ANDERMATT
BIOCONTROL
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Structure of the company

The Andermatt Biocontrol group of companies is embedded within Andermatt Holding. Andermatt Holding is owned by the Andermatt family and its employees.

The aim of Andermatt Biocontrol is to commercialize biological alternatives to replace chemical pesticides and synthetic fertilisers and to make this practice available – for healthy foodstuffs and a healthy environment. Andermatt Biocontrol wants to achieve this goal by setting up a worldwide network of similarly aligned producers and distributors.
Dear Reader,

Despite a tough international environment marked by events such as political instability in Brazil and severe drought in South Africa, Andermatt Biocontrol has had a very successful year. Many markets are showing tangible signs that biological solutions have become a key component even of integrated control strategies.

Unfortunately, the registration burden continues to be the main limiting factor on the development of biological solutions. In place of sensible, streamlined procedures, we find ourselves dealing worldwide with greater administrative effort and constantly rising requirements relating to dossiers.

Nevertheless, Andermatt Biocontrol continues to invest in product innovations, solution strategies and market developments.

We invite you to delve into the world of Andermatt Biocontrol on the following twelve pages, and hope you enjoy reading them.

Daniel Zingg
Managing Director

Dr. Martin Andermatt
Founder, Chairman of the Board
Bug control is the new challenge in integrated pest control

The sporadic occurrence of bugs as a subsidiary pest makes it difficult to use beneficial insects because the effective, approved insecticides are not very selective. Alternative control strategies are not yet ready for practical application. Successful control needs to encompass all possible solutions.

Bug damage in vegetable and berry growing has increased in recent years. In Switzerland, this is mainly caused by the two native bug species Lygus rugulipennis (aubergines and strawberries) and Liocoris tripustulatus (strawberries). Even small populations which are barely perceptible in the crop can cause damage, but their presence often goes unnoticed until stunted fruit appear in strawberries or falling blossoms in the case of aubergines. Increasingly, we are also seeing exotic species such as the southern green shield bug Nezara viridula and the brown marmorated stink bug Halyomorpha halys. These species are slightly easier to detect because the initial attack starts with individual plants.

Solutions

▶ Insecticides: Active ingredients from the pyrethroid and neonicotinoid groups still have good efficacy. But both groups have serious side-effects (see box), making them incompatible with biological or integrated plant protection programmes. Specific insecticides (e.g. Plenum, NeemAzal-T/S) have only a partial effect and require repeated application. In any case, a major drawback is the fact that all insecticides have side-effects – to differing extents – on the predatory bug species Orius and Macrophlus deployed in the crops concerned.

▶ Netting: Bugs are known to be low-flying pests. Damage occurs much earlier in tunnels with side ventilation than in glasshouses with ridge ventilation. As the cultivation period progresses, however, greenhouse crops become infested too. Netting the ventilation inlets is a good way to delay the first infestation. But not even this measure can give absolute protection.

▶ Traps/attractants: Existing trap systems using pheromones are not yet fully developed and require further trials. The options for infestation monitoring or even mass trapping are being investigated.

▶ Diversionary plants: Sowing strips of diversionary plants (e.g. alfalfa, nettle) is a promising cornerstone of bug control. But maintenance of these strips (time of cutting, any use of insecticides) is challenging and needs to be planned early.

▶ Beneficial insects: The different species of bug have various known adversaries. But so far the targeted use of parasitic wasps, for example, has not proven to be a reliable control method.

Samuel Stüssi
Andermatt Biocontrol
Appleseed moth, a manageable challenge

*Grapholita lobarzewskii* (the appleseed moth, small fruit tortrix or smaller fruit tortrix moth) is a challenge which seems to threaten biological control. But based on mating disruption technology, combined with close observation and timely intervention, the challenge remains manageable.

