Cultivar selection for spring faba bean

Philipp Roth

Legumes Translated

Faba bean grows particularly on heavier soils that hold and supply water to the plant. If the site conditions are suitable, a careful choice of cultivar (variety) lays the foundation for successful faba bean cultivation. Although the number of cultivars available to growers is relatively small, several new cultivars with novel characteristics have come onto the market in Germany in recent years. The main differences are in grain yield potential and crude protein content, the level of antinutritional constituents, thousand grain weight (TGW), and to some extent, disease susceptibility.

Faba bean field. Photo: Thorsten Haase (LLH)

Applicability

Topic: Variety selection

For: All who grow faba bean

Where: On farms

Time: Cultivation planning

Effect: Usability of the crop

This practice note explains the range of traits available to growers in modern cultivars. It provides examples of varieties in which the respective traits are particularly pronounced. These example varieties are taken from the descriptive list of varieties (BSL) of the German Bundessortenamt (BSA).

The differences in cultivar characteristics are sometimes very large in faba beans. These are mainly grain quality characteristics that influence the market options. Others impact on crop management. The choice of variety has a major effect on how successfully faba bean can be further utilised or marketed on the farm after harvest. Knowledge of the different variety characteristics enables farmers to specifically consider the use of the grain either on the farm or by the buyer of the crop.

Bundessortenamt description of cultivars

The Bundessortenamt provides a descriptive list of faba bean cultivars for use in Germany. The properties of the faba bean varieties included in the list are characterised on a scale of 1 to 9. For traits such as yield, crude protein content, TGW, plant length, etc., grade 1 is a low score for the trait, grade 5 a moderate expression of the trait, and the score 9 a very high expression of the respective trait. Table 1 shows the faba bean varieties described in the BSL including the variety description by means of the grading scale.

LLH

Table 1. Faba bean varieties described in the German BSL

				Tendency to	Susceptibility to			Yield and quality characteristics			
Varieties	Start of flowering	Maturity	Plant length	Lodge	Ascochyta	Botrytis	Rust	TGW	Grain yield	Crude protein yield	Crude protein content
Allison [2)]	4	5	5	3	5	4	4	6	7	8	4
Apollo	4	5	6	-	-	-	5	7	7	8	4
Bianca [1), 2)]	5	5	5	4	5	5	5	6	2	4	5
Birgit	4	5	6	3	6	4	5	6	7	8	5
Bolivia[new] [2)]	4	5	5	-	5	4	4	5	7	8	5
Capri	4	5	6	-	-	-	5	6	7	9	5
Daisy	4	5	6	2	5	5	4	6	7	9	5
Dosis[new] [2)]	4	5	5	-	6	4	6	4	5	9	7
Fanfare	4	5	6	2	5	4	5	6	6	8	4
Fuego	4	5	5	2	5	4	5	7	6	7	4
GL Sunrise [1)]	5	5	4	-	-	4	4	5	3	6	5
Isabell	5	5	6	-	-	5	-	6	5	7	5
Macho	4	5	6	3	6	4	4	8	8	7	3
Stella	4	5	6	4	5	5	4	6	8	9	5
Taifun [1)]	4	5	5	3	5	4	6	5	5	6	4
Tiffany [2)]	4	5	6	2	5	4	5	6	7	8	5
Trumpet	5	5	6	2	5	4	6	5	8	7	3

[1)] tanninfrei [2)] vicinarm
Source: German Bundessortenamt (2021)

Grain yield

At first glance, the grain yield potential of a variety often plays the most important role. This criterion is particularly relevant where the crop is sold under current common trading conditions. In Germany, quality parameters such as protein content or grain size still rarely influence pricing when marketing to the agricultural trade or to processing companies. However, this could change in the future, especially with regard to the use of faba bean in human nutrition. Table 2 shows the average grain yields of faba bean harvested in Germany in the past 10 years.

Of the cultivars listed in the BSA's BSL 2020, the following have yielded particularly well in German trials:

- Macho
- Stella
- Trumpet

These cultivars were low yield in German trials:

- Bianca
- GL Sunrise

Crude protein content

The crude protein content is particularly relevant to processing companies that feed the harvested faba beans themselves. When marketing to the human sector, higher crude protein contents can lead to price premiums. In the case of trade between arable farming and processing companies, a fair pricing could be realised on the basis of the crude protein content as a value-added ingredient. From the crude protein analyses of the variety tests, the BSA indicates an average crude protein content of approx. 25% (at 86% dry matter (DM)) across all faba bean varieties. This corresponds to approx. 29% crude protein in the dry matter.

According to BSL, the following variety has a comparatively high crude protein content:

- LG Cartouche (BSL 2020, no longer included in BSL 2021 due to insufficient number of test sites)
- Dosis

These varieties have a comparatively low crude protein content:

- Macho
- Trumpet

Crude protein yield per area

Together with the grain yield potential, the crude protein content results in the crude protein yield per area. Most varieties with high grain yields have rather low crude protein contents, but still perform quite well in terms of crude protein yield per area due to the high mass yield. The crude protein yield per area is also primarily of interest to finishing farms. Especially when it is simply a matter of ensuring the total protein requirement, and less about the last gram of crude protein, i.e., the crude protein concentration, per kg DM of the feed ration.

Of the varieties listed in the BSL, the following have a comparatively high crude protein yield per area:

- Capri
- Daisy
- Dosis
- LG Cartouche (BSL 2020)
- Stella

In contrast, the following have a comparatively low crude protein yield per area:

- Bianca
- GL Sunrise
- Taifun

Antinutritive ingredients

Many of the available faba bean varieties contain the antinutritional substances tannin, which is found in the faba bean husk, and vicin and convicin, which are found in the grain. In monogastric feeding, these substances have a negative effect on feed intake and performance above certain concentrations. Tannins can lead to a lower feed intake (bitter substances) as well as to a deterioration in protein digestibility. Vicin and convicin have a negative effect on the performance of laying hens. In ruminant feeding, however, these substances do not play a role. Tannins are even considered to be more beneficial, as they can somewhat increase nutrient stability in the rumen.

