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.

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Dear Reader,

In 2018 Andermatt Biocontrol celebrates its 30-year anniversary. Looking back, a great deal has changed over the last 30 years. From Andermatt Biocontrol’s perspective, we have seen and continue to see some important global trends that have significantly boosted the company’s development.

In the 1990’s, the organic boom in Switzerland was crucial for us, as it was the problem of growing chemical resistance to certain crop protection products (in our case, specifically for codling moth in Europe) around the turn of the millennium. Most recently the modern consumer’s desire for residue-free foods has driven demand for our products. Today, many consumers are generally in favour of fair and sustainable agriculture.

Organic plant protection products and biostimulants are gradually becoming mainstream and now form an integral part of many treatment programmes. Andermatt Biocontrol aims to continue to make a major contribution by developing additional solutions and making them available to farmers around the world, allowing for synthetic chemical products to be replaced with intelligent biological solutions – for healthy food and a healthy environment.

We hope you enjoy reading these articles from the Andermatt Biocontrol Group.
A life in biocontrol: 30 years growing a successful company

The company Andermatt Biocontrol was founded by Drs Isabel and Martin Andermatt in 1988. Since then it has developed to become the leading company in Switzerland for biological based plant protection and a significant contributor to the development of the market for such products worldwide. In 2018 Andermatt Biocontrol is celebrating its 30th year and so we ask Isabel and Martin about their experiences.

What made you start Andermatt Biocontrol? From where did you draw inspiration to start and build this incredible business and what was it like when you first got started? Martin: We started because we saw a gap between the academic know-how about what could be potential solutions to pest problems and a lack of these solutions in the market place. It surprised us, but also motivated us to close such gaps. We worked very closely together from the very beginning, but most of the work was done by Isabel as I was finishing my PhD. The two of us did everything: Product development, field trials, registration, pricing, marketing, sales, logistics, book-keeping, etc.

You have demonstrated a passion and focus for biological pest control. Where did you get this drive for the business and what made you not give up on it? Martin: We were convinced, that an approach based on nature is much better for nature than an approach based on synthesised chemical molecules which are not part of the ecosystem.

I am sure there have been many challenges along the way. What have been the biggest problems in building the business to where it is today? Martin: Liquidity was always the biggest issue. When a business grows at a rate of 15 percent per year, everything doubles...
in five years: Income, expenses, employees, facilities and hopefully also profit. You must constantly adapt the structure of the organisation and continually develop people in the organisation to enable them to handle growing responsibilities.

What are, or were, the favourite parts of your jobs? What excites you most?

Isabel: If you produce something to replace something else, you are changing the world. If it is a change for the better, it is also motivating, irrespective of the size of your contribution. In 1988, we improved the conditions for a few organic apple growers because they could finally control codling moths, their key pest. Today we are active worldwide and a recognised group of biocontrol companies. That’s quite exciting!

What is the best piece of advice you have received?

Martin: Nothing ventured, nothing gained. This was the advice from the owner of the building where we rented our student apartment, when we asked him in 1988, if we could use the heater room in the basement to rear the codling moths, as we needed to keep them separate from the virus production in our apartment.

What is the most important thing that the company is working on right now?

Martin: We are developing and comparing different tools to fight against the Fall Armyworm (*Spodoptera frugiperda*), which is now an important pest in Africa. We are also working on our succession plan. Our employees are invited to become shareholders and they already hold 20 percent of the shares within Andermatt Holding AG. This will grow further in the coming years.

Andermatt Biocontrol is now in its 30th Year. What thoughts and emotions come to mind when you think about that? In the last 30 years, which moments stand out to you and what are you most proud of?

Isabel: We are grateful to all who have supported us over the last 30 years. Everyone in the Andermatt company can be proud about our overall success. Each person has contributed their part! We are especially proud about the Annual Biocontrol Industry Meeting now held in Basel, which Martin initiated many years ago and which is now the global meeting place of the whole biocontrol industry with 1,000 participants.

With the world population growing and natural reserves shrinking, how do you think agriculture will cope in the future? What will agriculture look like?

Martin: Modern agriculture will be more careful and more precise. The value of biodiversity will be more recognised. Residue free crops will become standard. Know-how transfer via internet, and precision farming will improve agriculture further.

What do you expect or hope for Andermatt Biocontrol in the next 30 years? In what ways do you expect to grow?

Martin: The worldwide growth potential for biocontrol is huge but the margins in the niche markets will not be big enough for the bigger plant protection companies. Here, we are convinced we can grow further by maintaining a lean organisation with many quite independent units in different markets.

Isabel: The Andermatt Biocontrol group is part of Andermatt Holding AG, which also owns Andermatt Biogarten, Andermatt BioVet and Entomos. These companies are also growing and are following the development of their big sister organisation, the Andermatt Biocontrol group.

Marriage can in itself be a challenge, but can also be doubly challenging when you both work for the same company. How has married life been over the last 30 years? How have you managed to fit personal life in with business life and when you were not both working, what did you do in your spare time. Did you have any?

Martin: The combination of marriage and business is not so uncommon! All farmers world-wide are in the same situation. There is a big advantage in it: you always have interesting topics to discuss together. A common history based on hard work over such a long time full of adventures, failures and successes helps to form a strong relationship.

Isabel: A good work life balance and enough time for our children was always important for us. We love hiking in the mountains and collecting mushrooms, ski-touring, gardening and beekeeping.

