



Sustainable Agriculture

Based on Colloidal Elements

B+H Solutions GmbH

B+H Solutions GmbH is a Nanotech-Company in Remshalden, Germany. We develop and produce ecologically valuable and sustainable products. Our R&D has developed solutions and products, that open the door for our vision:

Pesticide-free vegetable, fruit and cereals

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Table of contents

1	Nanotechnology.....	3
1.1	Definition.....	3
1.2	Advantages.....	3
1.3	Risk Management.....	4
2	The Protagonists	5
2.1	Elmar Buder	5
2.2	Prof. Dr. Ing. Martin Heinisch	5
2.3	Team	5
3	Mission, Vision	6
3.1	Mission.....	6
3.2	Vision.....	6
4	History, Situation, Outlook.....	7
4.1	History.....	7
4.2	Situation	7
4.3	Outlook	7
5	Concept / Products.....	8
5.1	Concept	8
5.2	Products.....	8
5.3	Registration.....	9
5.4	Synergism.....	9
6	Projects	10
6.1	ZIM Project KA3424501RH4: Development of trace-element-fertilizers on base of nanometals.....	10
6.1.1	Project-Details	10
6.1.2	Project Output.....	10
6.2	ZIM-Project ZU4393301 Formulation and Application method to control the vines-disease ESCA.....	11
6.2.1	Project-Details	11
6.2.2	Project Output.....	11
7	Target Crops.....	12
7.1	Type of crops.....	12
7.2	Cultivation Methods	12

7.2.1	Outdoor and Indoor farming	12
7.2.2	Application.....	13
8	Target Clients / Target Countries	14
9	Reaction / Experiences by the farmers	15
10	Summary	19

1 Nanotechnology

1.1 Definition

Nanotechnology was made possible thanks to the invention of the scanning tunneling microscope, developed by Swiss scientist Prof. Heinrich. This new tool made possible to view particles and structures that have not been seen before. In 1987, a group of scientists brought nanotechnology into being: by definition, from that day on, every structure and/or particle between 1 and 100 nanometer of size is considered "nanotechnology". Since then, products and materials in that size-range are called nano-products.

1.2 Advantages

Nanotechnology is highly resource-conserving. Materials in the nano-cosmos present new different properties, which in consequence, introduce new advantages for the users.

