact si la victime en porte et si elles peuvent être facilement enlevées. Continuer à rincer. En cas d'irritation persistante, consulter un ophtalmologiste.
En cas d'ingestion accidentelle : Rincer la bouche avec de l'eau (seulement si la personne est consciente). NE PAS faire vomir. Appeler aussitôt un médecin.
En cas d'inhalation : Transporter la victime à l'extérieur et la maintenir au repos dans une position où elle peut confortablement respirer. En cas de difficulté respiratoire, pratiquer la respiration artificielle et appeler un médecin.

Numéro d'appel des secours médicalisés : 15, 18 ou 112.

4.2. Principaux symptômes et effets, aigus et différés :
Les symptômes se produiront entre autres sous forme de céphalées, étourdissements, vertiges, fatigue, asthénie musculaire et dans les cas extrêmes perte de conscience.

4.3. Indication des éventuels soins médicaux immédiats et traitements particuliers nécessaires :
D'une manière générale, en cas de doute ou si les symptômes persistent, toujours faire appel à un médecin (si possible lui montrer l'étiquette).
Antidote : Sulfate d'atropine (sous contrôle médical).

5. MESURES DE LUTTE CONTRE L'INCENDIE

5.1. Moyens d'extinction :
Moyens d'extinction appropriés : Extincteurs à poudre ou à mousse.
Moyens d'extinction inappropriés : Jets d'eau.

5.2. Dangers particuliers résultant de la substance ou du mélange :
Risques spécifiques durant l'incendie : Comme tout produit organique, la combustion peut dégager des fumées toxiques (monoxyde de carbone, dioxyde de carbone, chlorure d'hydrogène…).

5.3. Conseils aux pompiers :
Equipements de protection contre le feu : Les sauveteurs doivent porter un appareil de protection respiratoire autonome et des vêtements de protection.

6. MESURES A PRENDRE EN CAS DE DISPERSION ACCIDENTELLE

6.1. Précautions individuelles, équipement de protection et procédures d'urgence :
Porter des gants de protection, des vêtements de protection, un équipement de protection des yeux et du visage et éventuellement un masque de protection respiratoire.
Prévenir de tout risque d'inflammation des vapeurs.
Eliminer les flammes de la zone intéressée.
Les déversements peuvent rendre les surfaces glissantes.
Pour les non-secouristes : A cause des solvants organiques contenus dans le mélange, éliminer les sources d'ignition et ventiler les locaux. Eviter d'inhaler les vapeurs. Eviter tout contact avec la peau et les yeux. Si les quantités répandues sont importantes, évacuer le personnel en ne faisant intervenir que des opérateurs entraînés munis d'équipements de protection individuelle.
Pour les secouristes : Les intervenants seront équipés d'équipements de protection individuelle appropriés (se référer à la section 8).

6.2. Précautions pour la protection de l'environnement :
En cas d'une grande perte, éviter toute contamination des égouts, des eaux de surface, du sol.
Si le produit contamine des nappes d'eau, rivières ou égouts, alerter les autorités compétentes selon les procédures réglementaires.

6.3. Méthodes et matériel de confinement et de nettoyage :
Contenir et recueillir les fuites avec des matériaux absorbants non combustibles (par exemple : sable, terre, vermiculite, terre de diatomée…) dans des futs en vue de l'élimination des déchets.
Nettoyer de préférence avec un détergent, éviter l'utilisation de solvants.

6.4. Référence à d'autres rubriques :
Se référer à la rubrique 8 et à la rubrique 13.

7. MANIPULATION ET STOCKAGE

Les prescriptions relatives aux locaux de stockage sont applicables aux ateliers où est manipulé le produit.

7.1. Précautions à prendre pour une manipulation sans danger :
Recommandations :
Porter des gants de protection, des vêtements de protection, un équipement de protection des yeux et du visage et éventuellement un masque de protection respiratoire.
Eviter le contact avec la peau et les yeux.
Ne pas respirer le brouillard fin.
Ne jamais aspirer le produit.
Employer le produit dans une zone bien ventilée.
Conseils en matière d'hygiène du travail :
Ne pas manger, boire ou fumer dans les zones de travail.
Se laver les mains après chaque utilisation.
Enlever les vêtements contaminés et l'équipement de protection avant d'entrer dans une zone de restauration.
Attention : Diluer le produit juste avant emploi, ne jamais conserver de produit dilué.

7.2. Conditions d'un stockage sûr, y compris d'éventuelles incompatibilités :
Les locaux de stockage doivent être en conformité avec la législation en vigueur y compris les circuits électriques.
Stocker dans un local frais et ventilé, loin de toutes sources de chaleur (flammes, étincelles) et non exposé directement à la lumière solaire. Tenir à l'abri du gel.
Conserver uniquement dans l'emballage d'origine, hors de portée des enfants.
Les emballages entamés doivent être refermés soigneusement et conservés en position verticale.
Le sol des locaux sera imperméable et formera une cuvette de rétention afin qu'en cas de déversement accidentel, le liquide ne puisse se répandre au dehors.

7.3. Utilisation(s) finale(s) particulière(s) :
Produit phytopharmaceutique insecticide à usage exclusivement professionnel.