And finally, who would you like to thank for your successful business?

Martin and Isabel: Our success wouldn’t have been possible without the hard and highly motivated work of our employees. Our special thanks go to them!

Interviewer: With over 30 years experience in pest management, including time with some major agrochemical and public health companies, David started working in biocontrol in 2003 when he first visited the Andermatt company. He has been editor of International Pest Control magazine since 2012, reporting on innovation and industry news across all markets with pest problems. Recognising the growth in interest in biocontrol he is now developing a new information platform for this industry.

David Loughlin
Editor International Pest Control and The Bio Mag
Lean Management at Andermatt Biocontrol

In 2016 Andermatt Biocontrol decided to develop the Andermatt-Management-System (AMS). The AMS will be based on the principles of the Toyota-Production-System and will be supported and optimised using Lean Management methods. Its introduction is primarily intended to optimise the key parameters of quality, delivery time and price which are vitally important to customers.

Two years ago, the Board of Andermatt Biocontrol had the opportunity to participate in a Toyota-Production-System (TPS) workshop at SIGA, a company based in Central Switzerland. It was impressive what SIGA had achieved with the TPS approach over a seven-year period. For example, a machine changeover that originally took longer than a day was reduced to under an hour. In early 2016 the Board decided to commit to an ongoing TPS path and, in the coming years, to develop an Andermatt-Management-System (AMS) based on TPS principles.

As a starting point, a pilot project was launched in Production in August 2016, with René Waltisperg of LeanCom being engaged as an external coach. The nine-member project team consisted of staff from Production, R&D and Technics, drawn from all levels of the hierarchy. This cross-departmental team improved the production of Helicovex over the course of twelve weeks. The teamwork was highly effective and productive from the start. Close cross-departmental, long-term cooperation was a new experience for the team members. It helped to bring many of their personal assumptions more into line with reality. Or, in other words, they began to question methods and situations that had been taken for granted over many years. This enabled them to make improvements that an individual person (e.g. a leader) would never have thought of on their own. It also became very clear that an effectively functioning cross-departmental team can implement improvements more sustainably. A basic precondition is that everyone should be ready to adopt solution-oriented thinking. Everyone should genuinely try to grasp and understand the assumptions and suggestions made by others. And everyone should be able to query their own assumptions and suggestions with a critical eye. In both cases, it is important to respect different opinions while also taking into account the rules and principles of Lean.

The results of the first project have already proved very satisfactory. Throughput time has been significantly reduced, as has the changeover time on the filling line. These improvements allow us to supply customers faster and with greater flexibility. After successful completion of this project, the Lean improvement time was retained in Production. This means that around ten percent of the working time is routinely used for continuous improvement.

Franz Bollhalder
Andermatt Biocontrol
Logistics department lives up to its motto “The customer is king”

Customers expect to receive their orders promptly and in perfect condition. Every day, the logistics department puts a huge amount of effort, flexibility and passion into meeting this customer need.

A company’s success is based primarily on the quality of its products and services and on its ability to position them successfully in the market in accordance with customer requirements. The role that warehousing and dispatch logistics play in the customer process is often overlooked by companies. Their focus is generally more on the marketing of products than on the associated flow of goods. Quality of delivery is a critical success factor, and a decisive factor for customer satisfaction. Timely, undamaged and faultless deliveries help to shape the image of a company.

As a consequence, Andermatt Biocontrol values its logistics department highly. We want to serve our customers and distributors not only with outstanding products and sound technical advice, but also with a flexible, speedy and customer-oriented logistics service. The logistics department in Grossdietwil currently serves more than 5500 customers in around 45 countries worldwide, dispatching a total of 23,000 consignments per year. The logistics team is facing up to the challenges posed by our strong company growth. A high degree of flexibility and customer proximity are crucial in this dynamic market environment. To ensure this, our logistics department is constantly evolving within the framework of the Andermatt-Management-System and adapting its processes in line with prevailing conditions.

In October 2017, the logistics department moved into Andermatt Biocontrol’s new extension building (extension 9). The new premises offer space for optimum working and will serve as a basis for supplying our global customers in the coming years.

Erich Frank
Andermatt Biocontrol
An unusual discovery
The first discovery was in Mexico in 1964, when a dead codling moth larva was found showing strange symptoms: its body had darkened and seemed to have liquefied. The cause of the symptoms turned out to be an infection with a virus which was identified as *Cydia pomonella* granulovirus and named CpGV-M (for Mexico).

Unique mode of action
It soon emerged, that the microscopic viral particles were highly infectious to codling moth larvae. Their ability to multiply in their host made them deadly to the larvae, even in tiny amounts. Viruses are dependent on their host in order to multiply – a property which makes them highly interesting for use as plant protection agents.

From larva to plant protection agent
It was a huge challenge to multiply these viruses on living host larvae and to formulate them in high concentrations in such a way as to produce a stable, high-quality product. The attempts, however, succeeded and Madex, the first insecticide based on CpGV-M, was registered in Switzerland in 1988 by Andermatt Biocontrol.

Advent of organic pome fruit growing
Madex arrived not a moment too soon, and coincided with the dawn of organic farming. At that time for organic pome fruit producers, CpGV products were the only tool for codling moth management.

