THE LUPIN IN DAIRY CATTLE FEEDING

Protein sources for the cows' rations are completely derived from domestic and Obtaining GMO-free sources and thus feeding physiologically but also economically well: a challenge for dairy farmers. Through innovative technology, it is now possible to produce a protein feed that contains only domestically produced ingredients and is competitive with conventional products. It consists of rapeseed extraction meal and lupine. Our editors have examined both the production and the practical use of this product.

PRODUCTION: WHAT IS LUPICON® R?

Soya and rapeseed extraction meal are the most commonly used protein-rich feedstuffs in dairy cattle feeding in Germany. Other domestic protein sources, such as field beans, peas and lupins, have also gained in importance in recent years. Deutsche Tiernahrung Cremer GmbH & Co. KG (deuka) has developed a new compound feed with the help of a patented pressure hydrothermal process that improves the physiological parameters of lupine, such as the ruminal degradability of the protein or the content of antinutritive substances. The product is called „Lupicon® R". It consists of 50 % rapeseed meal (RSM) and 50 % lupine.

More advantages with treatment

Lupine offers fundamentally high crude protein and energy contents. Treatment of the grain legume can further improve these ingredients.

The special process used by deuka can increase the UDP (undegraded dietary protein) and nxP (usable crude protein) content of the lupin compared to the untreated variant and reduce the ANF (antinutritional factor) values. In particular, by increasing the UDP content and thus the content of usable crude protein in the duodenum, an increase in the performance of dairy cows can be achieved in comparison to untreated lupin. In addition, the dietary cation anion balance (DCAB) can be improved by the use of lupine (Pieper et al 2004; Pieper et al 2007), which can reduce the risk of milk fever, for example. The process for producing Lupicon® R is called „Opticon®". This is a patented HTST (High Temperature Short Time) process that has been tried and tested for two decades.

The substrate of RSM and lupine (blue and white lupine), which has been moistened by water vapour is heated briefly and intensively and then pressed through a small diameter opening (extrusion). After this short and intensive phase under heat and pressure, the mass relaxes („flash phase") and releases excess heat and moisture in this phase. Cell structures are opened by this process and the surface of the substrate is enlarged. In contrast to „conventional" toasting, in which the substrate is also moistened, the Opticon® process also involves mechanical processing in addition to moistening and the short but intensive heat treatment. The innovative process is therefore gentle on proteins due to the moistening with water vapour, and the end product has a higher digestibility of the fibres and the UDP in the small intestine at the same time.

The result is a domestically produced feed with approx. 31 % total protein and an average of 245 nxP. Lupicon® R is currently manufactured at deuka's Herzberg site.

For which farms is Lupicon® R suitable?

In principle, any dairy farm that is interested can use Lupicon® R for its animals. The product is an alternative solution especially for those farms that ...

- ... want to use an energy- and UDP-rich feed in addition to rapeseed meal as the main protein carrier and need a more favourable DCAB balance.

- ... have exhausted starch and sugar contents in the ration (high maize and cereal content), as the energy in the lupine feed comes from the fat and therefore no starch needs to be added.

Deliver Lupine & get Lupicon® R – How does it work?

Regardless of whether blue or white lupine is cultivated, both species can be sold to deuka for the production of Lupicon® R. The only criteria for the delivery of legumes apart from the standard purchasing conditions is a moisture content of at least 15 %, 85 % dry matter for storage and a stocking rate including foreign grain of less than 2 %. At currently approx. 37 €/dt free Herzberg, white lupin is remunerated significantly above the current market prices in a partnership with deuka (as of June 2023). This is because deuka offers a coupling deal for farms that supply both lupin and use Lupicon® R for their dairy cattle feed. The finished feed Lupicon® R then costs approx. 41 €/dt.

Conclusion

Production and practice agree: Lupine is a suitable domestic protein component in dairy cattle feed! With the right basic conditions, it is more than competitive with soya or rapeseed. Currently, around 2,000 to 3,000 tonnes of Lupicon® R leave the deuka in Herzberg. It will become interesting for the processing industry when lupine is available as a raw material in large, permanently available quantities. Reliable political framework conditions and an attractive sales price are the basic prerequisites for a further increase in the area under lupine cultivation. The example described here shows that innovative approaches can offer new perspectives for dairy cattle feeding.

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THE PRACTICE: EVERYTHING WITH A SYSTEM

„I want to produce my own feed for my animals“– this is one of the reasons why Andreas Guhr has been using his own white lupin as a protein component in the form of „Lupicon® R“ to his dairy herd. In an interview, the farmer tells us about his experiences with the crop and what the results of its use as a feedstuff look like in practice.

