COMEBACK OF THE INDIGENOUS QUEEN OF PROTEIN

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White lupin is an indigenous grain legume that offers high levels of protein and a favourable composition of amino acids along with a high yield potential. Yet farmers stopped growing white lupin in the mid nineteen nineties when the fungal disease anthracnose was rampant. Anthracnose is caused by the fungus Colletotrichum lupini, which is primarily transmitted by seeds. The disease can lead to total crop failure in appropriately conducive, especially wet, weather. However, with the approval of the first anthracnose-tolerant variety FRIEDA this year, the queen of protein is making its comeback.

Bred for anthracnose resistance

The seed-borne disease anthracnose can infect plants from the emergence stage onwards. Typical symptoms are necrotic spots that are covered by orange spores. These spots are found on the cotyledons, stems or pods. Further symptoms of anthracnose are twisted stems and wilt. Even though only a very small number of the seeds may be infected with the fungus, this can spread rapidly in the stand in humid weather, leading to total crop failure. In 2001, the agricultural research institute Landwirtschaftliche Lehranstalten in Triesdorf, Germany, started selecting white lupin seeds. The primary goals were to breed a lupin that was not only reasonably tolerant to anthracnose but also yielded maximum grain levels and high levels of crude protein; also it should mature early in the season and have good agronomic properties. Tolerance to anthracnose means that there still is a certain risk of the new variety becoming infected, but this risk has been significantly reduced so that growers can still expect reasonably high yields.

Good reasons to call it the queen of protein

Indigenous grain legumes were tested in an orthogonal series on eight and nine test sites, which produced a sufficiently large database to allow comparison of grain and protein yields as well as crude protein contents (graph 1).

In these test fields, white lupin produced excellent grain yields and by far the highest level of crude protein at about 32 % at 86 % DM. At 14,600 kg/ha, the crop yields significantly more protein than peas, field beans and blue lupins.

This means the white variety produces higher yields and protein levels and has a higher nutritional value than its blue cousin has. But there are further benefits. With wider leaves and a very branching habit, white lupin is more effective in weed suppression. It has been observed that ripening is uniform and the pods are far more resistant to bursting.

A plant infested with anthracnose

Unlike soybean, white lupin adapts much better to European climates, especially to those typical for northern Germany and mountainous regions. In cool climates, they show more rapid early growth and better resilience to late frosts. Apart from this, they mature more rapidly and offer better yield stability. Threshing maturity is usually reached in mid-August in normal years but can be delayed until the first half of September in mountainous regions or in poor weather. By comparison, soybeans are harvested approximately three to four weeks later, typically in September or sometimes even October.

Suitable for many soils

White lupin is grown on slightly alkaline soils with ph-values of up to 7.3. Yet unlike blue lupin, white lupin places slightly higher demands on the site, so soil values of 25-30 are recommended. However, the new varieties are also being tested in lighter soils, so more factual information will be available in the next few years.

„THANKS TO ITS STURDY AND DEEP TAPROOT, WHITE LUPIN TAKES UP WATER VERY EFFICIENTLY IN PERIODS OF DROUGHT.“

Thomas Haubold, Manager of the DSV seed-breeding centre in Leutewitz, Germany

White lupin integrates easily in the crop rotation

Thomas Haubold has been with DSV for 16 years and runs the seed-breeding centre in Leutewitz in the federal state of Saxony. A couple of years ago, he included white lupin in the rotation. Easy to grow, lupins require less water than other large grain legumes. "Thanks to its sturdy and deep taproot, white lupin takes up water very efficiently in periods of drought", says Thomas. "On average, the crop yielded 4,400 kg/ha in our fields during the last two drought seasons 2018 and 2019. Harvesting is also very straightforward, because the pods grow higher from the ground than soybean pods, for example, and this makes them easier to cut. Another advantage is that white lupin pods offer good bursting resistance so no crop is lost before the crop is actually harvested. In addition, its system of deep roots creates an excellent tilth and so reduces tillage costs for the following crop. As a spring crop, it can diversify crop rotations with a high percentage of winter cereals so weeds can be controlled with chemicals that are different from those used on winter cereals. This is a major plus in the context of ever stricter regulation of chemicals."