8. CONTROLES DE L'EXPOSITION/PROTECTION INDIVIDUELLE

8.1. Paramètres de contrôle :
Valeurs limites d'exposition professionnelle (INRS, ED984 2016) :
(2-méthoxyméthyléthoxy)propanol : VLEP 50 ppm ; VLEP 308 mg/m^3 ; TMP n° 84.

Pyrimiphos-méthyl : VME 8 heures 3 mg/m^3 (peau).

8.2. Contrôles de l'exposition :
Protection des yeux/du visage : Eviter le contact avec les yeux et la peau. Porter des lunettes de protection. Il est recommandé aux porteurs de lentilles de contact d'utiliser des verres correcteurs car ils peuvent être exposés à des vapeurs irritantes.
Protection de la peau : Eviter le contact avec la peau. Porter un vêtement de protection.
Protection des mains : Eviter le contact avec la peau. Porter des gants en nitrile de protection.
Protection respiratoire : Eviter d'inhaler les vapeurs. En cas de ventilation insuffisante ou lorsque le travailleur est confronté à des concentrations supérieures aux limites d'exposition, porter un masque de protection à filtre type A2P3.

Lors de l'ensemble des phases d'utilisation du produit, porter des gants en nitrile certifiés NF EN ISO 374-1/A1 et NF EN 16523-1+A1 (type A) et un EPI vestimentaire conforme à la norme EN 14605+A1 (type 4). Le port du masque anti-poussière (FFP2) certifié EN 149+A1 est recommandé.
Lors du nettoyage des cellules vides, porter un EPI vestimentaire conforme à la norme EN 14605+A1 (type 4), des gants en nitrile certifiés NF EN ISO 374-1/A1 et NF EN 16523-1+A1 (type A) et un demi-masque certifié (NF EN 140) équipé d'un filtre P3 (NF EN 143)

9. PROPRIETES PHYSIQUES ET CHIMIQUES

9.1. Informations sur les propriétés physiques et chimiques essentielles :
Etat physique : Liquide.
Couleur : Incolore à jaune clair.
Odeur : Mercaptan.
Solubilité : Soluble dans les hydrocarbures et insoluble dans l'eau.
Point d'éclair : 67°C (norme ASTM D 3278 (coupe fermée)).
Masse volumique : 0,860 $^{+}/_{-}$ 0,01 g/cm^3 à 20°C.

9.2. Autres informations : Données non disponibles.

10. STABILITE ET REACTIVITE

10.1. Réactivité : Le pyrimiphos-méthyl est hydrolysé par les acides et bases fortes.
10.2. Stabilité chimique : Stable dans les conditions ambiantes normales et prévisibles de stockage (températures de stockage comprises entre -5°C et 50°C) et de manipulation.
10.3. Possibilité de réactions dangereuses : N/A.
10.4. Conditions à éviter : Chaleur excessive, humidité.
10.5. Matières incompatibles : Acides et bases fortes.
10.6. Produits de décomposition dangereux : Emission de vapeurs toxiques par élévation de la température.

11. INFORMATIONS TOXICOLOGIQUES

11.1. Informations sur les effets toxicologiques :
En cas de contact avec la peau : Irritation, dermatite non allergique de contact.
En cas de contact avec les yeux : Irritation.
En cas d'ingestion : Nocif, peut porter atteinte aux poumons. NE PAS faire vomir.
Mode d'action des organophosphorés : Inhibition de la cholinestérase.

Mélange :
Toxicité aiguë orale : DL50 orale rat mâle > 2000 mg/kg p.c. (OCDE 423).
Toxicité aiguë cutanée : DL50 cutanée rats mâle et femelle > 2000 mg/kg p.c. (OCDE 402).
Irritation cutanée lapin mâle : Irritant, inflammation de la peau (valeur moyenne des scores ≥ 2) (OCDE 404).
Irritation oculaire lapin femelle : Non irritant (OCDE 405).
Sensibilisation cutanée souris femelle : Non sensibilisant (OCDE 429).

Pyrimiphos-méthyl :
Toxicité aiguë orale : DL50 orale rats mâle et femelle = 1,414 mg/kg p.c.
Toxicité aiguë cutanée : DL50 cutanée rats mâle et femelle > 2000 mg/kg p.c.
Toxicité aiguë inhalation : CL50 inhalation 4 heures rats mâle et femelle > 5,04 mg/L.
Irritation/corrosion cutanée : Non irritant lapin.
Irritation/corrosion oculaire : Non irritant lapin.
Sensibilisation cutanée : Non sensibilisant cochon d'Inde.
Mutagénicité : Pas d'effets mutagènes (tests *in vivo*).
Cancérogénicité : Pas d'effets cancérogènes (tests *in vivo*).
Reprotoxicité : Non reprotoxique.
STOT exposition simple : Classé comme ayant un risque avéré d'effets graves pour le système nerveux central.
STOT exposition répétée : Non classé comme ayant un risque avéré d'effets graves pour les organes.

12. INFORMATIONS ECOLOGIQUES

12.1. Toxicité :
Très toxique pour les organismes aquatiques, entraîne des effets néfastes à long terme.

Eviter tout rejet et toute contamination des eaux naturelles.