CpGV goes global
The first marketing authorisation in Switzerland was soon joined by others in Europe. Demand grew and within a few years, CpGV products were hugely sought after in the major apple growing regions worldwide.

From organic novelty to integrated production tool
The codling moth is a highly adaptable pest and resistance to conventional active ingredients spreads quickly in intensive fruit growing. As a consequence, CpGV products gain ground among resistance management strategies due to their unique mode of action. The virus not only controls larvae that are already showing resistance to certain active substances but also extends the lifespan of conventional insecticides.

Making use of beneficial organisms
Producers in conventional systems are increasingly having to deal with persistent secondary pests. On the other hand, organic orchards using more specific agents such as CpGV are able to achieve a much more stable, natural balance.

CpGV resistance in Europe: shock and opportunity
In 2004, several dozen organic orchards in Europe reported reduced sensitivity to CpGV-M. Science, industry and practice came together in the SustainCpGV project to find solutions for orchards with resistant populations. With the development of several resistance breaking isolates it is possible to safeguard the long term use of CpGV based products.
The eventful history of Cydia pomonella granuloviruses

Hardly any other active substances are as fascinating as those based on baculoviruses. The Cydia pomonella granuloviruses (CpGV) are a particularly notable member of this group, with a success story that began more than 50 years ago which has been far from straightforward.

Gisela Brand
Andermatt Biocontrol

A by-product is premiered
The extensive know-how gained through the selection of resistance-breaking CpGV isolates spurred our researchers on to further developments. In 2010, Madex Twin was developed. It was the first CpGV that was not only highly effective against codling moth but also worked on peach moth larvae (Grapholita molesta).

Residues are targeted
Awareness of residues on crops is growing and many export-oriented production countries follow the strict residue requirements of major distributors in high-price markets. The combined use of CpGV and pheromone-based mating disruption technology opens up new possibilities for residue-free pome fruit production.

Resistance management is optimized
In the meantime, several different types of CpGV resistance have been studied. Resistance-breaking virus preparations are available for all known types. The situation around CpGV resistance has therefore been relaxed, while in the background research continues unabated. In the event that CpGV resistance will assume practical relevance again in the future, we are now armed to deal with such situations with much more expertise and more precise molecular methods.

Looking to the future
Global warming is furthering the spread of the codling moth and increasing the number of generations. The astonishing, roller-coaster success story of CpGV does not yet seem to have come to an end. Fascination for the tiny particles that have revolutionised codling moth management remains undiminished among the staff of Andermatt Biocontrol.
New and proven organic fungicides for viticulture

The area under organic vines is growing and at the same time there is increasing interest in incorporating biofungicides into IPM crop protection strategies. Andermatt Biocontrol is expanding its product range and services in Switzerland in the area of efficient fungicides for viticulture.

Choosing suitable fungicides adapted to environmental conditions, type of operation and growers’ needs is a key factor in successful organic vine protection. So it is important that producers should have a choice of efficient biological solutions at their disposal.

Downy mildew (Peronospora)

Copper products remain important in the fight against Peronospora. To comply with the limits on pure copper available per hectare per year, reduced application rates are often used (200–500 g/ha). Applications of Myco-Sin (sulphurated clay) until flowering help to reduce copper use further, or to keep more copper available for the second half of the season. Thanks to its good efficacy, confirmed by many years of FiBL trials, Myco-Sin is increasingly and more widely used. Field trials and experience gained by Andermatt Biocontrol in the Swiss canton of Valais show that, in areas with low precipitation, even a pure Myco-Sin strategy without copper treatments works very well. Field trials and experience gained by Andermatt Biocontrol in the Swiss canton of Valais show that, in areas with low precipitation, even a pure Myco-Sin strategy without copper treatments works very well. With Alginure (not organic certified), consisting of potassium phosphonate and algal extracts, a further weapon in Peronospora control will be available from 2018 for non-organic certified vineyards. Combined with minimal amounts of copper, Alginure offers good protection for young leaves and buds until the end of flowering. Thanks to the systemic action of potassium phosphonate, Alginure can provide crucial protection during difficult periods (high risk of washing off).

Powdery mildew (Oidium)

Wettable sulphur Stulln continues to be used as an inexpensive standard product for the control of powdery mildew. However, to protect predatory mites and prevent sulphite formation, demand for sulphur reduction is growing. Vitisan, based on potassium bicarbonate, is a good alternative. Vitisan is ideally applied with a wetting agent (e.g. Cocana) in combination with Fenicur or with lower quantities of wettable sulphur. Combined application with Myco-Sin is not possible. However, application with small quantities of copper (up to 500 gram of pure copper per hectare) works best. In IPM strategies, Vitisan can be mixed very flexibly with synthetic chemical agents without risking phytotoxic damages. Vitisan also hardens the skin of the grape, which brings advantages when spraying after pea size. If Fenicur is applied alone (41/ha), the fennel oil has a very good preventive effect against Oidium.

Botrytis

Botector contains highly active micro-organisms (yeasts) which colonise microcracks in the grape’s skin, blocking the growth of the grey mould fungus. Applied in the bunch zone at the end of flowering, before the majority of berries are touching and at veraison, Botector helps to prevent botrytis.