Andreas Guhr is part of the management board of a group of companies with three farms whose main location is between Chemnitz and Zwickau. The farm consists of arable and forage farming as well as a dairy farm with 620 cows. On a total of 4,750 ha of arable land, seed potatoes and table potatoes are cultivated for the most part. In addition, cereals are grown in the form of winter and spring barley as well as winter wheat and winter rape. Seed propagation for cereals and grass is also carried out. In fodder production, the farm cultivates 250 ha of silage maize and 70 ha of intensive grassland, as well as about 90 ha of arable grass, which is used for dairy cattle feed. For the past three years, 232 ha of the white lupin CELINA have also been cultivated for this purpose by Deutsche Saatveredelung AG (DSV) (of which 80 ha are seed multiplication). After harvesting, the lupine is cleaned on the farm and then sent to deuka in Herzberg for further processing. The lupine comes back to the farm in the form of „Lupicon® R“ and can be fed to the cows.

Andreas Guhr could not note any change in performance or feed intake after changing the ration to Lupicon® R. And that is good!

» FOR ME, LEGUMES BELONG IN THE CROP ROTATION. A BALANCED CROP ROTATION SHOULD PREVENT ARABLE FARMING PROBLEMS FROM ARISING IN THE FIRST PLACE. «

Andreas Guhr, Betriebsvorstand

Innovation: Mr Guhr, what motivated you to use your own lupine in the form of „Lupicon® R“ in your dairy cattle feed and how did the cooperation with deuka come about?

Guhr: I am known for my love of trying out new things, which is why we started growing the white lupine on our farm in the first place. The crop is still an exciting and good expansion of the crop rotation. Already due to the arable reasons my interest was aroused. Martin Völske, deuka's product consultant, then gave me the idea of going one step further after our farm's entry into the propagation cultivation of white lupine and also doing consumer cultivation. I find the concept promising and think it could be something. I would like to grow the feed for my animals myself, and this would be a way to have the ration almost completely in my own hands.

Innovation: In 2021, your farm was the first to use „Lupicon® R“ with white lupine in its feed. Have you noticed any changes in the performance of the animals since you started using the new protein component?

Guhr: The positive thing is that nothing has changed. The average annual yield of the animals has been at a high level of 12,600 kg for seven years and even after the change of the ration in 2021, the quantity and also the content of the ingredients in the milk remained stable. The same applies to the health of the animals, which is shown by a good average of 90,000 cells.

Before using Lupicon® R, our ration consisted of barley and grain maize, which served as a starch source. RES and protected rape were mainly used for the protein part. With white lupin in the ration, there is no need to add barley and protected rape. Because of the alternative protein carrier, this ration does not need any additional starch, as the lupin provides sufficient energy due to its high fat content. The amount of Lupicon® R used is always determined by the crude protein content of the current cut of grass silage being used. The basic feed still consists of 45 % grass silage and 55 % maize silage. Feeding is in the form of a full TMR with six different rations. For a whole year we need 800 t of Lupicon® R for our 620 cows, which means 400 t of RES and 400 t of white lupine.

Innovation: What would be important for farms that are also thinking about feeding white lupin?

Guhr: Regardless of whether Lupicon® R is used in feeding or not: the basic feed remains decisive. Lupicon® R cannot compensate for the lack of high quality grass silage. Of the total 700 ha of grassland, 70 ha are managed as intensive grassland. This portion is treated as arable fodder and the areas are reseeded every three years. We use a quality mixture from DSV. It consists of German ryegrass, meadow fescue and timothy. This combination of species not only gives us greater flexibility in our cutting schedule, but always maintain a crude fibre content of 22 to 24 %. We check this before each cut. On our 90 ha of field grass, which have been cultivated with the DSV variety „Pollanum“ for many years, we carried out the first cut at the beginning of May 2023. With 6.7 MJ NEL and 180 g crude protein, this is a good start to the grass season. Here, we regularly take samples as well. In addition to forage management, good herd management is also a basic prerequisite. Here we leave nothing to chance: Our herd manager of many years' standing regularly evaluates all available data, which are obtained from rumen boluses and activity measurements, and can react directly to oestrus, rumen activity or illnesses that are announced as a result. This way, there are few surprises.

Innovation: How do you think domestic protein sources can be established in the long term?

The crop must first function perfectly in arable farming. At present, there are still large fluctuations in yield due to drought or weeds, and the reduction of plant protection products has made control more difficult. This applies to all indigenous legumes. I believe in the concept and want to produce domestic protein feed. But if we want to establish domestic protein production, we need the right tools. Healthy and resistant varieties like CELINA are indispensable for this. Future varieties brought to us by plant breeding will also set the course for this. Successful cultivation also means that it must make economic sense. Our direct costs in 2022 were around 1,000 €/ha – the yield of white lupin was 25 dt/ha. 40 €/dt are thus already necessary at least to cover direct costs. Feeding the dairy cow can generate more profit here and at the same time we become more independent in the design of our rations with domestic protein feeds.