Mélange : Aucune donnée disponible.

Pyrimiphos-méthyl :
Toxicité aiguë poisson : CL50 96 heures *Oncorhynchus mykiss* = 0,404 mg/L.
Toxicité aiguë invertébré aquatique : CE50 48 heures *Daphnia magna* = 0,000314 mg/L.
Toxicité aiguë algue : CE50r 72 heures *Pseudokirchneriella subcapitata* = 3,38 mg/L.
Toxicité aiguë algue : NOEC 72 heures *Pseudokirchneriella subcapitata* = 0,3 mg/L.
Toxicité aiguë bactérie : CI50 6 heures *Pseudomonas putida* : > 4,5 mg/L.
Toxicité chronique poisson : NOEC 28 jours *Oncorhynchus mykiss* < 0,025 mg/L.
Toxicité chronique invertébré aquatique : NOEC 21 jours *Daphnia magna* : 0,05 µg/L.

12.2. Persistance et dégradabilité : *Pyrimiphos-méthyl* : Non persistant dans l'eau.
12.3. Potentiel de bioaccumulation : *Pyrimiphos-méthyl* : Fort potentiel de bioaccumulation.
12.4. Mobilité dans le sol : *Pyrimiphos-méthyl* : Faible mobilité dans le sol.
12.5. Résultats des évaluations PBT et vPvB : N/A.
12.6. Autres effets néfastes : Données non disponibles.

13. CONSIDERATIONS RELATIVES A L'ELIMINATION

13.1. Méthodes de traitement des déchets :
Ne pas déverser dans les égouts ni dans les cours d'eau.

Déchets et emballages souillés :
La gestion des déchets se fait sans mettre en danger la santé humaine et sans nuire à l'environnement, et notamment sans créer de risque pour l'eau, l'air, le sol, la faune ou la flore.
Ne pas contaminer le sol ou l'eau avec des déchets, ne pas procéder à leur élimination dans l'environnement.
Eliminer les emballages, avec ou sans reliquat de produit, conformément à la réglementation en vigueur ou dans une installation d'élimination des déchets agréée.
S'assurer de l'impossibilité de réutiliser les emballages souillés.
Conserver la(les) étiquettes sur le récipient.

14. INFORMATIONS RELATIVES AU TRANSPORT

14.1. Numéro ONU : UN 3082.
14.2. Désignation officielle de transport de l'ONU : Matière dangereuse du point de vue de l'environnement, liquide, N.S.A. (pyrimiphos-méthyl).
14.3. Classe(s) de danger pour le transport : 9.
14.4. Groupe d'emballage : III.
14.5. Dangers pour l'environnement : Oui (pyrimiphos-méthyl).
14.6. Précautions particulières à prendre par l'utilisateur : ADR : Code : M6 ; N° danger : 90 ; Code tunnel : E.
14.7. Transport en vrac conformément à l'annexe II de la convention Marpol et au recueil IBC : Non.

15. INFORMATIONS RELATIVES A LA REGLEMENTATION

15.1. Réglementations/législation particulières à la substance ou au mélange en matière de sécurité, de santé et d'environnement :
Règlement (CE) n°1907/2006 du Parlement européen et du Conseil du 18 décembre 2006.
Règlement (CE) n°1272/2008 du Parlement européen et du Conseil du 16 décembre 2008, modifié par le Règlement (UE) 2018/1480 de la Commission du 4 octobre 2018 (10ème ATP).

Tableaux des maladies professionnelles selon le Code du Travail français :

N° TMP	Libellé
84	Affections engendrées par les solvants organiques liquides à usage professionnel :

84 Hydrocarbures liquides aliphatiques ou cycliques saturés ou insaturés et leurs mélanges ; hydrocarbures halogénés liquides ; dérivés nitrés des hydrocarbures alipathiques ; alcools, glycols, éthers de glycol ; cétones ; aldéhydes ; éthers alipathiques et cycliques, dont le tétrahydrofurane ; esters ; diméthylformamide et diméthylacétamine ; acétonitrile et propionitrile ; pyridine ; diméthhylsulfone, diméthylsulfoxyde.

Salariés relevant d'une surveillance médicale renforcée selon le Code du Travail français :
Surveillance médicale renforcée pour les salariés affectés à certains travaux définis par l'article L 4111-6 et les décrets spéciaux pris en application :
- Agents chimiques dangereux : Décret N° 2003-1254 du 23/12/2003.

Surveillance médicale renforcée pour les salariés qui réalisent des travaux fixés dans l'arrêté du 11 juillet 1977.
Pour les travaux comportant la préparation, l'emploi, la manipulation, ou l'exposition aux agents suivants :
- Phosphores et composés, notamment les esters phosphoriques, pyrophosphoriques, triphosphoriques, ainsi que les autres composés organiques du phosphore.

Nomenclature ICPE : 4510-1436.

15.2. Evaluation de la sécurité chimique :
Le fournisseur de cette fiche de données sécurité n'a pas effectué d'évaluation de la sécurité chimique.

16. AUTRES INFORMATIONS

Les paragraphes modifiés sont signalés par le signe #.
Références bibliographiques et sources de données : FDS des principaux constituants.

