BestFeed
Berg+Schmidt’s Newsletter

Berg+Schmidt
Functional Lipids

Lecithin: a successful career for a valuable ingredient

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The requirements of modern animal nutrition are becoming more and more complex, and the cost of feed is rising meteorically. We at Berg+Schmidt are well aware that innovative products are essential if a company is to assert itself on the market.

Berg+Schmidt’s product development team and applications technologists regard themselves as lipid designers. We use our knowledge of lipid technology, acquired over the course of decades, to develop new, optimized lipid specialities for animal nutrition. Throughout the world we sell products that set new standards and do much to shape the market and determine the state of the art.

In this issue of our newsletter “BestFeed” you will find information on new findings and developments in animal nutrition and the most important results of our work. One of our main topics this time is lecithin. With its unique double function as a physiological active ingredient and biological emulsifier, all in one, lecithin makes a valuable contribution to balanced animal nutrition. You can also read how the enlargement and modernization of the lipids laboratory is enabling Berg+Schmidt to keep abreast of the growing demands of the market in respect of enhanced products and processes. The recently commissioned spraying tower (pilot plant) will in future enable our product development team to test and realize innovative ideas involving new technologies. And that will benefit our customers too, of course! For years a sophisticated range of applications-oriented products, competent advice and the development of tailor-made formulations have enabled Berg+Schmidt to consolidate its leading position in the market.

We wish you interesting reading.

Andreas Reith
Managing Director, Berg+Schmidt (GmbH & Co.) KG
Lecithin – a successful career for a valuable ingredient

Animal feed, foods, toiletries or medicinal preparations: lecithins play a valuable role in many areas of our daily life. Some 180,000 tons of these fat-like substances (lipoids) are produced every year, mainly from soybeans. They help to enhance and guarantee the quality of numerous products. Lecithins play an important role in animal nutrition, too. Also classified as “secondary plant metabolites”, these substances are known to have a positive effect in the nutrition of pigs and poultry, and especially in fish farming. And there are indications that lecithin produces good results in cattle feeding, too.

Improving digestibility

In animal nutrition lecithins are used as emulsifiers. They improve the digestibility of the feed fats and fat-soluble vitamins. The substances used are either “crude lecithins” obtained directly from vegetable fats, for example soybean oil, or “deoiled lecithins” produced by means of extraction. With an oil content of 35 – 40%, “crude lecithins” have a rather viscous consistency, whereas “deoiled lecithin”, which contains a very high proportion of phospholipids (at least 95%), is available in powder form. Being highly concentrated it is also highly effective. This has been documented in numerous scientific studies.

Liquid or powder?

Deoiled lecithin is the most economical dosage form for feed. Liquid crude lecithin is used mainly as a raw material for other lecithin powders on carriers. These powders are made up on the basis of various carriers for different technical applications. In this consistency they are easier to transport and dose. For technical reasons the phospholipid content in these lecithin powders on carriers is reduced to about one-third.

The chemical background

From the chemical point of view, lecithins belong to the phospholipids with the groups of substances important for metabolism. The latter include phosphoric acid, glycerol, choline, inositol and also unsaturated fatty acids such as linoleic and linolenic acid. They have a characteristic structure with a hydrophilic or polar group and a hydrophobic or non-polar group. The former includes choline, inositol, glycerol and phosphoric acid, while the latter comprises unsaturated fatty acids. This polar structure makes lecithins excellent emulsifiers which can be used for stabilizing both oil-in-water and water-in-oil emulsions.

A diversity of effects

The effects of lecithin fall into both physical-technical and biochemical-physiological fields. The physical-technical effects can be described by the terms emulsifier, dispersant, releasing agent and water-binding capacity. The physiological effects are concerned with the metabolism of lipoproteins, phospholipids, triglycerides and cholesterol of various densities (HDL, LDL, VLDL) for the intermediate transportation of fats. When added to fattening feed for pigs, lecithin permits much better conversion of fat and thus improved fattening performance. But lecithin is not only beneficial in pig fattening. In milk substitutes it facilitates the feeding of calves and piglets, and it produces good results in broiler fattening and fish farming.

Lecithin products for animal nutrition, from Berg+Schmidt

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Broilers: BergaPur deoiled lecithin improves the digestibility of the nutrients.