Along with other fruit pests such as codling moth and fruit tree tortrix, the appleseed moth poses a serious threat in Switzerland. It usually affects orchards with direct links to forests, hedges or strips of trees. If countermeasures are not taken promptly, the infestation spreads from the margins throughout the site, causing crop losses of up to 8%. The moths take to the wing in mid to late May and the flight period lasts for seven to nine weeks. The peak, length and dynamics of the flight period differ from region to region, therefore control by means of a single insecticide application is not always sufficient to keep the pest below the 1% damage threshold. In addition to this, the loss of fenoxycarb as a control option by 2017 is forcing reconsideration on the part of producers.

Combined mating disruption technology (*Isomate C/OFM* or *Isomate CLR/OFM*) provides a proven method as a basis for integrated fruit moth control. Mating disruption puts pressure on the moth’s population throughout its period of activity. In “difficult” plots, mating disruption can be selectively supplemented with insecticide use shortly after the peak flight period. Thanks to the option of using Spinosad in these cases, it is even possible to keep the appleseed moth under control solely with biological alternatives.

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**Side-effects**

In pest control and beneficial insect use, the term “side-effect” refers to the effects of plant protection measures on non-target organisms. These direct side-effects are known for most active substances and can be researched quickly and easily on appropriate websites (such as www.biocontrol.ch). Another important factor is the persistence of an active substance, in other words the duration of side-effects on non-target organisms after application. This is an additional criterion to consider when devising a plant protection strategy friendly to beneficials.

The ecologically ideal product affects only the target organism. Unfortunately, few insecticides have such a profile (one is the virus preparation Madex). In many cases there is a balance to be struck between effect and side-effect. For example, in a case of heavy infestation it may make sense to use a quick-acting insecticide with major side-effects but only short persistence. Here, beneficials can quickly be used again in the crop or will migrate to it spontaneously from refuge strips. The most dubious applications are those with only moderate action and very long persistence (sometimes up to 3–4 months).
Downy mildew can be mastered biologically

2016 has shown that tried-and-tested organic plant protection strategies to control downy mildew in viticulture can be successful even in difficult years. On integrated vineyards, potassium phosphonate can supplement a strategy using protective alternative fungicides (copper, aluminium oxide), but it also has its limitations.

The proportion of organically cultivated vineyards in Switzerland is only around 3%, although recent years have seen an increase in the acreage of organic vineyards. In parallel with this trend towards conversion, greater numbers of growers are seeking to get away from chemical/synthetic and systemic pesticides on ideologically and oenological grounds, and are keen to use biological pesticides instead.

2016: the year of the Downy Mildew challenge

We are looking back on a year that will go down as one of the most difficult in history in terms of downy mildew pressure and attack. All vineyards (organic and integrated alike) faced a tough challenge. In the case of organic fungicide cover sprays which are used purely preventively, fungicide cover has to be renewed after 20 mm of rain. Due to the sheer volume and frequency of rainfall in 2016, this meant that extremely short spraying intervals were needed. And the time windows for the interventions required were often very brief.

With commensurate effort (14 to 16 treatments), it did prove possible to guarantee protection in the infection phases. So, despite the trying conditions, healthy vines and grapes were the eventual outcome. Once again, this shows that biological plant protection works even under difficult conditions.

Potassium phosphonate: a perfect solution?

Anyone wanting to optimise the number of treatments and efficacy of existing organic strategies is bound to consider the use of potassium phosphonate. Potassium phosphonate is controversial in organic farming and indeed is not permitted due to its known residues. For vineyards which are not organically certified but nevertheless want to move towards biological plant protection, potassium phosphonate’s systemic effect can be a hedging measure in difficult periods (e.g. strong leaf growth, high precipitation). But potassium phosphonate is not a panacea. It does have a good effect on the young leaves and until the end of blossoming, but after that the effect declines and its use is no longer beneficial. This was confirmed this year in trials conducted by Andermatt Biocontrol. The attack on the blossoms was effectively suppressed, but the berries were affected in the later infection events in July and August. This means that sufficient, uninterrupted coverage with copper or Myco-Sin must be guaranteed by the time the berries are pea-sized and before any infection events occur.