Toutes les indications contenues dans ce document sont fondées sur l'état actuel de nos connaissances, en accord avec la législation européenne et sont données de bonne foi.
L'attention des utilisateurs est en outre attirée sur les risques éventuellement encourus lorsqu'un produit est utilisé à d'autres usages que ceux pour lequel il est conçu. Il est de la responsabilité de l'utilisateur de prendre les mesures nécessaires afin de respecter la législation nationale, régionale et locale.
Elle ne dispense en aucun cas l'utilisateur de connaître et d'appliquer l'ensemble des textes réglementant son activité. Il prendra sous sa seule responsabilité les précautions liées à l'utilisation qu'il fait du produit.

Acronymes et abréviations :
ADR : *Accord for dangerous goods by road.*
ICPE : Installation classée pour la protection de l'environnement.
INRS : Institut national de recherche et de sécurité.
N/A : Non applicable.
N.S.A. : Non spécifié par ailleurs.
ONU : Organisation des Nations Unies.
PBT : *Persistent, bioaccumulative and toxic.*
REACH : *Registration, evaluation, authorization and restriction of chemicals.*
VLPE : Valeur limite d'exposition professionnelle.
VME : Valeur limite de moyenne d'exposition professionnelle.
vPvB : *Very persistent and very bioaccumulative.*

H226 Liquide et vapeurs inflammables.
H302 Nocif en cas d'ingestion.
H304 Peut être mortel en cas d'ingestion et de pénétration dans les voies respiratoires.
H372 Risque avéré d'effets graves pour les organes à la suite d'expositions répétées ou d'une exposition prolongée.
H400 Très toxique pour les organismes aquatiques.
H410 Très toxique pour les organismes aquatiques, entraîne des effets néfastes à long terme.
EUH066 L'exposition répétée peut provoquer dessèchement ou gerçures de la peau.

Annex XI: Safety data sheet Pirigrain SLD

PIRIGRAIN SLD

Fiche de données de sécurité conforme au Règlement (CE) n°1907/2006

Emission : 09/01/1994 ; Révision n°21 : 11/06/2021 ; Version n°22

1. IDENTIFICATION DE LA SUBSTANCE/DU MELANGE ET DE LA SOCIETE/L'ENTREPRISE

1.1. Identificateur de produit :

Nom commercial : PIRIGRAIN SLD.
N° UFI : X610-T0V5-8007-EW9C.

1.2. Utilisations identifiées pertinentes de la substance ou du mélange et utilisations déconseillées :

Utilisation conseillée : Formulation liquide prête à l'emploi, appliquée par nébulisation à froid (KN), pour la protection préventive et curative des grains stockés (uniquement blé, avoine, orge, millet et sorgho) contre les acariens et les insectes. AMM n° 8600313 délivrée en 1986.
Utilisation déconseillée : Autres que celles indiquées.
Type d'utilisateurs : Réservé à un usage exclusivement professionnel.

1.3. Renseignements concernant le fournisseur de la fiche de données de sécurité :

SOJAM
2, Mail des Cerclades – CS 20808 Cergy – 95015 CERGY-PONTOISE CEDEX
Téléphone : 01 34 02 46 60 – Fax : 01 30 37 15 90
E-mail : contact@sojam.fr
E-mail rédacteur de la FDS : s.laboratoire@sojam.fr
Agrément distribution de produits phytopharmaceutiques N° IF01739.

1.4. Numéro d'appel d'urgence :

Numéro ORPHILA (INRS) : 01 45 42 59 59
Site internet : www.centres-antipoison.net
En cas d'urgence, composer le 15 ou le 112 ou contacter le centre antipoison le plus proche. Puis signaler vos symptômes au réseau Phyt'Attitude, N° vert : 0 800 887 887 (appel gratuit depuis un poste fixe).

2. IDENTIFICATION DES DANGERS

2.1. Classification de la substance ou du mélange :

Conformément au Règlement (CE) n°1272/2008 et ses adaptations :
H304 Peut être mortel en cas d'ingestion et de pénétration dans les voies respiratoires (Asp. Tox. 1).
H315 Provoque une irritation cutanée (Skin Corr. 2).
H373 Risque présumé d'effets graves pour le système nerveux à la suite d'expositions répétées ou d'une exposition prolongée (STOT RE 2).
H410 Très toxique pour les organismes aquatiques, entraîne des effets néfastes à long terme (Aquatic Chronic 1).
EUH066 L'exposition répétée peut provoquer des dessèchement ou gerçures de la peau.

2.2. Eléments d'étiquetage :

Conformément au Règlement (CE) n°1272/2008 et ses adaptations :
Pictogrammes de danger :

GHS07 GHS08 GHS09

Mention d'avertissement :
DANGER.
Mentions de danger :
Contient : Hydrocarbures, C11-C14, n-alcanes, isoalcanes, cycliques, < 2% aromatiques.
H304 Peut être mortel en cas d'ingestion et de pénétration dans les voies respiratoires.

H315 Provoque une irritation cutanée.
H373 Risque présumé d'effets graves pour le système nerveux à la suite d'expositions répétées ou d'une exposition prolongée.
H410 Très toxique pour les organismes aquatiques, entraîne des effets néfastes à long terme.
EUH066 L'exposition répétée peut provoquer dessèchement ou gerçures de la peau.