In organic strategies for controlling of downy and powdery mildew, Myco-Sin can be used until flowering. However, Myco-Sin can only be combined with wettable sulphur Stulln. In copper applications wettable sulphur Stulln or Vitisan can be used. In integrated production, the efficacy of contact fungicides such as copper can be enhanced by adding Alginure until the end of flowering.
Combining preventive and curative methods for effective biological control of apple scab in fruit trees

With the approval of Curatio, a product based on calcium polysulphide, fruit growers now have an effective treatment to stop apple scab spores during germination.

**Biology of scab**

Apple scab (*Venturia inaequalis*) mainly overwinters in dead leaves, where the ascospores are produced. The maturity of the first ascospores generally coincides with the bud burst of apple trees. Each time it rains, the ascospores are ejected and carried far and wide by the wind. On wet foliage, they germinate and produce a germ tube that can penetrate the leaf. This is the primary phase of infection, which lasts until around early June. The ascospores need 320 degree-hours to penetrate the foliage (e.g. 20 hours at 16 °C). After a 15 to 20 day incubation period, new spores (conidia) grow on the leaves surface producing brown spots and infecting surrounding leaves and fruit in turn: This is the secondary phase of infection.

**Control methods**

Alternating the application of preventive and curative products, depending on weather conditions, allows for effective control of apple scab. Preventive products such as copper (Airone WG), sulphurated clay (Myco-Sin), and wettable sulphur should be applied before rain. This should be done before the spores have a chance to germinate. These products act as a lethal protective layer, inhibiting germination and growth of the pathogen. Curative products such as lime sulphur (Curatio) and potassium bicarbonate (Vitisan) are applied after rain during the spore germination phase, before the leaf wetness period exceeds 300 degree-hours. Curatio should be applied while the foliage is still wet. In these conditions, its highly alkaline properties (pH 11) have a saponifying action on the germ tube’s membrane, increasing its permeability and sensitivity to the active ingredient. Regarding Vitisan, it has to be applied always in combination with sulphur. However, the spray cover needs to dry out after application. The direct effect of the bicarbonate and potassium ions combined with the alkalinity and resultant osmotic pressure causes hyphae and spores to burst and dry out. It also increases their sensitivity to sulphur.

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**Organic and residue-free scab control strategy**

Apple scab can effectively be controlled by alternating organic preventative and curative products. In regard of residue reduction and resistance management these solutions can be integrated in conventional plant protection strategies.
Massive interest in biological plant protection

The Biocontrol Academy has got off to a flying start. The first courses in horticulture and landscaping were successfully held last winter. From spring 2018, the Academy will offer new courses for livestock farmers.

Farmers, growers, landscapers and amateur gardeners alike are increasingly facing the fact that chemical plant protection products are disappearing from the market or being banned. The socio-political environment is changing, and the use of conventional plant protection agents is increasingly being viewed with criticism. Reflections of this shift include political proposals such as the Federal Council’s action plan and two popular initiatives seeking to reduce or even ban the use of chemical agents.

To prepare sector participants for the future, Andermatt Biocontrol is offering courses on the use of biological plant protection products at its newly launched training unit, the Biocontrol Academy. The offers available also include courses on organic fertilisation and weed regulation, as well as the use of beneficial organisms in livestock farming. The one-day basic course for horticulturalists and landscapers was a huge success. The courses were fully booked and the participants left very satisfied with their newly acquired knowledge, having gained an insight into a wide variety of biological control strategies and organic fertilisers available. The opportunity to exchange expertise with other professionals contributed to the success of the course. But it was not just professionals who benefited. From May 2017, training was open to amateur gardeners as well. The participants were eager to learn how to tackle pests in their own gardens. Special highlights were the courses that offered guided tours of the botanical gardens, where the participants were able to observe beneficial organisms in situ, easily making the step from theory to practical application.

The Biocontrol Academy is expanding its offer in the coming year. From spring 2018, for example, chicken farmers will be given the opportunity to learn about using predatory mites to control red poultry mite populations. Another new course will focus on beneficial organisms for stable fly control.
A new pest is causing a crisis for African food security

The fall armyworm (*Spodoptera frugiperda*) was recently detected in Africa, where it is causing a devastating impact on food security. Littovir offers a promising solution to control this pest.

Risk to African food security

The first reports of fall armyworm (*Spodoptera frugiperda*) being introduced to Africa from America came in early 2016. Just a year later, the pest’s presence had been confirmed – or was suspected due to damage – in 28 sub-Saharan African countries. The armyworm caterpillars prefer maize, but also attack rice and millet, causing enormous crop losses and a severe risk for African food security. If the problem is not adequately resolved, African maize production for 2017 and 2018 is expected to suffer losses worth 2.2 to 5.5 billion US dollars, equivalent to around 20 percent of total production in southern Africa (estimates: CABI 2017). There is also the possibility of the pest spreading to Europe in the next few years.

Baculovirus as a solution

The use of chemical pesticides on *Spodoptera frugiperda* quickly leads to the development of resistance, which is why integrated or biological control strategies are recommended. A number of years ago Andermatt Biocontrol developed Littovir, a baculovirus product for the control of a closely related pest, *Spodoptera littoralis*. In multiple bioassays, Littovir showed a two to ten times greater activity than known virus isolates from *Spodoptera frugiperda*. These results encouraged us to test the product against *Spodoptera frugiperda* in the field. Initial feedback from Cameroon showed very promising results: two weeks after treatment, damage in the plots treated with Littovir was only 30 percent as opposed to 80 percent in the untreated controls.