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In a biological strategy to control downy mildew in grapes, Myco-Sin can be used at the start of the season (top) to ensure that the full allowance of 4 kg of pure copper per hectare remains available. In integrated production, the efficacy of strategies using contact fungicides such as copper can be enhanced by adding potassium phosphonate until the end of blossoming.
Controlling European Corn Borer with Trichogramma from the air

Biological control of the European Corn Borer requires comprehensive implementation. New application systems are hotly debated, but are not always implemented on grounds of cost.

Martin Günter Andermatt Biocontrol

Pressure from the European Corn Borer (ECB) is on the rise in Switzerland. To prevent a sharp increase in the pest population, the use of Trichogramma should ideally be coordinated comprehensively, region by region. A long-term trial, now running for five years, conducted with the participation of the Swiss Federal Office for Agriculture (FOAG), Agroscope research institute and cantonal plant protection agencies in the municipality of Mathod (canton Vaud), has shown that comprehensive Trichogramma application can keep the average infestation level at around 10%. Of the various methods of application, manual distribution using cards has proven the most effective. With a view to efficient, large-scale use on a comprehensive basis, new application systems have been in development for a few years. The first methods are already in use.

In 2016, Andermatt Biocontrol partnered with the company fl8cam to trial the airborne delivery of Trichogramma for ECB control using multicopters in a limited area. Technically, application worked perfectly. The biggest hurdles facing application systems like these are the additional costs incurred and the challenges of efficient organisation.

Mint oil as a potato sprout inhibitor

Since last year, Andermatt Biocontrol has been marketing the spearmint-based product Biox-M as a sprout inhibitor in potatoes. The first practical applications have been very successful.

Martin Günter Andermatt Biocontrol

Inhibiting sprout formation is a challenge in potato storage. There is no such thing as the perfect method to suit every situation. The most widely used product, chlorpropham, is harmful to health, highly persistent and long overdue for replacement.

An alternative has been found in the shape of an oil extracted from spearmint (Mentha spicata). It contains L-carvone as an active substance. Biox-M is applied as a hot fog in a sealed storage room or delivered in small regular doses via an evaporation device. Initial practical tests have confirmed the efficacy observed in trials. Biox-M burns off the tiny buds or "eyes". Even the longer sprouts dry up completely. When applied by hot fogging its effect lasts for 3 to 4 weeks. After that, application has to be repeated.

Biox-M and other alternative methods are more time-consuming and expensive than chlorpropham or are not long-lasting enough by themselves (i.e. cold storage or maleic hydrazide). A plus in favour of Biox-M may be its side-effects on silver scurf and Erwinia. International trials have already demonstrated such effects. In Switzerland, Agroscope research institute and the School of Agricultural, Forest and Food Sciences (HAFL) are currently running a project to study solutions for storage diseases.
Knowledge transfer in biological plant protection

The successful use of biological pesticides and fertilisers requires certain basic knowledge of their possibilities and limitations. To make this basic knowledge more widely available, Andermatt Biocontrol is investing in the training and education of users of biological plant protection products, and to that end has established the Biocontrol Academy.

In recent years, a vast amount of research has been performed in the various techniques of biological plant protection. Several products have emerged from this research and been made available to agriculture and horticulture. Knowledge transfer around the possible applications in this field has to date fallen short in many areas, except in the case of highly specialised farms. Measures to identify the needs of our customers and other interest groups have confirmed that training and education in the field of biological plant protection are virtually non-existent.

Andermatt Biocontrol is keen to fill these gaps in education and to that end established the Biocontrol Academy. In nearly 30 years of operation, Andermatt Biocontrol has developed a thorough knowledge of the production and application of biological pesticides and fertilisers. Beginning in the winter of 2016/2017, the Biocontrol Academy will offer its first courses on various topics related to biological plant protection in agriculture and horticulture.

