



# novIGRain – The First Year



novIGRain team



*Plodia interpunctella* with larvae. Photo: novIGRain

The well-informed readers of International Pest Control should remember the previous article about the multi member novIGRain Consortium that, in 2020, applied to the EU for grant funding under the Horizon 2020 scheme with the title of “Sustainable storage of grains by implementing a novel protectant and a versatile application technology”.

Following a successful application and the signing of the Grant Agreement, the Consortium started work on the project last October. A year has quickly passed – perhaps too quickly – and with us all working in lockdown and isolation because of COVID. But now, the Consortium wishes to give a short account of its work to date, what has been achieved, and what is ahead.

After such a serious social and economic setback, a number of new challenges have emerged and it is apparent that no one is unaffected by the pandemic. The huge number of deaths, the aftermath of the illness, novel vaccines, increasing prices, equipment shortages and even social unrest have all had an impact. In addition climatic change has delivered one of the

hottest summers in human history and it has become increasingly difficult to forecast the future context of our project.

Access to a stable food supply and a reliable water supply is critical to the well-being of humans, but even providing these basic resources is becoming a challenge. Hot and humid weather, unprecedented floods, and long droughts have had a major impact on grain production, whether for human food or animal feed. In 2021 some areas have had the best yield ever but others have failed to achieve even average yields.

Storage facilities, both capacity and physical condition are very different across Europe. Between 5% and 30 % of grain is still lost every year because of mismanagement, disease, weather or pests. At its simplest aeration of stored grain is an essential tool to lessen the number of insect pests destroying stored crops, but the dramatic increase in energy prices across Europe has been a serious headache for store managers. Increasing road fuel and transportation prices are also adding to costs and the increasing shortage of professional truck drivers further adds to the difficulties.

If we are to avoid hunger, deprivation, epidemics or even local resource-wars, the most challenging questions for the future include how to improve food productivity, how to protect the crops we produce, how to reduce wastage, how to control diseases, and how to defend the standard of living we have achieved in Europe while significantly reducing our impact on the world’s environment.

Last October the novIGRain project started its work on addressing some of these questions. The target was clearly defined:

*Develop a grain protectant insecticide, based on an Insect Growth Regulator (IGR) larvicide, which targets precise development stages in a new and unique way.*

The active IGR, S-methoprene was chosen as it is a less hazardous product than conventional insecticides, with less hazardous residues and therefore good Maximum Residue Level (MRL) values; it also has a favourable mammalian toxicological profile which is important for its safe use by pest control operatives and for its impact on end consumers. The use of a solvent from a renewable and natural origin as a carrier, with the aim of making the product more sustainable, was also an important part of the project.

Formulation development was the task of Babolna Bio (HU) and out of nine initial options first three, and finally one was selected and then chemical-physical trials and basic environmental and human risk assessments were carried out.

Further to the formulation development, additional goals were set:

- The possibility of separately applying multiple grain protection products in combination (larvicide together with an adulticide for example), which diversifies the mode of action and reduces the risk of resistance.
- Resistance assessment and decision tool development: research and compilation of available information on Plant →

- Protection Products (PPP)-resistance in a user-friendly tool or model.
- Perform an impact assessment that will make the comparison between the more common storage management techniques and the product and application techniques developed by the novIGRain project. The impact will be assessed on three different areas: economic, social and ecological impacts.

- Stakeholder interaction throughout the project: dissemination and exploitation of the results of the project, spreading the knowledge generated within the project-consortium, communicating and interacting with key target groups, decision makers and the general public.

In parallel a long list of studies had to be identified. Quotations were obtained and

the laboratories chosen. The study protocols are driven by the OECD, SANCO and other guidelines. The laboratories define the quantities of the ready-to-use formulation, the active substance, the metabolites and the C14 labelled radioactive material they need to complete the short and long-term studies.

Production and the synthesis of these materials were completed within the year. Quality and quantity requirements were strict. None of the materials were available on the market, every compound had to be developed and produced.

The Czech consortium member, the Crop Research Institute (CRI) completed an evaluation of resistance of storage pests to the two common insecticidal active ingredients of deltamethrin and pirimiphos-methyl. The aim was to establish the discriminatory doses.

These results will consequently be used as the base reference values for the estimation of relative degree of resistance of field populations and strains of storage pests, that have been gradually collected by members of the novIGRain Consortium from several European geographical areas.

Differences in sensitivity were established in the test species for both active ingredients. The strains obtained were found to be more sensitive to deltamethrin (ie they have lower discriminatory doses) than to pirimiphos-methyl. Therefore the discrimination doses are higher for pirimiphos-methyl than for deltamethrin.