Rapid action necessary

The urgent need for a solution in Africa means that Littovir will soon be made available, without too much red tape, for the control of *Spodoptera frugiperda*. Littovir has already been approved in Europe and is being used successfully against *Spodoptera littoralis* in several countries. Therefore, the otherwise lengthy approval processes should be accelerated in this situation. Successful application strategies using baculoviruses to control various Spodoptera species have already been developed in Europe. We are confident that the control of *Spodoptera frugiperda* is within reach. Besides Littovir, available biocontrol options against this pest include the *Beauveria bassiana* product Bb-Protec and *Metarhizium rileyi* product Nomu-Protec. Bb-Protec has already been granted emergency approval in South Africa.
A multi-pronged approach to reducing the devastation of the tomato leaf miner

The tomato leaf miner has been keeping European farmers busy since 2006. Andermatt Biocontrol aims to make a major contribution to the successful control of this pest in the future by offering various solutions.

The tomato leaf miner (*Tuta absoluta*) was first detected in Europe in 2006. Originating from South America, the pest has long been a problem in that region. Under favourable conditions, this nocturnal moth produces up to 12 generations per year with a developmental period of around 25 to 30 days. Eggs are laid mainly on the undersides of leaves. The first larval stages feed inside the leaves, creating mines. Older larval stages may leave the mines and attack fruits and stems. Due to intensive use of synthetic chemical pesticides and poor resistance management, many *Tuta absoluta* populations are now resistant to a variety of pesticides. The control strategy should therefore be based on a range of measures. In addition to established control strategies using beneficial organisms (*Macrolophus* in Northern Europe and *Nesidiocorus* in Southern Europe), *Bacillus thuringiensis* preparations (*Delfin* and *Agree WP*) and adapted cultivation measures, two further methods are available: a virus preparation (*Tutavir*) developed by Andermatt Biocontrol, and mating disruption technology.

**Tomato leaf miner virus**

*Tutavir* has been developed by Andermatt Biocontrol under the EU’s *Biocomes* research project to provide an effective, sustainable method to control the tomato leaf miner. *Tutavir* is a *Phthorimaea operculella* granulovirus (*PhopGV*) which was isolated from the potato tuber moth. Field trials in Italy have confirmed the excellent action against tomato leaf miner that was observed in the laboratory (see graph). *Tutavir* has a different mode of action to any other product currently available for use against tomato leaf miner. It is therefore expected to be a useful component of successful control and resistance management of the tomato leaf miner in the future. Plans are underway to obtain the necessary plant protection product registrations throughout Europe and other regions.

**Mating disruption**

Andermatt Biocontrol has more than 20 years of experience with mating disruption technology for vineyards and orchards. Mating disruption is successful where low initial infestation and little incoming migration of adult moths is expected. To prevent any incoming migration of mated females, the dispensers should be located in the *Tuta*-infested area, as well as in a buffer zone of 500 meter surrounding the area. Dispensers must be distributed immediately after planting. The trial results from the Ticino and the experience from Italy, Spain, and Greece are promising. The product has already been approved in Italy and Andermatt Biocontrol also plans to seek approval in Switzerland.

With combined use of cultivation measures, monitoring, *Tutavir*, mating disruption, beneficial organisms, and microbial products, controlling the problem pest *Tuta absoluta* becomes a manageable task.
Tutavir greatly reduced the damage compared to untreated controls and worked as well as a Bt product

Mating disruption is effective, reducing the number of adult moths caught compared to the variant with insecticide treatment

Results of glasshouse trials in Italy in 2017
Expansion of the RhizoVital line: flexibility in application

Over the last 30 years, ABiTEP GmbH has gained a wealth of experience in the production and application of biostimulating bacterial inoculants. *Bacillus amyloliquefaciens* FZB42 (RhizoVital 42) has become the industry standard. New strains are making it possible to respond even more effectively to customer needs.

The colonisation of the root surface by microorganisms is a natural process and part of the plant-soil-microorganism interactions in a healthy soil. Microorganisms promote root and plant growth by secreting auxins and enzymes. They also stimulate the plant’s natural defences, increasing its resistance to stress. By using selected microorganisms and applying them in high concentrations, the natural balance can be temporarily shifted in favour of desired properties. Endospore-forming Gram-positive bacteria are particularly suitable for this purpose. They offer both logistical flexibility (above two year shelf life at 25 °C) and flexibility in application: liquid formulation and compatibility with most fungicides, insecticides and fertilisers.

Under the brand name RhizoVital 42, *Bacillus amyloliquefaciens* FZB42 has become established as a key component of future-oriented production systems over many years and on various crops. Its positive effect on marketable yield is highly appreciated. Many genes within the FZB42 sequence code for the production of secondary metabolites, which are crucial for the induction of systemic resistance. *Bacillus amyloliquefaciens* FZB42 is therefore particularly suitable as a biostimulating preventive fungicide. Its inclusion in EU Annex 1 as a soil fungicide to control Rhizoctonia in lettuce and potatoes is currently being evaluated by the authorities.