P260 Ne pas respirer les vapeurs.
P264 Se laver soigneusement les mains après manipulation.
P270 Ne pas manger, boire ou fumer en manipulant le produit.
P273 Eviter le rejet dans l'environnement.
P301 + P310 EN CAS D'INGESTION : Appeler immédiatement un CENTRE ANTIPOISON ou un médecin.
P331 NE PAS faire vomir.
P391 Recueillir le produit répandu.
P501 Eliminer le contenu/récipient conformément à la réglementation en vigueur ou dans une installation d'élimination des déchets agréée.
SP1 Ne pas polluer l'eau avec le produit ou son emballage. Ne pas nettoyer le matériel d'application près des eaux de surface. Eviter la contamination via les systèmes d'évacuation des eaux à partir des cours de ferme ou des routes.
EUH401 Respectez les instructions d'utilisation pour éviter les risques pour la santé humaine et l'environnement.

2.3. Autres dangers :
Le mélange ne répond pas aux critères applicables aux mélanges PBT ou vPvB, conformément à l'annexe XIII du Règlement (CE) n°1907/2006.

3. COMPOSITION/INFORMATIONS SUR LES COMPOSANTS

3.2. Mélange :

Substances	% (m/m)	Classification selon le Règlement (CE) n°1272/2008
N° CE : 926-141-6 N° REACH : 01-2119456620-43 *Hydrocarbures, C11-C14, n-alcanes, isoalcanes, cycliques, < 2 % aromatiques*	> 50,0	GHS08 Dgr Asp. Tox. 1, H304 EUH066
N° CE : 252-104-2 N° CAS : 34590-94-8 N° REACH : 01-2119450011-60-XXXX *(2-méthoxyméthyléthoxy)propanol**	10,0 – 25,0	Non classé
N° CE : 249-528-5 N° CAS : 29232-93-7 N° INDEX : 015-134-00-5 *Pyrimiphos-méthyl**	8,27 % (m/m) Soit 72,5 g/L	GHS02 GHS07 GHS08 GHS09 Dgr Flam. Liq. 3, H226 Acute Tox. 4, H302 STOT RE 1, H372 Aquatic Acute 1, H400 (M = 1) Aquatic Chronic 1, H410 (M = 1)

* Substances pour lesquelles il existe des valeurs limites d'exposition sur le lieu de travail.

Informations complémentaires : Pour le libellé des phrases de risques citées, se référer à la rubrique 16.

4. PREMIERS SECOURS

LA RAPIDITE EST ESSENTIELLE.
NE JAMAIS LAISSER SEULE LA PERSONNE INTOXIQUEE.

4.1. Description des premiers secours :
En cas de contact avec la peau : Enlever immédiatement tout vêtement souillé ou éclaboussé et se laver immédiatement et abondamment avec de l'eau et du savon. En cas d'irritation persistante, consulter un médecin.
En cas de contact avec les yeux : Rincer soigneusement et abondamment avec une douche oculaire ou de l'eau pendant 10 minutes au moins, en maintenant les paupières écartées. Enlever les lentilles de contact si la victime en porte et si elles

peuvent être facilement enlevées. Continuer à rincer. En cas d'irritation persistante, consulter un ophtalmologiste.
En cas d'ingestion accidentelle : Rincer la bouche avec de l'eau (seulement si la personne est consciente). NE PAS faire vomir. Appeler aussitôt un médecin.
En cas d'inhalation : Transporter la victime à l'extérieur et la maintenir au repos dans une position où elle peut confortablement respirer. En cas de difficulté respiratoire, pratiquer la respiration artificielle et appeler un médecin.

Numéro d'appel des secours médicalisés : 15, 18 ou 112.

4.2. Principaux symptômes et effets, aigus et différés :
Les symptômes se produiront entre autres sous forme de céphalées, étourdissements, vertiges, fatigue, asthénie musculaire et dans les cas extrêmes perte de conscience.

4.3. Indication des éventuels soins médicaux immédiats et traitements particuliers nécessaires :
D'une manière générale, en cas de doute ou si les symptômes persistent, toujours faire appel à un médecin (si possible lui montrer l'étiquette).
Antidote : Sulfate d'atropine (sous contrôle médical).

5. MESURES DE LUTTE CONTRE L'INCENDIE

5.1. Moyens d'extinction :
Moyens d'extinction appropriés : Extincteurs à poudre ou à mousse.
Moyens d'extinction inappropriés : Jets d'eau.

5.2. Dangers particuliers résultant de la substance ou du mélange :
Risques spécifiques durant l'incendie : Comme tout produit organique, la combustion peut dégager des fumées toxiques (monoxyde de carbone, dioxyde de carbone, chlorure d'hydrogène…).

5.3. Conseils aux pompiers :
Equipements de protection contre le feu : Les sauveteurs doivent porter un appareil de protection respiratoire autonome et des vêtements de protection.