Table 2. Average grain yields of faba bean in Germany 2011–2020

Year	Faba bean yield t/ha
2011	3.6
2012	3.9
2013	3.6
2014	4.3
2015	3.5
2016	4.0
2017	4.1
2018	2.9
2019	3.3
2020	4.0
Mean over 10 years	**3.7**

Source: according to DESTATIS

The content of antinutrients is also relevant, especially for livestock farms. It can therefore make sense to switch to varieties that are free of some or even all of the aforementioned ingredients through breeding. In the field of human nutrition, the parameter of antinutritional ingredients is not yet relevant, at least in Germany. Particularly in the case of low-tannin varieties, however, this breeding success seems to be accompanied by a reduced grain yield capacity. Alternatively, tannin-containing varieties could be hulled before feeding.

Varieties with low tannin content are the following, according to BSL:

- Bianca
- GL Sunrise
- Typhoon

The following varieties ar low in vicine/convicine:

- Allison
- Bianca
- Bolivia
- Dosis
- Tiffany

Thousand grain weight

The TGW, and thus the grain size, of common faba bean varieties varies in a range from approx. 350 to 750 g. Varieties with a high TGW cause higher seed and sowing costs, as more mass of seed must be used for the same number of seeds per m². Particularly in the case of additionally poor germination capacity, the calculated required seed quantity per ha can exceed the technically feasible maximum application rate, depending on the seed drill. In addition, particularly large faba beans can cause problems with the sowing and conveying technology. If these are not designed to move such large grains, blockages and grain breakage can occur on seed wheels or augers.

For human nutrition, large-grain faba beans are demanded and are also better paid. In addition, large-grain, tannin-containing faba beans have a lower tannin content than small-grain tannin-containing varieties. This is due to the fact that the tannins are mainly found in the skin. Due to the surface/volume ratio, the hull of large-grain varieties has a lower proportion of the total grain than that of small-grain varieties.

Of the varieties listed in the BSL, the following have a comparatively high TGW:

- Apollo
- Fuego
- Macho

These varieties have a low TGW:

- Dosis
- GL Sunrise
- Typhoon
- Trumpet

Susceptibility to disease

As regards susceptibility to relevant faba bean diseases, there are only significant differences between the varieties for faba bean rust. As faba bean rust is relatively heat-dependent, it tends to occur in warmer growing regions. If you are in such a region and have increased problems with this disease, you should rather use varieties that are less susceptible to rust, or be particularly attentive in conventional cultivation in order to be able to react to rust outbreaks at an early stage.

Faba bean flower. Photo: Frederick Stoddard (University of Helsinki)

Of the varieties listed in the BSL of the BSA, the following have a low to medium susceptibility to rust:

- Allison
- Bolivia
- Daisy
- GL Sunrise
- LG Cartouche (BSL 2020)
- Marcho
- Setella

According to BSL, these varieties have a medium to high susceptibility to rust:

- Dosis
- Trumpet
- Typhoon

Key practice points

- The differences between the few available faba bean varieties are relatively large in some characteristics.
- Before choosing a variety, the grower must be clear about the individual conditions and possibilities regarding cultivation and utilisation or marketing. From this, the demands on a faba bean variety can be derived.
- These requirements must then be compared with the available range of faba beans in order to filter out the most suitable variety.
- As new varieties regularly appear on the seed market, it is helpful to find out about these new varieties every year. Promising varieties are tested in independent variety trials of the respective national institutions in „national variety trials" and the results are published.

Further information

The results of the German land variety trials for faba bean can be found under the following links:

www.demoneterbo.agrarpraxisforschung.de/index.php?id=180

www.isip.de/isip/servlet/isip-de/infothek/versuchsberichte

Sources

Bellof, G., Halle, I., Rodehutscord, M., 2020. Ackerbohnen, Körnererbsen, Süßlupinen und Sojabohnen in der Geflügelfütterung, zweite Auflage. Union zur Förderung von Oel- und Proteinpflanzen e.V., Berlin.

Bundessortenamt, 2020. Beschreibende Sortenliste Getreide, Mais, Öl- und Faserpflanzen, Leguminosen, Rüben, Zwischenfrüchte 2020. Hannover.

DESTATIS: Growth and harvest - Field crops -Series 3, Series 3.2.1. www.statistischebibliothek.de/mir/receive/DESerie_mods_00000335

Losand, B., Pries, M., Steingaß, H. und Bellof, G., 2020. Ackerbohnen, Körnererbsen, Süßlupinen und Sojabohnen in der Rinderfütterung, zweite Auflage. Union zur Förderung von Oel- und Proteinpflanzen e.V., Berlin.

Weber, M., Preißinger, W., Bellof, G., 2020. Ackerbohnen, Körnererbsen, Süßlupinen und Sojabohnen in der Schweinefütterung, zweite Auflage. Union zur Förderung von Oel- und Proteinpflanzen e.V., Berlin.

About this Practice Note and Legumes Translated

Author: Philipp Roth

Publisher: Landesbetrieb Landwirtschaft Hessen (LLH)

Production: Donau Soja

Permalink: www.zenodo.org/record/6381694

This practice note was prepared within the Legumes Translated project funded by the European Union through Horizon 2020, Project Grant Number 817634

Citation: Roth, P. 2022. Cultivar selection for spring faba bean. Landesbetrieb Landwirtschaft Hessen (LLH). Legumes Translated Practice Note 63. www.legumestranslated.eu

This project is funded by the European Union