As an alternative strain for the biostimulant segment, RhizoVital P45, based on *Bacillus amyloliquefaciens* FZB45, will be used increasingly in the future. An essential genetic feature of FZB45 is the powerful promoter which regulates phytase synthesis. Increased phytase production leads to improved potential for mobilisation of organic phosphorus, which has a positive effect especially under low phosphate conditions. With RhizoVital C5, Andermatt Biocontrol offers a new solution for use at low soil temperatures. RhizoVital C5 contains the soil bacterium *Bacillus atrophaeus* ABio5, which was isolated in the cool subalpine zone. ABio5 grows from temperatures as low as 8 °C. This cold tolerance allows early colonisation of roots in the spring and supports the crops during cold spells.

With the expanded RhizoVital line (RhizoVital 42, RhizoVital P45 and RhizoVital C5), Andermatt Biocontrol enables situational flexibility and targeted application of biostimulating bacterial inoculants.
Andermatt Biocontrol establishes Andermatt UK

The global footprint of Andermatt Biocontrol has further expanded with the establishment of Andermatt UK in July 2017.

In July of 2017 the United Kingdom became the latest country to have a subsidiary of Andermatt Biocontrol established within it. Building on existing commercial activities Andermatt UK will bring a portfolio of both in-house and third party technologies to the market.

Despite the uncertainties related to “Brexit” which are likely to affect the agriculture and horticulture business, the UK offers an exciting opportunity for Andermatt Biocontrol. The UK biocontrol market is estimated to be growing at 15 percent per year. Within the UK there is very strong consumer demand for UK produced fruit and vegetables. One example from a market key to Andermatt UK is top fruit production where the industry is aiming for more than 60 percent British sourced production. With apple supply currently 39 percent UK grown, there will need to be significant increases in areas of production to supply our growing population of over 65 million people. To support this growth in biocontrol, Andermatt UK will work with those advising and using our products to improve performance and reliability. Growers within the UK are using increasingly sophisticated modelling software to plan pest and disease control strategies, fitting our products into these systems as well as multi-platform education will be key to the successful launch of the numerous products Andermatt have planned for the coming years. Commercial activities will start in 2018 with a product range containing insecticides, fungicides, fertilizers as well as other solutions for fruit and other crops. The Andermatt UK portfolio will expand over the next years and will offer flexible tools for integrated pest management growing systems. In addition, Andermatt UK will launch a comprehensive range of products for the Home and Garden market in the UK. The presence of Andermatt in the UK market will further strengthen the position of the Andermatt Biocontrol brand as a global leader in baculoviruses and other biological control products.
Public policies provide essential support for biocontrol products in France

Public policies followed since 2008 are key to the development of biocontrol products on the French market. This impetus is needed to counter resistance to change and to alter behaviour.

France has had several successive governments in the past ten years, but the aim of reducing pesticide use remains important throughout these changes. Better yet, the aim of “zero pesticides” has become an accepted watchword. But there is a long way to go: although the biocontrol market has grown by 25 percent in the past two years, it still accounted for less than 5 percent of the pesticide market in 2016. The term “biocontrol” was recently included in the French Rural Code. Laws are therefore being adopted to promote the use of biocontrol products. Regrettably however, products for organic farming are not specifically taken into account. Innovative measures have been put in place, such as the Dephy Ferme and Dephy Expe programmes. Trials integrating biocontrol products into existing control strategies are being carried out at 1900 farms and 170 experimental sites to evaluate performance and identify potential uses under the real-world conditions faced by farmers.

Andermatt France is responding seamlessly to these trends by proposing some thirty solutions. These provide the advantages associated with biocontrol and can also be used in organic farming. The viruses in the “Invex” range (Capex, Madex Pro, Madex Twin, Helicovex and Littovir) are particularly useful in combination with conventional insecticide protection programmes due to their compatibility with conventional chemicals. The fungicide Curatio is an ideal fit in programmes to protect against scab or brown rot in fruit trees. A second fungicide, Vitisan, completes the product range. In addition, the insecticide NeemAzal-T/S is now viewed as one of the most serious alternatives to neonicotinoids for major uses.

Andermatt France maintains a high level of investment in the acquisition of technical expertise by numerous field trials and continues to expand its portfolio of biocontrol products. The company thus provides producers with powerful tools to move towards systems of agriculture that are equally productive but more respectful of the environment.

Comparison of IPM program with and without Curatio

The following chart illustrates the comparison of IPM program with and without Curatio. The chart shows the percentage of scabbed shoots under different conditions:

- **IPM with Curatio**: 11 applications between March 15 and May 20. Curatio applied curatively instead of Syllit (April 4) and Merpan and IBS (April 22).
- **IPM reference**: 11 applications between March 15 and May 20.
- **Untreated control**

The chart indicates the impact on scabbed shoots over time (May 9, May 23, June 6). The data is collected from an apple scab trial in 2016 at the Experimental station La Pugère.
Phosbac helps to optimize availability of nutrients

Andermatt do Brasil is developing a complementary biofertilizer product to achieve faster market entry opportunity.

Despite limitations, Brazil has developed advanced tropical agriculture and is becoming a key food supplier to the rest of the world. Nevertheless, new advances are required to improve the long-term sustainability and to reduce environmental impacts of the current production systems which rely heavily on chemical pesticides and GMO crops. Applied agricultural science has succeeded in not only increasing food productivity but also to reduce or even eliminate environmental damages. Andermatt do Brasil aims to contribute with its biorational solutions towards a modern and sustainable agriculture, increasing productivity while at the same time improving soil fertility and protecting the environment.

With the recent development of Phosbac, Andermatt do Brasil launches a novel solution, which helps to optimize availability of plant nutrients.