Tips for growers

Depending on the site and weather, white lupin is ideally sown between mid-March and mid-April. Being sensitive to deep seed placement, it should be sown at a depth of 3-4 cm and not deeper. Weed control is carried out during the pre-emergence stage. Organic farmers can then harrow the field or use the hoe after drilling the crop at wider row spacings. The seed rate is 55-70 seeds/m². The high 300-400 g TGW translates into a seed rate of 220-300 kg/ha. The seeds should be inoculated with a rhizobi product to ensure good establishment of the nodule bacteria. It is critical to use only certified Z seeds, because anthracnose is also a seed-borne disease. Using farm-saved seeds is against the law. In very wet years, it is possible to use approved fungicides to fight anthracnose. For a plant to become infected with anthracnose, its leaves must be exposed to wet conditions for 10 hours and temperatures in the range of 20-26° C. The crop is ready to harvest when you hear the grains rustling inside the pods. The most gentle way of threshing with minimum crop damage is with a rotary combine. Yields usually range between 3,000 and 5,000 kg/ha, depending on weather conditions and soil fertility.

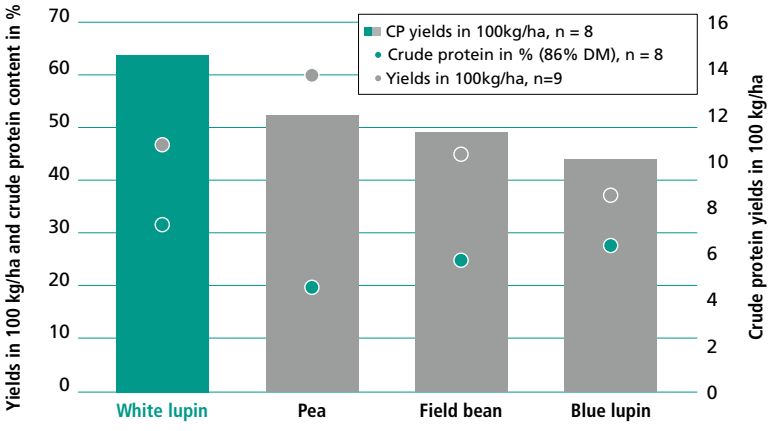
Good preceding crop and versatile use

As a legume, white lupin fixes aerial nitrogen with the help of its nodule bacteria, making the nitrogen available to the following crop. In addition, by excreting citric acid from its roots, the crop is able to break down soil-fixed phosphate. Its deep roots break through compacted soil, loosening it in a natural way. But growers should make sure its share in the rotation is not too frequent, with 6-7 years being a good interval to grow the crop in the same field. If this rule is not adhered to, they have to prepare for an increase in base diseases which incidentally can also infect other types of grain legumes.

Lupin is a high-quality protein plant that makes an excellent constituent in the feed ration where it can replace soybean. While there are no dietary restrictions for ruminants, pig and poultry rations should contain only limited amounts of lupin due to its alkaloid content and other factors. Alkaloid levels in sweet lupin must not exceed 0.05 %. Dairy farmers who grow and feed their own forage will consider white lupin a very attractive alternative to GM soybean. Unlike peas and field beans, lupins contain more protein and less starch and are therefore unlikely to replace inexpensive cereals in the ration. White lupin is very high in fat and therefore brings plenty of energy to the cattle feed.

Furthermore, it also has a part to play in the human diet and can essentially replace soybean in any type of product. In fact, lupin is becoming more and more popular as a food ingredient.

Fig. 1: Comparing yields in grain legumes



Source: BSA, 2017 and 2018 Annual Reports, orthogonally certified sites; white lupins: Mean results from FRIEDA and CELINA

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