

Project aims to cut losses of stored grain

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Grain store. Photo: novIGRain

The European Union's grain and oil seed production is huge. Since 2005 the total available storage capacity has risen by 20% from 299 to 359 million tons. The cultivation of cereal crops is a major part of agriculture and embedded in European culture itself, from the cold North to the warm Mediterranean South. Grain gives us our daily bread and feeds our animals. In the history and culture of every European nation grains have been highly valued and have always been the essence of life and death, even if today few Europeans are familiar with hunger.

The importance of grain is not in question. Each year the issues for producers, processors and consumers are the weather, the yield, the harvest, crop loss, market prices, pest infestation, and storage losses.

Not many consumers are aware that one third of the potential global yield of grains is lost before harvest, another 20% is wasted due to losses in storage and mycotoxin contamination, and only one third of the total grain production is consumed, the remaining 10% being consumer waste. This is truly shocking and has a significant environmental impact especially if the greenhouse gases associated with this lost product are considered: each tonne of wheat lost is associated with 1.4 tonnes of production GHG emissions and if lost through spoilage may also be associated with emissions of more GHG gases such as methane.

Last year a multi member European Consortium submitted a project funding application to the EU Horizon 2020 scheme with the title of "Sustainable Storage of Grains by Implementing A Novel Protectant and a Versatile Application

Technology" which proposes the use of a larvicide to control grain storage pests.

After careful consideration, the EU approved the project proposal and granted the consortium 70% of the total estimated cost of almost €7 million. The project started on 1st October 2020 and will last for five years. It has been given the somewhat snappier name of novIGRain, the meaning of which should become clear as you read this article.

The idea and the driving force behind introducing a larvicide for stored grain protection came from Babolna Bio, Hungary. Potential partners were sought, and very quickly respected members of the international research community were chosen to join the newly formed novIGRain consortium. Goals have been discussed, tasks appointed and shared.

The other driving force is the lack of adequate protection for grain crops within the silos and other storage facilities. The losses are caused by improper ventilation, mycotoxins, several insect species, rodents and of course mismanagement. A narrow range of insecticides are available, they include organophosphates, synthetic pyrethroids, and desiccants. Fumigants are popular but they have less effect on progenies. A few EU member states permit fumigation, while others do not and environmentally fumigation is questionable.

The insects, as a result of insecticide use for many decades, have been developing tolerance and resistance. It goes without saying, that it is of utmost importance to minimise the post-harvest losses and storage-linked losses too. The grain industry is committed to maintain the "zero tolerance" policy for live insects and other biological contamination. In order to minimise the losses of grains stored in silos or warehouses it is important to apply proper insect management techniques with the aim to prevent the emergence of insect infestations while avoiding pest resistance. Hence the idea is to introduce a new class of chemical, this time a larvicide and not an adulticide.

Across Europe larvicides have never been used in silos or in stored grain treatment. Insect Growth Regulators have already established their ability to suppress

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the development of many insect pests. The most common stored grain insects live, develop, and reproduce in the grain and unfortunately all stages of development are present. Larvicides prevent reproduction and disrupt the life cycle of the pest.

Within the novigrain project the aim is to start from a scientific resistance assessment and develop a new type of Plant Protection Product (PPP) for larvicide treatment in combination with a versatile application technology. It has to be scientifically determined whether or not this active larvicide ingredient – applied in ultra-low volume (ULV) – can be shown to conform with the overall legal framework (Regulation EC No. 1107/2009 and EC 396/2005) so that it can be used as a grain storage Grain Production Product. The potential benefits of this new product are:

1. it will broaden the available active substance spectra in the field of PPPs, which is important for the prevention of the development of insecticide resistance in the EU,
2. as it is a larvicide, it has a unique mode of action and allows precise targeting of insect development stages,
3. it can target a broad species spectrum and is effective against the most common Coleoptera and Lepidoptera species,
4. the overall grain yield will improve (less destruction during storage),
5. given its favourable mammalian toxicological profile, it has improved health and safety characteristics, which is important for the product users and grain consumers,
6. as it has less hazardous residues, it is expected to have good MRL values,
7. the carrier will be of a natural, renewable origin,
8. as it will be applied using ULV, the product is highly effective, which results in less insecticide use, which in turn results in lower transport requirements,
9. the product has no smell, and therefore is convenient in usage, and finally
10. it would represent economic benefits for the EU, as there are lower export restrictions given the product's characteristics and the active ingredients and excipients are made in the EU.

Top: *Oryzaephilus surinamensis*; middle: Grain with eggs; bottom: *Plodia interpunctella* with larvae. Photos: novigrain

The new ULV application technology will aim to reduce the risk of development of PPP resistance as it should allow the combination of multiple PPPs (larvicides simultaneously with adulticides) which is expected to not only have a positive impact on the risk of resistance development but will also lower the amount of adulticides required for proper management, which results in less human and environmental exposure and cost savings. The combination of the larvicide and adulticides will be tested. The larvicide is designed to remain effective for 12 months.

The project is based on the very close collaboration of nine EU based companies from Belgium, Czech Republic, France, Germany, and Hungary. Highly reputed experts also share their knowledge with the novigrain Consortium from Australia, Belgium, Greece, Hungary, and Italy.

The project is divided into work packages and each package is under different supervision by the members. Strict financial and reporting policy is being required by the EU and interim reports are to be prepared and handed in by the given timelines.

Member States and EU policies seek to reduce reliance on pesticides by designing and implementing more integrated approaches to the use of pesticides while at the same time safeguarding competitiveness. With the introduction and use of larvicides, as proposed by this project, the quantity of the traditional insecticides can be considerably reduced.

The novigrain Consortium aims to keep the industry informed about the progress of the project by publishing updates on its website and in this magazine. Hopefully, another class of stored product pesticide is on its way to the benefit of the industry, consumers, and the environment. After formulation development, a number of laboratory studies and field trials will follow. The overall goal is to have both the novel pesticide and the novel application method approved, introduced, and in common use across the EU. ■

► www.novigrain.eu

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