For deltamethrin the sensitivity increased and discriminatory doses decreased in the six tested species. In addition, the type of surface was found to influence the estimated discrimination dose. For pirimiphos-methyl the same has been observed. Following stability validations, the discrimination doses will be used for detection and estimation of the degree of resistance in wild field strains gradually collected by members of the novIGRain consortium from different geographical areas.

Sojam, the French participant, is working to develop a new, mobile and versatile ULV sprayer system that is able to spray in parallel two different liquid insecticides without mixing the two. The separate systems will be individually adjustable to apply larger or smaller quantities as required by the infestation level.

To gain a better general understanding of the stored grain environment a

**TABLES 1 AND 2**  
**EU GRAIN, OILSEED AND PROTEIN CROP PRODUCTION**

PRODUCTION EU28 (THOUSAND T)	2014/15	2015/16	2017/18	2018/19	2019/20	2020/21	2021/22
Cereals	330,942	314,351	307,959	292,357	322,532	n.a	n.a
Oilseed complex	35,466	32,143	35,225	32,930	30,214	n.a	n.a
Protein crops	2,845	4,402	5,183	3,586	3,969	n.a	n.a
Total	369,253	350,896	348,367	328,873	356,715	n.a	n.a

PRODUCTION EU27* (THOUSAND T)	2014/15	2015/16	2017/18	2018/19	2019/20	2020/21	2021/22
Cereals	306,503	289,626	284,960	271,272	297,015	280,365	295,108
Oilseed complex	32,967	29,572	33,012	30,875	28,435	27,922	30,402
Protein crops	2,271	3,482	4,252	3,078	3,262	3,541	3,737
Total	341,741	322,680	322,254	305,225	328,712	311,828	327,247

\* (EU27 is without UK)

**TABLE 3**  
**EU GRAIN, OILSEED AND PROTEIN CROP PRODUCTION**

ACTIVE SUBSTANCE	DATE OF APPROVAL	END OF APPROVAL	AUTHORIZED COUNTRIES AMONG THE 6 LISTED
Deltamethrin (IN)	11/1/2003	10/31/2021	DE, ES, FR, HU, IT, RO
Cypermethrin (AC, IN)	3/1/2006	10/31/2021	DE, ES, FR, HU, IT, RO
Pirimiphos-methyl (IN)	10/1/2007	7/31/2022	<del>DE</del> , ES, FR, HU, IT, RO
Pyrethrins (IN)	9/1/2009	8/31/2022	DE, ES, FR, HU, IT, RO
Aluminium phosphide (IN)	9/1/2009	8/31/2022	DE, ES, FR, HU, IT, RO
Magnesium phosphide (IN)	9/1/2009	8/31/2022	DE, ES, FR, HU, IT, RO
Sulfuryl fluoride (IN)	11/1/2010	10/31/2023	DE, ES, FR, <del>HU</del> , IT, <del>RO</del>
Spinosad (IN)	2/1/2007	4/30/2022	DE, ES, FR, HU, IT, RO
Kieselgur (Diatomaceous Earth) (IN)	1/1/2021	31/01/2036	DE, ES, FR, <del>HU</del> , IT, <del>RO</del>

IN: Insecticide, AC: Acaricide

DE: Germany, ES: Spain, FR: France, HU: Hungary, IT: Italy, RO: Romania

~~DE~~ / ~~HU~~ / ~~RO~~ = Product banned



professional company has been subcontracted to carry out a market survey and analysis. Instead of considering and analysing the market in every member state of the European Union, we have focused on the major players of grain production: France, Germany, Spain, Italy, Hungary and Romania. In 2019/20 the total grain production of the EU (excluding UK production) was 328.7 million tonnes. The storage capacity is largest in France with Germany in second place. Grain is stored both vertically and horizontally in similar quantities.

Inland waterways and railways handle almost all long-distance tonnage in the EU (60-70% for inland waterways, 30-40% for railways). Trucks play a marginal role, but are important in short distance local transport.

Among insecticides, the most commonly used are: deltamethrin, cypermethrin and pirimiphos-methyl. Under the Plant Protection Product Regulation the approvals for these pesticides are valid for ten years, followed by a renewal procedure which is now taking place. New information is considered, a number of studies are completed and a new evaluation is established by the relevant authorities. The results, the conditions of use, and the outcome is unpredictable. The expectation is that withdrawal of some or all may occur, but at the very least it is expected that further restrictions of use will be imposed.

In general, the same pests damage stored grains throughout the European Union. Resistance is observed everywhere and it is now impacting on the effectiveness of fumigants too.