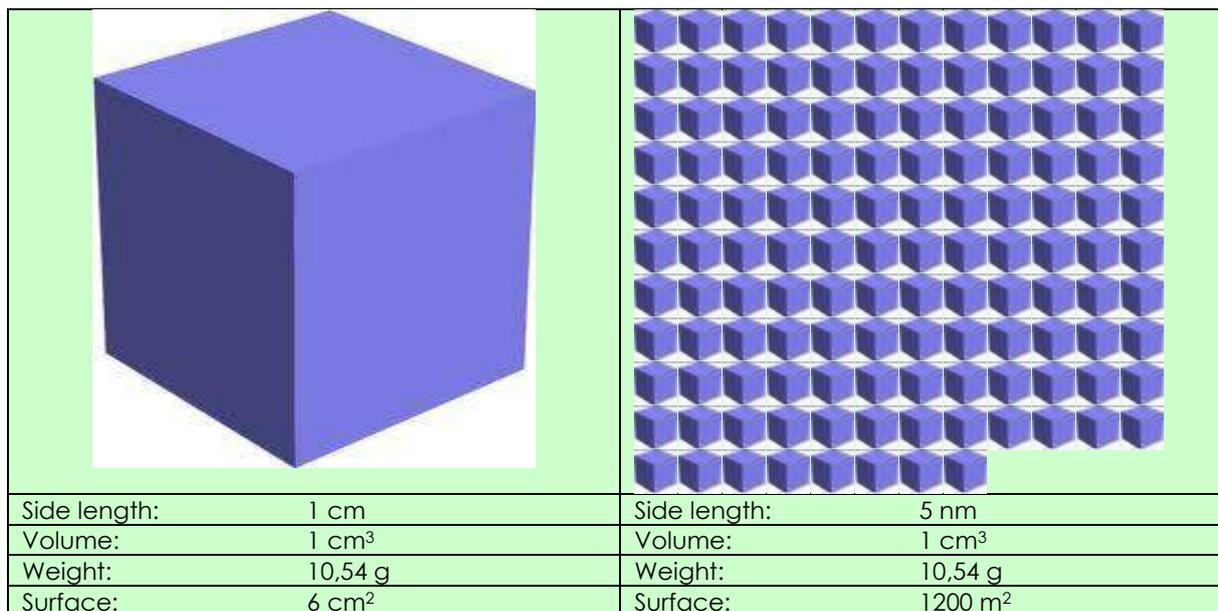


Fig 1. If you cut one single silver cube of 1 cm side length into smaller cubes of 5 nanometer side length, mass (weight) will be the same in both cases at 10,54 grams, but surface will increase from 6 square centimeters to 1200 square meters.

Nanoparticles have – in relation to their mass – a very big surface. B+H Solutions GmbH wants to take advantage of this effect and create solutions for applications in agriculture, hence, very small volumes of different elements lead to impressive benefits in the plants.

1.3 Risk Management

We give special attention to possible risks during and after the development of our products. All our products that are ready for serial production, have been checked for any risks based on state-of-the-art knowledge and best practice. When used as directed, all our products are safe and present no risk to humans, animals and the environment, based on the current state of knowledge.

2 The Protagonists

2.1 Elmar Buder

Founder of:	B+H Solutions GmbH.
Born:	1956
Nationality:	Austria
Profession:	Packaging Engineer, Quality Engineer, Auditor
Agricultural background:	Growing fruit and vegetables in family farm
Nanotechnology:	Since year 2000; pioneer in Nanotechnology
Patent:	EP 3 205 637 B1, Aqueous fertilizer containing nanoparticles

2.2 Prof. Dr. Ing. Martin Heinisch

Founder of:	B+H Solutions GmbH.
Born:	1965
Nationality:	Germany
Profession:	Civil Engineer – Construction and Project Management
Nanotechnology:	Since Year 2011
Patent:	EP 3 205 637 B1, Aqueous fertilizer containing nanoparticles

2.3 Team

High level team of Chemists, Biologists, Production and Logistic experts, Marketing and Sales experts enforced by external Scientists.

3 Mission, Vision

3.1 Mission

Our mission is to use innovation through new technologies in order to provide solutions to the problems faced by the agricultural sector today.

3.2 Vision

Our vision is sustainable, pesticide-free growing of vegetable, fruit and cereals, and residue-free products in Germany, Europe and worldwide.

4 History, Situation, Outlook

4.1 History

10 years ago, the product AgroArgentum® was for the first time used extensively in the first farms.

Back then, the feedback we received from our customers was, that they were able to stop using fungicide treatments and they had savings of up to 50% on fungicides (cost) at the end of the season.

4 years ago, the products AgroCyprum® and AgroFerrum® were developed and since then are available to farmers. Many decided to use the two new products based on metallic colloids after their great success with AgroArgentum®.

Over the past two years AgroCalcium® has been introduced and now is often used by farmers.

4.2 Situation

The whole program results in a solution concept that more and more farmers claim to be the answer in order to avoid the usage of fungicides for the entire season.

We provide the plants with the necessary trace elements that make the plants healthy and strong, without which the crops are defenseless against harmful organisms.

Strong and healthy plants feel very well and are not susceptible to disease.

This not only gives the advantage that the harvest is no longer burdened with fungicides, but also the beneficial insects used in sustainable agriculture work well. By this means, the problem of insect pests is also sustainably solvable.

4.3 Outlook

The complete withdrawal of fungicides is possible with our solution approach and opens the option to be 100% permanent.

No fungicides
No chemical insecticides
No herbicides
No growth regulator

5 Concept / Products

5.1 Concept

Micronutrients such as copper, iron, boron, calcium, and others, are essential for the right balance and proper functioning of the plant metabolism. Lack of these trace elements causes symptoms such as chlorosis, lack of strength and brightness, necrotic spots, susceptibility to infection, etc. and these effects mean great loss for the farmers. The concept of B+H Solutions GmbH is based on seeking an efficient fertilization strategy that allows to provide the plants with the precise amounts of micronutrients, and such a goal can be achieved with nanotechnology. Our products, thanks to their physical and chemical properties, provide more surface area and are more bioavailable for the plants. By this means, the applied material is minimized, allowing a better nutrient control.