6. MESURES A PRENDRE EN CAS DE DISPERSION ACCIDENTELLE

6.1. Précautions individuelles, équipement de protection et procédures d'urgence :
Porter des gants de protection, des vêtements de protection, un équipement de protection des yeux et du visage et éventuellement un masque de protection respiratoire.
Prévenir de tout risque d'inflammation des vapeurs.
Eliminer les flammes de la zone intéressée.
Les déversements peuvent rendre les surfaces glissantes.
Pour les non-secouristes : A cause des solvants organiques contenus dans le mélange, éliminer les sources d'ignition et ventiler les locaux. Eviter d'inhaler les vapeurs. Eviter tout contact avec la peau et les yeux. Si les quantités répandues sont importantes, évacuer le personnel en ne faisant intervenir que des opérateurs entraînés munis d'équipements de protection individuelle.
Pour les secouristes : Les intervenants seront équipés d'équipements de protection individuelle appropriés (se référer à la section 8).

6.2. Précautions pour la protection de l'environnement :
En cas d'une grande perte, éviter toute contamination des égouts, des eaux de surface, du sol.
Si le produit contamine des nappes d'eau, rivières ou égouts, alerter les autorités compétentes selon les procédures réglementaires.

6.3. Méthodes et matériel de confinement et de nettoyage :
Contenir et recueillir les fuites avec des matériaux absorbants non combustibles (par exemple : sable, terre, vermiculite, terre de diatomée, *etc.*) dans des futs en vue de l'élimination des déchets.
Nettoyer de préférence avec un détergent, éviter l'utilisation de solvants.

6.4. Référence à d'autres rubriques :
Se référer à la rubrique 8 et à la rubrique 13.

7. MANIPULATION ET STOCKAGE

Les prescriptions relatives aux locaux de stockage sont applicables aux ateliers où est manipulé le produit.

7.1. Précautions à prendre pour une manipulation sans danger :
Recommandations :
Porter des gants de protection, des vêtements de protection, un équipement de protection des yeux et du visage et éventuellement un masque de protection respiratoire.
Eviter le contact avec la peau et les yeux.
Ne pas respirer le brouillard fin.
Ne jamais aspirer le produit.
Employer le produit dans une zone bien ventilée.
Conseils en matière d'hygiène du travail :
Ne pas manger, boire ou fumer dans les zones de travail.
Se laver les mains après chaque utilisation.
Enlever les vêtements contaminés et l'équipement de protection avant d'entrer dans une zone de restauration.
Attention : Diluer le produit juste avant emploi, ne jamais conserver de produit dilué.

7.2. Conditions d'un stockage sûr, y compris d'éventuelles incompatibilités :
Les locaux de stockage doivent être en conformité avec la législation en vigueur y compris les circuits électriques.
Stocker dans un local frais et ventilé, loin de toutes sources de chaleur (flammes, étincelles) et non exposé directement à la lumière solaire. Tenir à l'abri du gel.
Conserver uniquement dans l'emballage d'origine, hors de portée des enfants.
Les emballages entamés doivent être refermés soigneusement et conservés en position verticale.
Le sol des locaux sera imperméable et formera une cuvette de rétention afin qu'en cas de déversement accidentel, le liquide ne puisse se répandre au dehors.

7.3. Utilisation(s) finale(s) particulière(s) :
Produit phytopharmaceutique insecticide à usage exclusivement professionnel.

8. CONTROLES DE L'EXPOSITION/PROTECTION INDIVIDUELLE

8.1. Paramètres de contrôle :
Valeurs limites d'exposition professionnelle (INRS, ED984 2016) :
(2-méthoxyméthyléthoxy)propanol : VLEP 50 ppm ; VLEP 308 mg/m^3 ; TMP n° 84.

Pyrimiphos-méthyl :
VME 8 heures 3 mg/m^3 (peau).

8.2. Contrôles de l'exposition :
Protection des yeux/du visage : Eviter le contact avec les yeux et la peau. Porter des lunettes de protection. Il est recommandé aux porteurs de lentilles de contact d'utiliser des verres correcteurs car ils peuvent être exposés à des vapeurs irritantes.
Protection de la peau : Eviter le contact avec la peau. Porter un vêtement de protection.
Protection des mains : Eviter le contact avec la peau. Porter des gants en nitrile de protection.
Protection respiratoire : Eviter d'inhaler les vapeurs. En cas de ventilation insuffisante ou lorsque le travailleur est confronté à des concentrations supérieures aux limites d'exposition, porter un masque de protection à filtre type A2P3.

Lors de l'ensemble des phases d'utilisation du produit, porter des gants en nitrile certifiés NF EN ISO 374-1/A1 et NF EN 16523-1+A1 (type A) et un EPI vestimentaire conforme à la norme EN 14605+A1 (type 4). Le port du masque anti-poussière (FFP2) certifié EN 149+A1 est recommandé.
Lors du nettoyage des cellules vides, porter un EPI vestimentaire conforme à la norme EN 14605+A1 (type 4), des gants en nitrile certifiés NF EN ISO 374-1/A1 et NF EN 16523-1+A1 (type A) et un demi-masque certifié (NF EN 140) équipé d'un

filtre P3 (NF EN 143).