Why is further education needed in this field? Biological plant protection is no more difficult than the use of conventional methods, but it is often slightly different and generally more system-related. Effective use of biological pesticides and fertilisers, beneficial insects and biostimulants therefore requires a sound understanding of the biology of the organisms to be controlled and their interactions with the environment. The more demanding and intensive a production system is, the more complex the interaction of plant, cultivation methods and plant protection measures are.

As a first step, two course formats have been developed to familiarise interested parties with the possibilities and limitations of biological plant protection in general, and in horticulture specifically. Working with the specialists at Andermatt Biocontrol and other partners, the Biocontrol Academy will continue to develop course formats and broaden its offer from 2017 onwards.

Johanna Häckermann
Andermatt Biocontrol
In vitro technology as an opportunity in baculovirus production

In future, baculovirus production in bioreactors could replace the established method of production in insect larvae. Provided we can manage to adapt modern techniques from cell culture technology.

Baculovirus products are among the most successful biological insecticides worldwide. Until now, baculoviruses have been produced by infecting larvae of their host insects. Known as "in vivo production", this method guarantees consistently high virus quality but is very complex and expensive. Andermatt Biocontrol is constantly optimising this method and adapting it to new virus-host systems through innovative advancements.

Since the early 1970s, there has been research on ways to multiply baculoviruses in vitro, i.e. in bioreactors on cell cultures obtained from host insects. High production costs and problems relating to virus quality have so far obstructed the implementation as a marketable baculovirus product. Moreover, only a few insect species have provided productive cell lines. Due to technological advances in cell culture technology, however, this new production method is becoming increasingly attractive.

A functioning in vitro production method would have many advantages. For example, it would eliminate the need for complicated, labour-intensive mass rearing of insects. And it would enable us to produce baculoviruses from hard-to-rear pests or pests with high quarantine standards at our production site in Switzerland. Baculoviruses produced in vitro show low foreign contamination and allow multiple formulations. Andermatt Biocontrol is currently investigating the possibilities of this technology within the EU project BIOCOMES run in partnership with the Zurich University of Applied Sciences (ZHAW) in Wädenswil and the Julius Kühn-Institut (JKI) in Darmstadt. Further information on the project is available at www.biocomes.eu.

Although there are still various biological and technical hurdles to overcome, the current trial results give cause for optimism. They show that baculoviruses produced in vitro are in no way inferior to conventionally produced viruses in terms of efficacy against their host insects. Modern production reactors using cell culture technology based on single-use systems could make a significant contribution to reducing costs at industrial production scale. It will certainly be interesting to see the outcome of the project, which is scheduled to run until the end of 2017.

Markus Züger
Andermatt Biocontrol

Under ideal process conditions in cell culture, a virus-infected host cell produces dozens of polyhedral occlusion bodies (OB) measuring 1–3 µm in diameter. These envelop the infectious virions in a polyhedrin matrix as protection against environmental influences. They are the active ingredient of a baculovirus product.
New and old challenges to the approval of biological plant protection products

Registration requirements are one of the main hurdles to market entry for biological plant protection products. They still demand unreasonably high levels of investment, jeopardising the availability of biological solutions in crop protection.

Increased requirements
New scientific knowledge and methods result in adapted requirements for registration dossiers. What makes sense for chemicals does not automatically make sense for biological products. The trend towards non-chemical solutions is leading even large, multinational agrochemical companies to market biological crop protection products. Out of habit and based on strategic considerations, these groups often supply the authorities with comprehensive dossiers featuring broad, strain-specific study packages. Previously, the authorities would accept pragmatic solutions with lower-cost dossiers and scientifically based concepts, but now they expect an excessively high standard of data which small companies are no longer able to finance. It is precisely the small companies which develop innovative products and offer welcome alternatives serving even small markets with sound biological solutions. However, the current trend poses a threat to this innovative capacity, especially in niche crops.