The final conclusion of the 150 page long market study is that there is a huge potential for the introduction of a larvicide in the current market.

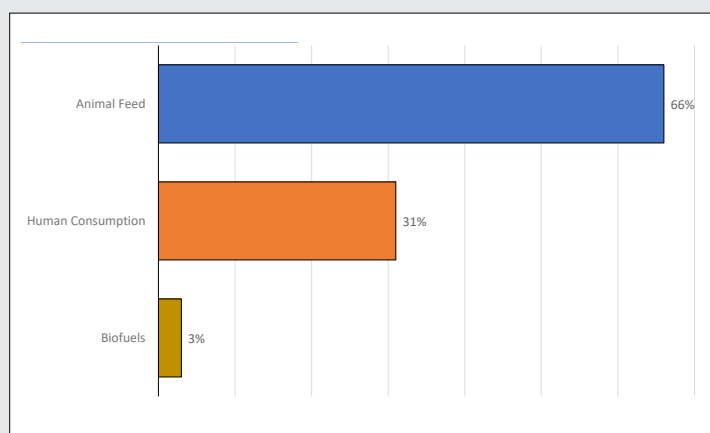
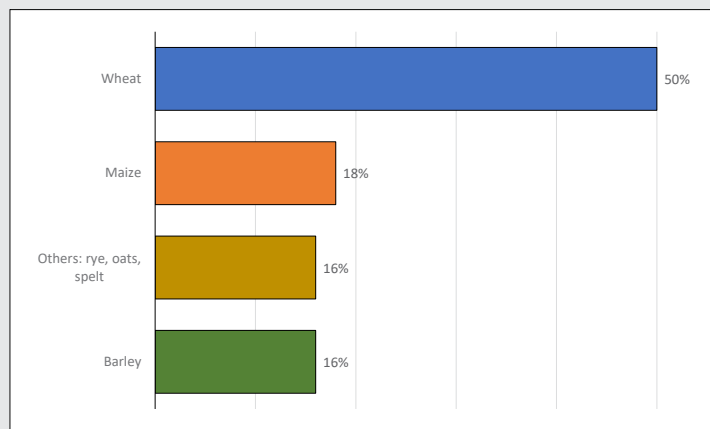
To have a better understanding of the storage industry three workshops in Hungary, France and Germany were organized. Because of COVID, these were online meetings, and they attracted fewer participants than expected. The takeaway lesson of these discussions was to have better organization prior to the events and to make more effective use of the channels of communication. In France, Sojam the Consortium partner - and a well-known distributor of grain protectants and equipment - took over the lead and managed to get professionals together in greater numbers.

During these discussions the most important and most frequently raised reservations related to the price of treatments and environmental issues. Most professionals estimated grain losses at 20%. Nonetheless, some extremely interesting and basic industry insights came up that will be very useful once the new technology is ready for introduction. Based on the answers and responses of the workshops an improved questionnaire has been prepared for future use.

Also in order to provide additional professional assistance we have chosen a panel of five recognized experts in the field from Belgium, Italy, Greece, Australia and Hungary. The online meetings with these experts are always an exceptional experience and they have drawn our attention to details that were not considered previously.

With any European Union grant – especially one at this level – dissemination of results and goals is a must. One of the aims of this article is to give readers an account of our work. The Consortium also wishes to publicise its achievements at conferences, online and in articles.

The Hungarian Pest Control Association was established in 1993 and is now celebrating its 30th conference anniversary.



Cereal production and consumption in the EU.

Source: [https://ec.europa.eu/info/food-farming-fisheries/plants-and-plant-products/plant-products/cereals\\_en](https://ec.europa.eu/info/food-farming-fisheries/plants-and-plant-products/plant-products/cereals_en)

Towards the end of November 2021 a conference is to be held with a separate section dedicated to stored product pests. Four presentations will be given including one from the novIGrain project.

The Consortium has registered a poster for the International Conference of Urban Pests (ICUP) to be held next summer in Barcelona.

The last two years have been exceptionally difficult and sad for many people worldwide. Consortium members have been working together but without personal meetings and without having seen each other face-to-face. But our goal and the hoped for outcome of the research is a very strong driving force and we all wish to contribute to better control of diseases and pests – whether of plants or humans – to improve productivity, minimise environmental impact and reduce waste.

Every member of the Consortium has tried to remain very positive, take the necessary precautions and encourage and support each other. The message of the novIGrain Consortium: take care, stay safe, remain confident and do what can and has to be done. ■

► [www.novigrain.eu](http://www.novigrain.eu)

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