Fat is added to broiler feed to increase its energy concentration and make the fattening process more efficient. The usual energy concentration for broiler feed is in the range of 3,000 – 3,250 kcal/kg, depending on the fattening method, the region and the quality of the feed. This represents a fat content of up to 10% in the finishing ration.

Making nutrients available

Just after hatching and in the starter phase, young chicks are unable to digest the large proportion of fat in the feed completely and utilize it to the full. One reason for this would seem to be that they do not produce enough of the bile salts that act as endogenous emulsifiers in their bodies. Fat digestibility does not reach a maximum until the period between the 20th and 43rd day of the birds’ life. The excess feed fat may cause health problems in young chicks and result in a loss of performance that cannot be made up for during the further course of their growth.

BergaPur opens up potential

BergaPur is a pure, deoiled lecithin with a phospholipid concentration of at least 95%. The positive effect of deoiled lecithin on the digestibility of the crude nutrients and the fattening performance of the broilers has been confirmed by numerous studies, the latest of which was conducted by the University of Göttingen in 2006. The addition of 0.3% deoiled lecithin to the finishing ration (cf. Fig. 1) resulted in:

- noticeably improved digestibility of the crude fat;
- better digestibility of the organic substance, protein, and the remaining carbohydrates.

In turn, the 7% increase in fat digestibility resulted in:

- better utilization of energy by the birds, and thus
- enhanced conversion of valuable proteins from the feed for muscle formation. The improved digestibility of the nutrients is reflected in better carcass parameters (cf. Fig. 2).
Feeding trout: successful rearing with phospholipids

The addition of lecithin to the feed of freshwater Salmonidae such as trout opens up greater chances of success for fish farmers.

Until the decisive breakthrough in research it was usual to feed trout without fat. The use of feed containing (animal) fat caused fatty liver degeneration in the fish. For this reason, only oils from marine animals were regarded as suitable for addition to dry trout feed. But even when fed with easily digestible fats, fish of the salmon family tended to develop fatty disease of the liver and kidneys. This resulted in impaired functioning of these organs and ultimately in frequent cases of oedema and an elevated mortality rate.

But if 3% poultry fat was added to their feed, the fish grew faster. Feed experts attributed this effect to the phospholipid content of the fat. Against this background the constituents of lecithin acquired totally new importance in the feeding of trout. The conclusion to be drawn is that the use of lecithin in feed for trout has a highly favourable effect on the health, growth and feed conversion of the fish. This is especially true if large amounts of fat are added to the feed.

The digestive effect results from the surface activity of the lecithin. The chyme is mixed very homogeneously and its surface area enlarged. This facilitates the breakdown of the substrate by the digestive enzymes. The effect of lecithins on metabolism becomes apparent in the transportation of fat between the liver and the tissues and in the exchange of substances between cells.

Besides the deoiled lecithin BergaPur as a highly concentrated complex of active substances, Berg+Schmidt offers further lecithin products for the aquaculture market.

Phospholipids supply linoleic and linolenic acid, inositol and choline

- Linoleic and linolenic acid are indispensable for fish of the salmon family and have the effect of stimulating growth. The estimated requirement is 1% linoleic or 0.1% linolenic acid in the dry feed. A deficiency is recognizable by depigmentation of the skin (after 16 – 24 weeks), since the production of melanin in the pigment cells of the skin is reduced.

- An inositol deficiency results in stunted growth and swelling and prolonged evacuation of the stomach. The estimated daily requirement is 18 to 20 mg/kg live weight.

- Choline deficiency also causes impaired growth and feed conversion in trout and tends to result in fatty liver degeneration and bleeding from the kidneys and gut.
Healthy, productive cows with BergaPlus D

BergaPlus D is a vegetable fat powder with functional components. In dairy farming it has a favourable effect on the main economic parameters, especially the milk yield, and the fertility and health of modern dairy cows.

Problems of modern dairy farming

The marked increase in the milk yield over recent decades is associated worldwide with reduced fertility of the herds. Although the quantity of milk increased by about 2% annually, the fertility of the herds fell by 1%. Moreover, the rate of metabolic disease among the cows increased too. This has resulted in financial losses in the field of milk production.