Old problems in the EU—dished up again
With enormous expense and effort, Andermatt Biocontrol has managed to have a number of baculovirus products approved in the EU over the last ten years. The forthcoming re-assessment process will require a comprehensive restructuring of dossiers, expensive new studies and high registration fees that soon add up to investments of 150 000 to 300 000 euro per active substance. Such levels of investment are unbearable because capital returns are not possible within a short timeframe on account of the limited market.

For example, the first national approval for Spexit (Spodoptera exigua NPV) in Europe was granted only two years before the new re-registration deadline for the active substance. As a result, Andermatt Biocontrol was forced, for economic reasons, reluctantly to refrain from seeking re-approval of the active substance.

The codling moth granulosis virus (Cydia pomonella GV) is also due to be reassessed by the EU authorities by 2019. The costs of the process and the expected approval period of the safe, environmentally friendly active substance are likely to be comparable to those for a chemical active substance. However, Andermatt Biocontrol will definitely seek re-approval of their CpGV products.

The EU’s zonal approval system for crop protection products unfortunately has to be judged a failure. The legal time limits are simply ignored by many member states. Individual peculiarities of national legislations, as well as distrust between authorities, obstruct the rapid mutual recognition of approvals and further delay the prompt market entry of new, environmentally friendly products.

The result of the current situation is that environmentally friendly, highly specific active substances are lost in the EU and toxic active substances with broad ranges of application remain on the market. This clearly contradicts current political and social demands! We therefore expect the legislature to adjust the legal basis immediately in such a way that safe, environmentally friendly products and active substances are made available to producers more quickly, without cost-raising re-assessment procedures, and for an indefinite period. A few member states have recognised the problem and are working to improve the situation (e.g. the “Green Deal” project in the Netherlands).

New challenges
Further regulations such as those designed to implement the “Nagoya Protocol on Access and Benefit Sharing for Genetic Resources rising from their Utilization” hold new risks. We welcome fair compensation for access to genetic material. But any bureaucratisation of access to new strains will mainly affect the innovative capacity of small companies. We are working to help find reasonable solutions that will continue to bring as many benefits as possible to all parties.
Andermatt Biocontrol goes USA

With the approval of Helicovex and Spexit in the USA in the winter of 2015, Andermatt Biocontrol took an important step forward in the US market. A broad network of distributors and the first season’s success are the cornerstones for the founding of our new subsidiary Andermatt USA.

The USA is one of the world’s largest and most important global agricultural players. Increasing demand for organically produced food and declining acceptance of many chemical products make the USA an extremely attractive market for biological crop protection products.

With the approval and successful launch of Helicovex and Spexit on the US market, Andermatt Biocontrol has developed a broad network with links to various stakeholders. The USA is a strategically important market for the independent Swiss company, so the founding of the Andermatt USA subsidiary helps to increase market penetration and to secure long-term success in a fast-changing market. The long-standing and very successful distribution of codling moth granulosis viruses by Certis USA fits well into the marketing strategy and will continue unchanged.

Andermatt Biocontrol is a global leader in the production of baculoviruses and the launch of biological insecticides to combat a range of key lepidopteran pests will play a central role. Biological fungicides, biostimulants, bioinoculants and many other products will of course be part of Andermatt USA’s future portfolio. This high-quality portfolio will allow us to offer integrated solutions from a single source in future. The focus will be not solely on organic farming but also on IPM farms. An ever-expanding portfolio, high-level technical support and cooperation with key stakeholders will provide US producers with valuable tools for effective crop protection.

Silvana Niedermann
Andermatt Biocontrol
Lymantria dispar MNPV, a proven product for use against an important forest pest

The gypsy moth (*Lymantria dispar*) is an important pest in Eurasia, North America and New Zealand. More than 300 tree species are at risk of defoliation by the larvae. *Lymantria dispar* multiple nucleopolyhedro virus (LdMNPV) offers an effective and proven biological control product for this pest.