5.2 Products

Product name	Product description	Main Action
AgroArgentum®	Liquid EC fertilizer with the optimized concentration of all its ingredients. AgroArgentum® O-Mix (NK 9-6) and AgroArgentum® Bor/Endo (2% boron), all of them with 1% silver nanoparticles as an additive	The silver nano particles interact with the light and make the photosynthesis more efficient. The active metabolism of the plant makes the plant to assimilate other nutrients very well and the biomass to increase. Plants reach its maximum development with great blossoming, have fruit with best features, and become stronger and more tolerant to stress
AgroCyprium®	Copper EC fertilizer solution. It contains 3% copper nanoparticles	It provides the plant with the correct amount of copper with very reduced amount of material. It helps the plant to recover from copper chlorosis and used from the very beginning avoid any signs of chlorosis at all. It keeps the plant strong, healthy and tolerant to stress
AgroFerrum®	Iron EC fertilizer solution. It contains 15% iron nanoparticles	It provides the plant with the correct amount of iron with very reduced amount of material. It helps the plant to recover from iron chlorosis and used from the very beginning avoid any signs of chlorosis at all. It keeps the plant strong, healthy and tolerant to stress

AgroCalcium®	Calcium EC fertilizer solution. It contains 20% calcium and 1% magnesium from microfine ground rock flour	It provides the plant with the correct amount of calcium with very small amount of material. It helps the plant to avoid calcium deficiencies and help the correct cell wall formation. It keeps the plant strong, healthy and tolerant to stress
ESCALibur®	EC fertilizer with 2% Boron, 1% silver nanoparticles and 0,3% copper nanoparticles	Product specially developed to help vines overcome the ESCA disease. The active metabolism of the plant keeps the plant strong and tolerant

5.3 Registration

All the products are EC fertilizers in Europe in accordance to the Regulation (EC) No. 2003/2003 of the European Parliament and of the Council of 13 October 2003 relating to fertilizers.

5.4 Synergism

All of our products have been developed in such a way that application can be done jointly. The results and experiences that have been provided by both our customers, as well as, from official trials performed by partner companies and in collaboration with research institutions, have shown the synergistic effect between all trace elements. Each of our product works perfectly by itself but together, the effect of one another is improved.

6 Projects

6.1 ZIM Project KA3424501RH4: Development of trace-element-fertilizers on base of nanometals

6.1.1 Project Details

Type of trace element	Project goals	Goal achievement	Marketable product?	Product name
Iron	Must work at every pH-value Environmentally friendly Every application type Resource-friendly (factor 10) Longer lasting effect Better assimilation by plants Cost reduction for farmer	YES YES YES YES YES YES YES	YES	AgroFerrum®
Copper	Environmentally friendly Reduction of copper emission by factor of 100 Longer lasting effect Better assimilation by plants Cost reduction for farmer	YES YES YES YES YES	YES	AgroCyprum®

6.1.2 Project Output

AgroFerrum® and AgroCyprum® are established in the market for 4 years.

Both products work in all kind of crops with no restrictions.

AgroFerrum®, as well as AgroCyprum® are part of a concept for sustainable agriculture. Both products are formulated in such a way that the metallic particles are deposited on the plants and assimilated in a very efficient manner.

Very low doses of AgroFerrum® and AgroCyprum® are sufficient to provide the plants with the necessary amounts of iron and copper, respectively.

By this means, pollution and excessive use of fertilizers can be avoided. Both products are considered suitable for sustainable and precise agriculture, causing the least environmental impact.

6.2 ZIM-Project ZU4393301 Formulation and Application method to control the vines-disease ESCA

6.2.1 Project Details

Type of trace element	Project goals	Goal achievement	Marketable product?	Product name
Boron	Find the right formulation	YES	YES	ESCALibur®
Silver	Asses the best application method	YES		
	Reproducibility in different regions	YES		
Copper	Evidence of non-phytotoxic effect	YES		
	Recovery of the vine-disease ESCA	YES		
	Action through plant own defenses	YES		
	Environmentally friendly	YES		

6.2.2 Project Output

The ESCA disease of grapevines is very devastating and no solution was known by the time the project began. More than one fungi have been proven to be responsible of the infection that affects trunks of old vines. The disease has been responsible of important economic losses and solutions were needed.