Stress, especially in the transition phase

During the transition phase and early lactation period, dairy cows are subjected to increased stress. The changes affect their metabolism and hormone production. The animals’ bodies are preparing themselves for calving, milk formation (lactogenesis), milk secretion and repeated reproduction. The burden on the cows’ organism and economic performance should not be underestimated.

Strategies for improving milk production, fertility and health

By providing rumen-stable fats and functional nutrients, BergaPlus D boosts the cows’ milk yield and improves their fertility and health. BergaPlus D reduces the mobilization of body fat, thus countering the harmful effects of a negative energy balance on the amount of milk produced and the cows’ fertility, liver functions and health. It has a positive influence on the function of the reproductive and immune systems, particularly in high-yielding cows during the transition phase and early lactation.

A glance inside the cells

Being a vegetable fat powder complex, BergaPlus D consists of natural vegetable triglycerides and the functional nutrients carotene and vitamin E. The product was developed specially to compensate for a negative energy balance and to increase the milk yield and fertility of dairy cows. At the same time it supports the functions of the liver and immune system. Infections and metabolic or reproductive disorders occur less often. With regard to reproduction it should be remembered that the corpus luteum (yellow body) contains large amounts of B-carotene. This means that dairy cows with a B-carotene deficiency are more susceptible to reproductive disorders, especially in the winter months and early spring. A diversity of problems may result: silent or prolonged oestrous cycles, delayed ovulation, low progesterone release, early death of embryos, infections of the udder due to problems with the afterbirth, inflammation of the udder or uterus and placental retention.

Advantages for dairy cows:

Simultaneous availability of fat, B-carotene and vitamin E in the small intestine. In particular the fat is available immediately for storage in lipoproteins and thus as a source of energy. Higher milk yield; normal oestrous cycle, ovulation and pregnancy; fewer infections and reproductive or metabolic disorders.
Practical trials with BergaPlus D – noticeably increased milk yield in Chinese Holstein cows

In trials at a dairy farm in Shanghai, China, 52 high-performance cows were selected and divided into two groups. One group was given rumen-protected fat in powder form, the other BergaPlus D. The cows were divided up according to the expected calving date and the milk yield of the previous lactation period (8,500 kg on average). Administration of BergaPlus D as a top dressing started at 125 g per cow and day 21 days before calving and continued at 350 g per cow and day for a further 90 days. In the cows fed with BergaPlus D the milk yield increased significantly by an average of 10.6% as compared with the cows receiving the rumen-protected fat powder (37.38 kg as against 33.78 kg/day).

Enzyme complex BergaZym P: a new assessment of feed components

BergaZym P, the enzyme–complex micro–granulate from Berg+Schmidt, helps to save money. That is the conclusion reached after comprehensive growth and metabolism studies conducted in many places throughout the world and most recently at the Bangkok Animal Research Centre of Ajinomoto Co. Ltd. in Thailand. BergaZym P boosts the conversion of nutrients in broilers and generally in poultry fed with nutrient-reduced rations.

Against a background of constantly rising prices for the raw materials of feed such as maize, extracted soybean meal and soy and palm oils, approaches to more efficient feed conversion in poultry are meeting with more and more interest. BergaZym P helps to make better use of expensive raw materials like maize and soybeans and increase the feed value of cheaper alternatives such as millet, rice polishings, rape-seed, cotton–seed or palm–kernel meal and dried brewer’s grain.

Increased bioavailability

BergaZym P is a multi–enzyme complex consisting of endo–ß–1,4–xylanase derived from Trichoderma longibrachiatum, endo–ß–1,4–glucanase, amylase and protease and the side activities cellulase and galactomannase. These enzymes have synergistic effects in the digestion of nutrients from feed and thus increase the bioavailability of the nutrients for the fowls. This is confirmed by the latest study at the Bangkok Animal Research Centre, where BergaZym P was added to both standard and nutrient-reduced feed (5% less apparently metabolizable energy [AME], 10% less protein, amino acids, calcium and phosphorus).

The results of the four-day metabolism test are shown in the following table.

The addition of BergaZym P to standard feed

increased the apparently metabolizable energy of the feed by 91 kcal/kg. The birds’ protein gain was 1.1 percentage points greater (53.6% as against 52.5%). The gain in nine essential amino acids increased by 1.5 percentage points (80.4% instead of 78.9%). Phosphorus retention increased from 30.2 to 34.4%, and calcium retention from 28.5 to 32.1%.