During 2017, we started to test Phosbac (*Bacillus amyloliquefaciens* strain FZB45), which confirmed the phytase mode of action in the field. In essence, Phosbac increases the efficacy of the phosphate fertilization (mineral and organic) and makes phosphorus, captured in organic matter, available to the plant. Recent research trials performed on potato provided good results in relation to productivity and nutritional state of the plants (see chart). Phosbac has shown to be a good alternative to make a phosphate fertilization more effective, offering cost reduction opportunities while at the same time gaining increased plant health and ultimately yield.

Andermatt do Brasil looks forward to supporting Brazilian growers with this novel solution Phosbac by reducing crop-risks and fertilizer cost, as well as by increasing efficacy and contributing to the sustainability of agriculture.

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**Increase of yield on potato after application of phosphate fertilizer\(^1\) and of Phosbac\(^2\)**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield [kg/ha]</th>
<th>Increase of yield [kg/ha]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphate fertilizer (2 t/ha) + Phosbac (200 ml/ha)</td>
<td>8332</td>
<td></td>
</tr>
<tr>
<td>Phosphate fertilizer (2 t/ha)</td>
<td>4644</td>
<td></td>
</tr>
<tr>
<td>Phosbac (600 ml/ha)</td>
<td>7804</td>
<td></td>
</tr>
<tr>
<td>Phosbac (200 ml/ha)</td>
<td>6919</td>
<td></td>
</tr>
<tr>
<td>Untreated control</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Monoammonium-phosphate MAP (P\(_2\)O\(_5\): 50–52%, N: 10–12%)

\(^2\) *Bacillus amyloliquefaciens* FZB45

Trial performed by Andermatt do Brasil in 2017

Markus Ritter
Andermatt do Brasil
The emerald ash borer (*Agrilus planipennis*) is an important invasive pest. A native of Asia, the insect has killed millions of ash trees (*Fraxinus sp.*) in North America and threatens Europe. Early detection is crucial for its management. AphinityEAB, a pheromone technology, offers such a tool.

Most of the damage caused by the emerald ash borer is caused by the larvae, which feed between the bark and the sapwood of the tree. As the larvae feed, they destroy the tree’s nutrient and water transportation system thus leading to girdling of the tree and causing tree mortality. Trees that are under attack by the insect can have symptoms that include crown dieback, bark deformities, woodpecker feeding holes, D-shaped emergence holes and epicormic shoot which grow out of the trunk, roots and branches of the trees. Since symptoms of attack are not obvious until populations of the beetle are well established within the tree, it is important to be able to detect this invasive early. Early detection is crucial for the management of this pest, e.g. tree removal or tree injection with systemic insecticides such as azadirachtin (neem extract).

AphinityEAB, a pheromone lure based on the female-produced sex-pheromone of the emerald ash borer, has been shown to attract male beetles at low population levels when used in combination with a green sticky prism trap and a host derived, green leaf volatile, often prior to the development of attack symptoms (Picture below). Studies carried out by Natural Resources Canada – Canadian Forest Service (Ryall et al., 2013) showed that by adding the female-produced sex-pheromone to a trap containing the host green leaf volatile, the number of EAB positive traps increased from 60 to 88 percent in low-level density areas.

AphinityEAB is produced by Sylvar Technologies Inc. Canada, a 100 percent subsidiary of Andermatt Biocontrol.
Regional solutions for integrated plant protection

Andermatt USA is developing regionally adapted IPM strategies for efficient plant protection in order to ensure sustainable benefits for producers.

The USA offers huge market potential for companies like Andermatt USA which focus on the sale of high-quality biological plant protection products, fertilisers and soil microorganisms. Due to the wide variety of climate conditions and the associated diversity of pests and diseases, it is not possible to develop sales markets according to a single blueprint and an approach tailored to regional conditions is needed.

Andermatt USA has set itself the goal of developing regional strategies for existing and future products across the entire portfolio. We aim to offer solutions that add value for our customers in both biological and conventional crop protection. These strategies and ideas are tested and evaluated together with various stakeholders. The ability to rely on the broad, global experience of the entire Andermatt Group is a major advantage here. There are various strategies for how our products can be used: as standalone solutions, in rotation, or in tank mixtures. The challenges on a farm are usually diverse in nature. Pests and diseases are numerous and can occur at different times. Targeted, mostly preventive measures help to keep pest and disease pressure low and reduce the use of chemical pesticides. Insecticide and fungicide resistance is a growing problem throughout the USA. Integrated crop protection is attracting increasing interest because it can delay resistance and save money.

Example of an IP strategy in cabbage production in southern California

Precise monitoring of existing pests allows targeted control. Several active substances are therefore used for optimum resistance management with minimal impact on beneficial organisms.