B+H Solutions GmbH's earlier experiences showed that by providing the plants with different trace elements, the plants become stronger and tolerant. For this reason, different formulations and modes of applications were tested.

Given that ESCA disease causes blockage of the vascular system, the main recommendation was to perform a trunk injection, both for evaluation of the progress of the infection and for allowing a direct uptake of the nutrients by reaching the xylem. Such single application would be reinforced with combination of foliar treatments carried out throughout a year, every year.

Evaluation of the trials performed in vineyards located in different regions and countries, and with different vine varieties, showed that in vines where infection is not in its most advanced stage, that is, when the wood rests of drilling have a light color and characteristic grappa bouquet, recovery was over 90%.

The dosage in the application is very low, excluding the chances of any contact effect. The positive response of the vines was attributed to the correct supply of trace elements, as well as the stimulation of phytoalexins.

ESCALibur® was developed with the successfully tested formulation and has been established since the beginning of 2019.

7 Target Crops

7.1 Type of crops

All the trace element fertilizers are suitable for any cormophyte, that is, any plant differentiated into roots, shoots and leaves, and among this classification, all crops of economic importance can be found.

Since the very first appearance of our fertilizers, we have been gaining experience in the usage of our fertilization system in all types of fruits, vegetables, legumes, cereals, flowers, ornamentals and turf. Every experience has been accompanied by a success story.

7.2 Cultivation Methods

7.2.1 Outdoor and Indoor farming

There is no impediment of using our trace elements fertilizers with both outdoor and indoor cultivation methods. The same occurs with different climates.



Fig 2. Trial on an outdoor endive crop: Control plot (left picture) and the treated plot (pictures right). Farmer could harvest 10 days earlier and had less failure.



Fig 3. Indoor bell pepper in Spain (2019) treated with the trace element fertilization program. Farm had no problems with pathogens and presented record harvest.

7.2.2 Application

The nature of the products makes them very easy to adapt to the farmer needs, situation and infrastructure.

Products can be applied through the irrigation system, drip irrigation, field sprayer, cold fogging and endotherapy. The last method is a trunk injection carried out where the plants so allow.



Fig 4. Vine being treated by endotherapy with the trace elements mix.

8 Target Clients / Target Countries

B+H Solutions GmbH clients are present worldwide in countries located in 4 different continents, which are reached through our representatives or directly from our base in Germany.