The addition of BergaZym P to low-nutrient rations

increased the apparently metabolizable energy by 34 kcal/kg of feed; this is equivalent to 1.3%. The birds’ protein retention was 6.2% greater (56.6 as against 53.2%).

Better utilization of nutrients thanks to BergaZym P

Through the addition of BergaZym P, the feed with reduced crude nutrients achieved the efficacy of a commonly used standard feed based on maize and soy.

Better utilization of the feed and higher profits thanks to BergaZym P

The addition of BergaZym P resulted in better feed conversion, especially in the case of nutrient-reduced rations. Consequently, the use of BergaZym P results in higher profits according to the profitability index for poultry.
Since 2005, increasing amounts of grain and seed have been used for the production of biodiesel and ethanol and are thus no longer available as food and feed on the international markets. As a result, the price of feed is rising. That is putting more and more pressure on stock farmers and the feed industry and raising the question of how to counteract the effects of biodiesel production and optimize conversion of the components of the feed.

At the end of May 2007 the eminent participants in a workshop held on the Indonesian island of Bali by the American Soybean Association – International Marketing (ASA–IM) also devoted themselves to this topic. As one of 15 speakers, Dr. Yuyun Mu (R&D Manager, Berg+Schmidt Asia) held a paper on "the use of phospholipids in poultry and pig feed" before some 100 experts from all parts of the world. He described the function and effects of phospholipid products, taking BergaPur as an example. In particular Dr. Yuyun Mu drew attention to the improved utilization of crude nutrients and the enhanced performance of monogastric animals. "This product ensures more efficient digestion, so the fat content of the feed can be reduced accordingly", he said.

The paper met with great interest on the part of the audience, especially since the prices for soybean and palm oil are particularly high in Asia. As a result, there is considerable demand in this region for practicable ways of optimizing feed costs and reducing direct dependence on further price rises in the feed sector.

**Expansion of European ethanol and biodiesel production**

![Graph showing the expansion of European ethanol and biodiesel production](source: FAZ.NET)
New lipids laboratory

The commissioning of a modern lipids laboratory in Ahrensburg, near Hamburg, opens up ideal prospects for Berg+Schmidt’s research activities. One of the most important features is the spraying tower for product development.

Sophisticated research centre

Together with its sister companies in the Stern-Wywiol Gruppe, Berg+Schmidt has invested in an ultra-modern research centre. The centre offers the company everything it needs in order to react quickly and specifically to developments in the market. Besides developing new products the Hamburg company attaches great importance to optimizing and adapting existing product lines – “a process that never ends”, as Berg+Schmidt emphasizes.

New technologies

New encapsulation technologies including spray-drying and cold spraying methods will meet the growing demands of the market. Examples are the optimum combination of fats, hydrocolloids, enzymes, vitamins, lecithins and emulsifiers. For this a whole package of new technologies has been developed in recent years.

“We want our customers to benefit by our research activities”, says the Managing Director of Berg+Schmidt, Andreas Reith. In particular certain aspects of product enhancement and process optimization give good reason for confidence.

We shall continue to report on the development of this lipids laboratory.

Berg+Schmidt expands in Poland

With the opening of a modern tank farm for liquid feed fats last year the company’s Polish branch, Berg+Schmidt Polska, strengthened its presence in the Polish and Eastern European market. Construction of the plant on a 50,000 m² site in Pomeranianwice, near Poznan, started in 2005.

The stainless steel tanks offer considerable storage and production capacity. With this step completed, Berg+Schmidt Polska feels excellently equipped to meet the challenges of the future in this market from the strategic as well as the logistic point of view. This confidence is supported by the existing storage and distribution facility for dry products on an area of over 1,500 m².

Closer to the customer

Berg+Schmidt attaches great importance to direct presence in its markets. “Our branch Berg+Schmidt Polska was established at the Poznan site as long ago as 1998”, the Hamburg firm says, looking back.