9. PROPRIETES PHYSIQUES ET CHIMIQUES

9.1. Informations sur les propriétés physiques et chimiques essentielles :
Etat physique : Liquide.
Couleur : Incolore à jaune clair.
Odeur : Mercaptan.
Solubilité : Soluble dans les hydrocarbures et insoluble dans l'eau.
Point d'éclair : 67°C (norme ASTM D 3278 (coupe fermée)).
Masse volumique : 0,860 +/- 0,005 g/cm^3 à 20°C.
Propriétés explosives : Non explosif.
Température d'auto-inflammation : 232°C +/- 4°C.
Tension de surface : 26,6 +/- 0,2 mN/m à 20°C.

9.2. Autres informations : Données non disponibles.

10. STABILITE ET REACTIVITE

10.1. Réactivité : Le pyrimiphos-méthyl est hydrolysé par les acides et bases fortes.
10.2. Stabilité chimique : Stable dans les conditions ambiantes normales et prévisibles de stockage (températures de stockage comprises entre -5°C et 50°C) et de manipulation.
10.3. Possibilité de réactions dangereuses : N/A.
10.4. Conditions à éviter : Chaleur excessive, humidité.
10.5. Matières incompatibles : Acides et bases fortes.
10.6. Produits de décomposition dangereux : Emission de vapeurs toxiques par élévation de la température.

11. INFORMATIONS TOXICOLOGIQUES

11.1. Informations sur les effets toxicologiques :
En cas de contact avec la peau : Irritation, dermatite non allergique de contact.
En cas de contact avec les yeux : Irritation.
En cas d'ingestion : Nocif, peut porter atteinte aux poumons. NE PAS faire vomir.
Mode d'action des organophosphorés : Inhibition de la cholinestérase.

Mélange :
Toxicité aiguë orale : DL50 orale rat mâle > 2000 mg/kg p.c. (OCDE 423).
Toxicité aiguë cutanée : DL50 cutanée rats mâle et femelle > 2000 mg/kg p.c. (OCDE 402).
Irritation cutanée lapin mâle : Irritant, inflammation de la peau (valeur moyenne des scores ≥ 2) (OCDE 404).
Irritation oculaire lapin femelle : Non irritant (OCDE 405).
Sensibilisation cutanée souris femelle : Non sensibilisant (OCDE 429).

Pyrimiphos-méthyl :
Toxicité aiguë orale : DL50 orale rats mâle et femelle = 1,414 mg/kg p.c.
Toxicité aiguë cutanée : DL50 cutanée rats mâle et femelle > 2000 mg/kg p.c.
Toxicité aiguë inhalation : CL50 inhalation 4 heures rats mâle et femelle > 5,04 mg/L.
Irritation/corrosion cutanée : Non irritant lapin.
Irritation/corrosion oculaire : Non irritant lapin.
Sensibilisation cutanée : Non sensibilisant cochon d'Inde.
Mutagénicité : Pas d'effets mutagènes (tests *in vivo*).
Cancérogénicité : Pas d'effets cancérogènes (tests *in vivo*).
Reprotoxicité : Non reprotoxique.
STOT exposition simple : Classé comme ayant un risque avéré d'effets graves pour le système nerveux central.
STOT exposition répétée : Non classé comme ayant un risque avéré d'effets graves pour les organes.

12. INFORMATIONS ECOLOGIQUES

12.1. Toxicité :
Très toxique pour les organismes aquatiques, entraîne des effets néfastes à long terme.
Eviter tout rejet et toute contamination des eaux naturelles.

Mélange : Aucune donnée disponible.
Pyrimiphos-méthyl :
Toxicité aiguë poisson : CL50 96 heures *Oncorhynchus mykiss* = 0,404 mg/L.
Toxicité aiguë invertébré aquatique : CE50 48 heures *Daphnia magna* = 0,000314 mg/L.
Toxicité aiguë algue : CE50r 72 heures *Pseudokirchneriella subcapitata* = 3,38 mg/L.
Toxicité aiguë algue : NOEC 72 heures *Pseudokirchneriella subcapitata* = 0,3 mg/L.
Toxicité aiguë bactérie : CI50 6 heures *Pseudomonas putida* : > 4,5 mg/L.
Toxicité chronique poisson : NOEC 28 jours *Oncorhynchus mykis*s < 0,025 mg/L.
Toxicité chronique invertébré aquatique : NOEC 21 jours *Daphnia magna* : 0,05 µg/L.

12.2. Persistance et dégradabilité : *Pyrimiphos-méthyl* : Non persistant dans l'eau.
12.3. Potentiel de bioaccumulation : *Pyrimiphos-méthyl* : Fort potentiel de bioaccumulation.
12.4. Mobilité dans le sol : *Pyrimiphos-méthyl* : Faible mobilité dans le sol.
12.5. Résultats des évaluations PBT et vPvB : N/A.
12.6. Autres effets néfastes : Données non disponibles.

13. CONSIDERATIONS RELATIVES A L'ELIMINATION

13.1. Méthodes de traitement des déchets :
Ne pas déverser dans les égouts ni dans les cours d'eau.

Déchets et emballages souillés :
La gestion des déchets se fait sans mettre en danger la santé humaine et sans nuire à l'environnement, et notamment sans créer de risque pour l'eau, l'air, le sol, la faune ou la flore.
Ne pas contaminer le sol ou l'eau avec des déchets, ne pas procéder à leur élimination dans l'environnement.
Eliminer les emballages, avec ou sans reliquat de produit, conformément à la réglementation en vigueur ou dans une installation d'élimination des déchets agréée.
S'assurer de l'impossibilité de réutiliser les emballages souillés.
Conserver la(les) étiquettes sur le récipient.