The gypsy moth (*Lymantria dispar*) is a native forest pest of Europe and Asia. It is considered an important exotic-invasive pest in North America and Australasia. Damage is caused exclusively by the larvae, which feed on developing leaves of more than 300 tree species. During severe outbreaks, defoliation of trees and shrubs can occur over large areas, resulting in significant growth loss in forest ecosystems. Prolonged outbreaks can lead to tree mortality. In addition, the hairs produced by the insects can cause dermatitis and are allergenic to humans. Control efforts are necessary in order to manage the damage caused by the gypsy moth and to protect natural resources as well as forest integrity.

*Lymantria dispar* multiple nucleopolyhedro virus (LdMNPV) is a biological control product that has been developed as an alternative to *Bacillus thuringiensis* or to the traditional chemistries for use in controlling the gypsy moth. Because LdMNPV only infects *Lymantria dispar*, it has been shown to have no impact on non-target species, including non-target lepidopteran species. LdMNPV based biological technologies have a proven and successful record of use against the gypsy moth in control programs with more than 45 years of treatments to large areas of forests in North America and Europe.

LdMNPV is produced by Sylvar Technologies Inc. Canada, a 100%-subsidiary of Andermatt Biocontrol.
Use of T-77 (Trichoderma atroviride) for the management of Botrytis on grapes

Botrytis is a common disease that causes significant damage, both pre and post-harvest, to a number of important crop varieties. A summary of research done in South Africa reveals good efficacy of the biological control organism, *Trichoderma atroviride* to suppress Botrytis on grapes.

Botrytis is caused by the necrotic fungus *Botrytis cinerea* and affects numerous plant species, significantly, commercially produced soft fruits such as tomatoes, strawberries and grapes. Infected fruits spoil with a characteristic soft rot which develops to produce a brown mould on the fruit surface. The disease can cause symptoms while in field but tends to have a greater impact during post-harvest storage. Management of this disease during the crop cycle is important to reduce post-harvest spoilage. Historically chemical treatments have been used to manage this disease however with development of resistance to these products and stricter controls over residue limits growers are more frequently looking to Biocontrol methods to manage this disease.

Plant Health Products in partnership with Madumbi Sustainable Agriculture have been conducting research, through independent trial consultants, into the management of Botrytis using a strain of *Trichoderma atroviride* (previously known as *Trichoderma harzianum*, strain 77B), a beneficial fungus that colonises wounded plant tissue protecting it from pathogenic organisms like Botrytis. T-77 has proven to be effective in suppressing this disease on a range of crops and is already registered in South Africa on tomatoes, cucumbers and recently table grapes. Efficacy trials were conducted in the Western and Northern Cape regions of South Africa, the largest grape production area in the region. South Africa produces 1.8 million tons of table and wine grapes annually on an area of 120 000 hectares (Sources: SA Wine Industry Statistics NR 40, June 2016).

**Details of treatment and evaluations**

For suppression of Botrytis on grapes T-77 was applied at a rate of 250 g/ha. Different chemical standards were used at each of the sites. The standards were applied according to label recommendations in each case and all standards used are registered for the purpose. Both the T-77 and chemical standards were applied according to the generally accepted treatment protocol for Botrytis with first application taking place at flowering, second at peaberry stage (just prior to bunch closure), third at veraison stage and final application seven days before harvest.

Results show that T-77 may be a viable alternative to standard chemistry as a method for suppressing Botrytis. While not tested it is likely that an integrated programme would prove to be even more effective. This data shows that T-77 is effective at suppressing Botrytis incidence. With an integrated approach T-77 offers a solution to managing disease while maintaining good agricultural practices in preventing development of resistance to standard chemistry and managing residue levels in the crop programme.
Launch of NeemAzal-T/S in France

The biological insecticide NeemAzal-T/S is well-known among French organic producers as a key tool in controlling the rosy apple aphid. NeemAzal-T/S is now viewed as a serious alternative to some conventional insecticides which are being considered for withdrawal from the market. Its broad spectrum of action hints at future uses in both field crops and speciality crops.