“This region has become one of Poland’s most important trading, industrial and university centres again.” Over the past few years the company has been able to develop along with its environment and integrate itself into the growing structure. And it intends to make good use of the advantages this structure and location offer in the coming years too.
Success needs partners

Berg+Schmidt is about to intensify its cooperation with Dr. Pieper GmbH and extend it with a view to the future: that is the subject of an agreement between the two partners. The companies have already worked together in various fields in the past. They will now make joint efforts to enlarge the markets for existing products and develop new, market-oriented products that will permit even more effective animal nutrition. The keyword here is “rumen-stable fat powder”.

To understand the project you need to know where the roots of the two companies lie. There can be no doubt that Berg+Schmidt has been one of the few global players in the fat powder business for decades. A worldwide distribution network supplies feed components to pig fattening units in China or dairy farms in Canada, Europe and Australia.

Mutual benefits

With the establishment of Dr. Pieper Technologie und Produktentwicklung GmbH in Wuthenow (Brandenburg) in 1993, Dr. Bernd Pieper laid the foundations of his activities centring on silage-making and feed conservation. It was he who developed the “Bio-Sil” biotechnological silage additives for the production of quality silage. When combined with BergaFat T-300 from Berg+Schmidt, these form an optimum starting point for a high-performance ration. Another of Dr. Pieper’s patented ideas is ultrasound-controlled dosing technology for exact application of the silage additives to the harvested produce. On this basis, cooperation between the two companies will give rise to valuable synergisms.

Cooperation between the companies started informally. Dr. Pieper took an interest in the use of vegetable fats in animal nutrition at an early stage and inevitably discovered the products from Berg+Schmidt. The latter had been specializing in vegetable feed fats since the early 1980s and established itself in the market with the development of quality fat powders. So in fact Dr. Pieper was using the Berg+Schmidt products in making up complete solutions for individual farms. As an enthusiastic customer he contacted the Hamburg headquarters numerous times with suggestions for changes and ideas of his own. Both companies benefited by this cooperation, and it gradually led to an ideal partnership.

Personal commitment and passion

This early cooperation resulted in fat powders that are still setting standards throughout the world. “A lot of things are possible if you work on solutions together, with personal commitment and passion, and really care about healthy, efficient and sustainable animal nutrition”: that is how both partners view their cooperation to date. In Germany they market BergaFat 300 jointly and exclusively; the product is a rumen-stable, finely sprayed fat powder based on fractionated palm fat and without a carrier. A valuable source of energy, it does not make the necessary additional fat available to the animal until it reaches the small intestine – and the animals like the taste, too. So it is hardly surprising that feeding trials have revealed a significant, long-term increase in the milk yield of healthy high-performance herds.

Extending cooperation

The two companies are now opening up a new chapter in their cooperation with the product BergaLac. For the first time, Dr. Pieper and Berg+Schmidt have made a joint application for a patent: after all, the new additive has been the brainchild of both the partners practically from the first thought. BergaLac is a new feed fat, a compound consisting of palm oil fractions and carbohydrates, the latter being encapsulated in the rumen-stable fat. This enables the carbohydrates to pass into the small intestine unharmed, so that they are directly available for the production of lactose via glucose. Special properties of BergaLac are its excellent digestibility and good acceptance as feed. For this reason it is recommended particularly for the early phase of lactation.

Future cooperation between the two companies is expected to give rise to even more interesting solutions for healthy, efficient and sustainable animal nutrition. We will report on these when the time comes.
Discovering and using synergisms

Dr. Pieper Technologie- und Produktentwicklung GmbH (TuP), Wuthenow (Brandenburg)

Main object of the enterprise
Silage-making and feed conservation.

Core business
Development of essential vegetable ingredients for healthy animal nutrition and profitable stock production.

Customers
Top companies and farms throughout Germany and its Eastern European neighbours.

Own reference farm
300 high-performance cows are kept on a farm near Neuruppin, not far from Berlin, for opening up new potential in stock-keeping and feeding.

>> As close as possible to the customer <<

Berg+Schmidt (GmbH & Co.) KG, Hamburg

Main object of the enterprise
Innovative lipids and enzymes.

Core business
Development of efficient, modern feed components.

Customers
Feed manufacturers, the trade, farmers.

Own production plant
in Malaysia; Technology Centre in Ahrensburg, near Hamburg.

>> Development of innovative feed additives that set standards throughout the world <<
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