14. INFORMATIONS RELATIVES AU TRANSPORT

14.1. Numéro ONU : UN 3082.
14.2. Désignation officielle de transport de l'ONU : Matière dangereuse du point de vue de l'environnement, liquide, N.S.A. (pyrimiphos-méthyl).
14.3. Classe(s) de danger pour le transport : 9.
14.4. Groupe d'emballage : III.
14.5. Dangers pour l'environnement : Oui (pyrimiphos-méthyl).
14.6. Précautions particulières à prendre par l'utilisateur : ADR : Code : M6 ; N° danger : 90 ; Code tunnel : E.
14.7. Transport en vrac conformément à l'annexe II de la convention Marpol et au recueil IBC : Non.

15. INFORMATIONS RELATIVES A LA REGLEMENTATION

15.1. Réglementations/législation particulières à la substance ou au mélange en matière de sécurité, de santé et d'environnement :
Règlement (CE) n°1907/2006 du Parlement européen et du Conseil du 18 décembre 2006.
Règlement (CE) n°1272/2008 du Parlement européen et du Conseil du 16 décembre 2008, modifié par le Règlement (UE) 2018/1480 de la Commission du 4 octobre 2018 (10ème ATP).

Tableaux des maladies professionnelles selon le Code du Travail français :

N° TMP	Libellé
84	Affections engendrées par les solvants organiques liquides à usage professionnel :
84	Hydrocarbures liquides aliphatiques ou cycliques saturés ou insaturés et leurs mélanges ; hydrocarbures halogénés liquides ; dérivés nitrés des hydrocarbures alipathiques ; alcools, glycols, éthers de glycol ; cétones ; aldéhydes ; éthers alipathiques et cycliques, dont le tétrahydrofurane ; esters ; diméthylformamide et diméthylacétamine ; acétonitrile et propionitrile ; pyridine ; diméthhylsulfone, diméthylsulfoxyde.

Salariés relevant d'une surveillance médicale renforcée selon le Code du Travail français :
Surveillance médicale renforcée pour les salariés affectés à certains travaux définis par l'article L 4111-6 et les décrets spéciaux pris en application :
- Agents chimiques dangereux : Décret N° 2003-1254 du 23/12/2003.

Surveillance médicale renforcée pour les salariés qui réalisent des travaux fixés dans l'arrêté du 11 juillet 1977.
Pour les travaux comportant la préparation, l'emploi, la manipulation, ou l'exposition aux agents suivants :
- Phosphores et composés, notamment les esters phosphoriques, pyrophosphoriques, triphosphoriques, ainsi que les autres composés organiques du phosphore.

Nomenclature ICPE : 4510-1436.

15.2. Evaluation de la sécurité chimique :
Le fournisseur de cette fiche de données sécurité n'a pas effectué d'évaluation de la sécurité chimique.

16. AUTRES INFORMATIONS

Les paragraphes modifiés sont signalés par le signe #.
Références bibliographiques et sources de données : FDS des principaux constituants.

Toutes les indications contenues dans ce document sont fondées sur l'état actuel de nos connaissances, en accord avec la législation européenne et sont données de bonne foi.
L'attention des utilisateurs est en outre attirée sur les risques éventuellement encourus lorsqu'un produit est utilisé à d'autres usages que ceux pour lequel il est conçu. Il est de la responsabilité de l'utilisateur de prendre les mesures nécessaires afin de respecter la législation nationale, régionale et locale.
Elle ne dispense en aucun cas l'utilisateur de connaître et d'appliquer l'ensemble des textes réglementant son activité. Il prendra sous sa seule responsabilité les précautions liées à l'utilisation qu'il fait du produit.

Acronymes et abréviations :
ADR : *Accord for dangerous goods by road.*
ICPE : Installation classée pour la protection de l'environnement.
INRS : Institut national de recherche et de sécurité.
N/A : Non applicable.
N.S.A. : Non spécifié par ailleurs.
ONU : Organisation des Nations Unies.
PBT : *Persistent, bioaccumulative and toxic.*
REACH : *Registration, evaluation, authorization and restriction of chemicals.*
VLPE : Valeur limite d'exposition professionnelle.
VME : Valeur limite de moyenne d'exposition professionnelle.
vPvB : *Very persistent and very bioaccumulative.*

H226 Liquide et vapeurs inflammables.
H302 Nocif en cas d'ingestion.
H304 Peut être mortel en cas d'ingestion et de pénétration dans les voies respiratoires.
H372 Risque avéré d'effets graves pour les organes à la suite d'expositions répétées ou d'une exposition prolongée.
H400 Très toxique pour les organismes aquatiques.
H410 Très toxique pour les organismes aquatiques, entraîne des effets néfastes à long terme.
EUH066 L'exposition répétée peut provoquer dessèchement ou gerçures de la peau.