<table>
<thead>
<tr>
<th></th>
<th>Oct. 4</th>
<th>Oct. 12</th>
<th>Oct. 19</th>
<th>Nov. 2</th>
<th>Dec. 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketable yield</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>43%</td>
<td>90%</td>
</tr>
<tr>
<td>Untreated control</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Chemical standard</td>
<td>Spinetoram</td>
<td>Spinetoram</td>
<td>Spinetoram</td>
<td>–</td>
<td>90%</td>
</tr>
<tr>
<td>IPM strategy including NPV</td>
<td>Spexit</td>
<td>Spinetoram</td>
<td>Loopex</td>
<td>Loopex</td>
<td>83%</td>
</tr>
</tbody>
</table>

**Results of trial by E. Natwick (USA, 2016)**

**Pest pressure**
- Cabbage looper *Trichoplusia ni*
- Beet armyworm *Spodoptera exigua*
- Other pests: *Hellula rogata*, *Plutella xylostella*

**Spexit**: Spexit: SeNPV product to control beet armyworm (*Spodoptera exigua*). (Product of Andermatt Biocontrol)

**Loopex**: AcMNPV product to control cabbage looper (*Trichoplusia ni*). (Product of Sylvar Technologies)
Microbial products from Plant Health Products will provide solutions to farmers worldwide

Andermatt Biocontrol’s acquisition of the majority shareholding in Plant Health Products (Pty) Ltd will enable the Andermatt Biocontrol company group to offer fungal- and bacterial-based solutions to farmers worldwide. The biopesticide and biostimulant products from PHP can be used for the control of numerous pests and diseases and for plant stimulation on various crops.

Situated in the scenic Kwa-Zulu Natal Midlands region of South Africa, Plant Health Products (PHP) researches and manufactures biological solutions for agricultural challenges. The company has seen enormous growth in the nearly two decades since it was founded in 1998 by experienced scientists, Dr Mike Morris and Professor Mark Laing. The PHP product range of T-Gro, T-Gro Easy-Flow, T-77, Bb-Protec, RootWin-S (Soya Rhizobium) and RootWin-A (Alfalfa Rhizobium) have been successful in the market in several African countries and some are currently undergoing the registration process in the USA, Brazil and elsewhere. To accommodate the growing international demand for these products, a new state-of-the-art production facility is in the process of being built on the PHP premises. With a strong in-house research team and ties to key academic institutions, PHP is committed to thorough, science-based development of new products and ongoing research, monitoring and innovation of existing products hallmarked through continuous improvement.

PHP has several new products under development. PHP is planning to finalize the registration of a Metarhizium rileyi product for the control of several caterpillar pests during the next year. *Metarhizium rileyi* (formerly *Nomuraea rileyi*) is an entomopathogenic fungus effective against some members of the Lepidoptera (*Noctuidae family*) including economically important Fall Armyworm (*Spodoptera frugiperda*) and African Bollworm (*Helicoverpa armigera*) amongst others. Registration trials in South Africa against bollworm have shown exciting results revealing a successful decrease in the pest population (see chart) as well as up to 70 percent efficacy in reduction of feeding damage, comparable with a registered standard control. This product promises to be an effective biological control measure against these destructive lepidopteran pests.

PHP and Andermatt Biocontrol work closely together to bring you effective biological products for a variety of different agricultural requirements.

Field results showing the suppression of African Bollworm (*Helicoverpa armigera*) on soybeans by *Metarhizium rileyi* compared with a standard registered chemical (0, 7 and 13 days after application)

<table>
<thead>
<tr>
<th>Day 0</th>
<th>Day 7</th>
<th>Day 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>0.75</td>
<td>1.75</td>
</tr>
</tbody>
</table>

[Chart showing average number of living larvae on every 10 plantlets]
Bb-Protec and Cryptex, a successful combination against False Codling Moth, Thaumatotibia leucotreta

Combining the two products against false codling moth (FCM) on various crops strengthens the control strategy by affecting FCM at all lifecycle stages.

The false codling moth (FCM) is one of the most important pest insects in the citrus production in South Africa. Cryptex, a *Cryptophlebia leucotreta* Granulovirus is very species specific and active only against FCM larvae when virus particles are ingested by the larvae. Bb-Protec (*Beauveria bassiana*), an entomopathogenic fungus is a broad-spectrum contact insecticide with activity against FCM eggs, larvae, exposed pupae and adults. Applying the two products as a tank mixture on citrus and other affected crops makes perfect sense for a well-rounded, integrated pest management (IPM) approach against FCM.

A trial done in South Africa in the Hoedspruit area, on the citrus cultivar Turkey, showed that the combination has potential and could be further optimised by fine-tuning application timing and dose rates. Various products and product combinations were evaluated and although the trial was done under unfavourable conditions (initiated during the latter part of the season during very high FCM pressure) positive trends could be identified for many of the treatments. The focus treatments were Bb-Protec applied at 600 gram per hectare (applied every two weeks), Cryptex applied at 300 ml per hectare (applied every two weeks) and a combination of Cryptex and Bb-Protect at a reduced dosage applied at monthly intervals. Evaluation took place 7 and 14 days after each application and infected fruit was inspected for the presence of live FCM larvae. Even under the unfavourable trial conditions positive trends could be seen. All treatments had fewer living larvae compared with the untreated control and the solo applied Bb-Protec and Cryptex treatments were very effective in reducing FCM infestation even under the high-pressure scenarios. The Cryptex and Bb-Protec treatment demonstrated potential and was one of the most effective treatments overall with effective and consistent reduction in pest population over the course of treatment. This can be attributed to the Cryptex and Bb-Protec affecting all life cycle stages of FCM in the orchard and therefore having a bigger impact on total FCM population reduction.

Following this trial, many commercial citrus growers have implemented this strategy. The two products are applied at their registered dose rates during times of high FCM pressure and the strategy has proven to be very effective.