NeemAzal-T/S, not to be confused with Neem oil, is a biological insecticide based on plant extracts. The special extraction process used to obtain its active ingredient azadirachtin A provides the product with properties and a toxicological profile that meet current requirements. At the instigation of producer associations, technical bodies and the French Research Institute for Organic Farming (ITAB), NeemAzal-T/S has been granted a temporary marketing authorisation (Paragraph 53) in France every year since 2014 for use against aphids in apples and pears and, most recently, against citrus leafminer. Moreover, Andermatt France has initiated an approval process covering a wide range of crops, mirroring approvals already obtained worldwide and especially in Europe.

The action of NeemAzal-T/S shows thrips, whiteflies, caterpillars, leafminers, aphids and beetles is also advantageous in vegetable, ornamental and field crops. A French law to restrict the use of insecticides belonging to the neonicotinoid family has created a keen appetite among professionals for NeemAzal-T/S, which is considered one of the more credible technical alternatives against aphids in particular. Its varied modes of action are also attractive as a means of limiting the development of resistance. The product is now being included in many trials as a replacement for or supplement to conventional insecticides. Under the high aphid pressure seen in the 2016 season, NeemAzal-T/S provided similar efficacy to that of the reference products.

NeemAzal-T/S thus demonstrates that a Biocontrol product can be a valid alternative to conventional insecticides.

Comparison between NeemAzal-T/S and chemical insecticide treatment (flonicamid and tau-fluvalinate) to control rosy apple aphid on apple. Trial by Station Expérimentale La Pugère (France), 2015.
Development of Andermatt do Brasil's baculovirus portfolio targets key lepidopteran pest control

The sudden outbreak of new pests and diseases had lead farmers to an intensified use of pesticides. New side effects cause changes in the natural populations such that secondary pests suddenly become predominant and turn into priority pests.

The outbreak of the Asian rust disease (*Phakopsora pachyrhizi*), in soybeans more than a decade ago led to a continued increase of the number of fungicides used and to an increased number of applications, reducing natural enemies populations as well as naturally occurring entomopathogenic fungi like *Nomuraea rileyi*. The resulting natural imbalance from the intensive use of fungicides gave opportunities for the cotton bollworm (*Helicoverpa armigera*) to become a major pest in 2013 and 2014.

The alarming fast advancing of the cotton bollworm, motivated Brazilian Ministry of Agriculture to call for emergency situation and to allow fast track registrations for biological and chemical solutions. Andermatt do Brasil took advantage and registered its HearNPV Baculovirus as Verpavex, which is now in the market introduction phase. Concurrently, Andermatt do Brasil collaborated with FMC and Koppert, which registered HearNPV under the trademarks Helicovex and Diplomata.

While the whole biopesticide industry has engaged in developing production infrastructure for baculovirus production, these attempts towards a biological and sustainable control technology have been jeopardized, at least in a short term, by two events; on one side, the emergency registration of the chemical insecticide emamectin benzoate, and the simultaneous introduction of Bt soybeans. However, these solutions contributed to further biological imbalances. Consequently, secondary pests again moving up the steps of importance, and the most recent problem is the soybean looper (*Chrysodeixis includens*). Andermatt do Brasil is initiating the registration process of an AcMNPV baculovirus which has proved in first tests to be highly effective, achieving up to 97% efficacy with two applications.

The importance of biological solutions, harmless to natural enemies is becoming more and more evident. Farmers are realising that classical chemicals and GMO solutions are leading to the selection of new pests. There is a growing interest from farmers in integrating the specific and highly effective baculovirus solutions into their specific pest management strategies as new products are being authorized and becoming commercially available.

Similar to the situation in soybeans, the use of GMO Bt corn selected the fall armyworm (*Spodoptera frugiperda*) which has become a difficult to control pest. Andermatt do Brasil has also initiated the development of the baculovirus product Spodovir.

With the three brands Verpavex, Loopex and Spodovir, Andermatt do Brasil will be able to offer alternative and sustainable biological control tools for the key lepidopteran pests in row crops such as cotton, corn and soybeans.