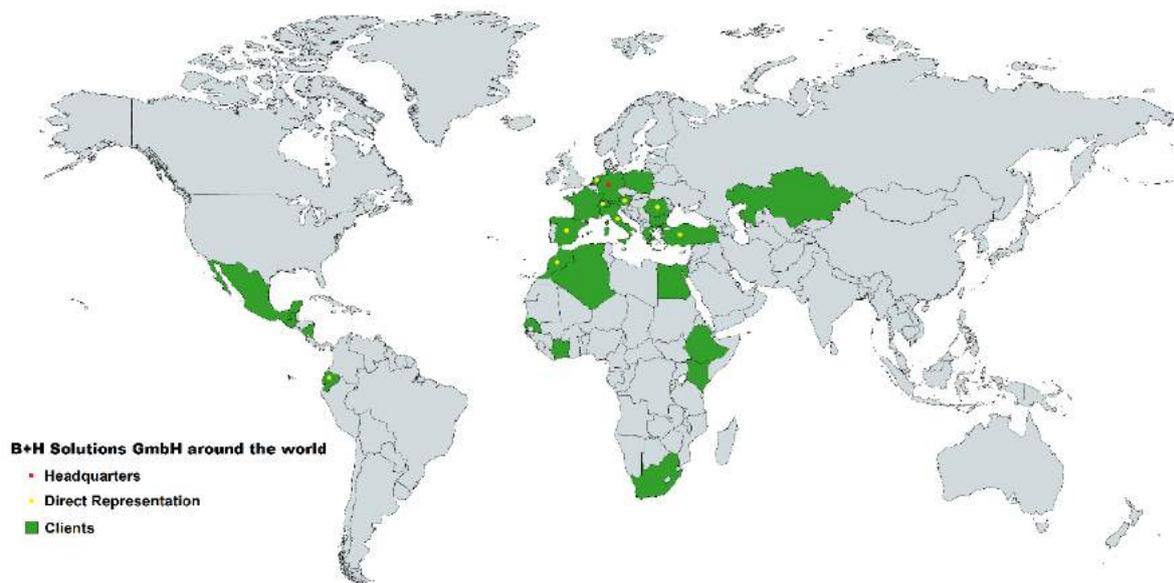


Fig 5. B+H Solutions GmbH presence in the world. Map created with mapchart.net.

Our innovative solutions and our sustainably-oriented status had caught the attention of both large and small producers, as well as agricultural input suppliers worldwide. Therefore, our approach has allowed us to gain ground in several countries year after year. We work very close to all the partners that share our philosophy and by doing this, we join forces and try to bring our technology increasingly to many more countries.

9 Reaction / Experiences by the farmers

The feedback we receive worldwide pays testament to the effort the company has put into ensuring that our clients achieve their goals.

Following are a few of our most recent success stories.



Fig 6. 11 months after the start of the campaign, this egg plant crop in El Ejido, Spain was very stressed (left). After 20 days with our program, plants became vital, strong and healthy, and were not interesting for pathogens anymore.



Fig 7. B+H Solutions' Program in tomato (Niederbipp – Switzerland, Gemüse-Bösiger). Production average in 2017 was 51 kg per m², production average of 2018 (with our system) was 62 kg per m², 21.6 % more harvest.



Fig 8. This lawn in southern Germany in May 2018 was highly affected by pathogens. After application of the mixture of colloidal metals by mid-June 2018, the turf grass was in optimal conditions.



Fig 9. B+H Solutions' Program in bell pepper (Spain, 2019). No infected plants and record harvest.



Fig 10. Control area (left) vs. treated area (right) in the same rose variety in Cotopaxi, Ecuador (March 2019). B+H Solutions' area had longer stems, bigger shiny dark-green leaves and bigger buds.



Application started



2 months later



3 months later

Fig 11. Vines healthy, green and with excellent fruit set after the treatment with the trace element mix (Italy). No fungicide treatments.



Fig 12. B+H Solutions' program in cucumber (Spain, 2019). Plants presented massive flowering and outstanding fruit set.



Fig 13. Before B+H Solutions' program (left) and after (right) in vine. The mixture of colloidal metals could help to the recovery of the ESKA disease in more than 90% of the treated vines.



Fig 14. B+H Solutions' program in radish (Sevilla, 2019): No fungicide treatment. No damaged radishes, super crunchy, no fungal infection, residue-free.



Fig 15. Garlic plants with our program (left) and with no treatment (right) in Spain (2019). Treated plant showed better development, healthy and strong root system with no signs of garlic rust.



Fig 16. Table grape in Egypt in August 2019. Grapes in the treated area (right) had 1 brix degree higher, better color, earlier maturity, 50% less affections by powdery mildew and 27% more yield in comparison with control (left).

The positive feedback we receive from our clients and partners continue every day.

10 Summary

B+H Solutions GmbH is a company committed to find solutions to the problems faced by the agricultural sector today, using the most advanced and innovative technologies.

The products created and developed by the company are a result of the joint efforts of our highly professional team and have been demonstrated to be very effective and environmentally friendly. Thanks to their improved properties, our solutions provide perfect tools for sustainable agriculture.

The most prominent results that we have experienced with the use of our innovative fertilization strategy are: more biomass, more yield, earlier harvest, more flowering and fruit set, less biotic stress and therefore reduction, even elimination of phytosanitary measures, among others. We have demonstrated repeatedly that residue-free production is possible with our concept, in greater quantity and with the best quality.

The company will continue with its efforts in the research and developing of new technologies applied to agriculture in order to improve formulations, dosage and application methods in widely known and new crops. As always, we will focus on the creation of ecological products that will bring the maximum level of economic success to the farmers.

Signed, October 15th 2019

Elmar Buder, Managing Director

Prof. Dr. Martin Heinisch, Managing Director