



Entwicklungsprogramm
für den ländlichen Raum
im Freistaat Sachsen
2014 - 2020

Europäischer Landwirtschaftsfonds für die Entwicklung des
ländlichen Raums: Hier investiert Europa in die ländlichen Gebiete

Testing innovative cultivation strategies on organic dairy farms in low mountain ranges

project duration: 2017 - 2020

Results and discussion – grain legumes

Field emergence - winter grain legumes

The field emergence results of the winter grain legumes varied strongly within the trials (autumn 2017, Schafhäuser and autumn 2018, Schönbrunn). The winter variety of field bean emergence reached 15.6% at the first assessment (autumn 2017) and represented on the average 3.6% one year later (autumn 2018). The variety of winter field pea scored at the first assessment 79.6%, while the winter pea was in the autumn of 2018 with 3.6% barely present in the plots. The emergence percentage of the mixture variant with field bean and pea was 46.9% during the first trial and sank drastically to 5.7% within the second experimental year (2018). The mixture with field bean, pea and triticale had significantly higher emergence, because of the high emergence of triticale in the mixture. The major reason for the rather low emergence of the winter grain legumes were the adverse weather conditions. The precipitation in the time from September until November (2017, Schafhäuser) was on the average 89.6 mm. Within the same period one year later (2018, Schönbrunn) only 63.9 mm precipitation was measured, which is 29% less water that reached the legumes during the germination process. A review at the precipitation means from previous years showed, that in the autumn 2014 152.4 mm, in 2015 116.8 mm and in 2016 149.3 mm the grain legumes had clearly more rainfall. A check of the plots with low emergence results revealed that the seeds were dry and did not germinate properly.



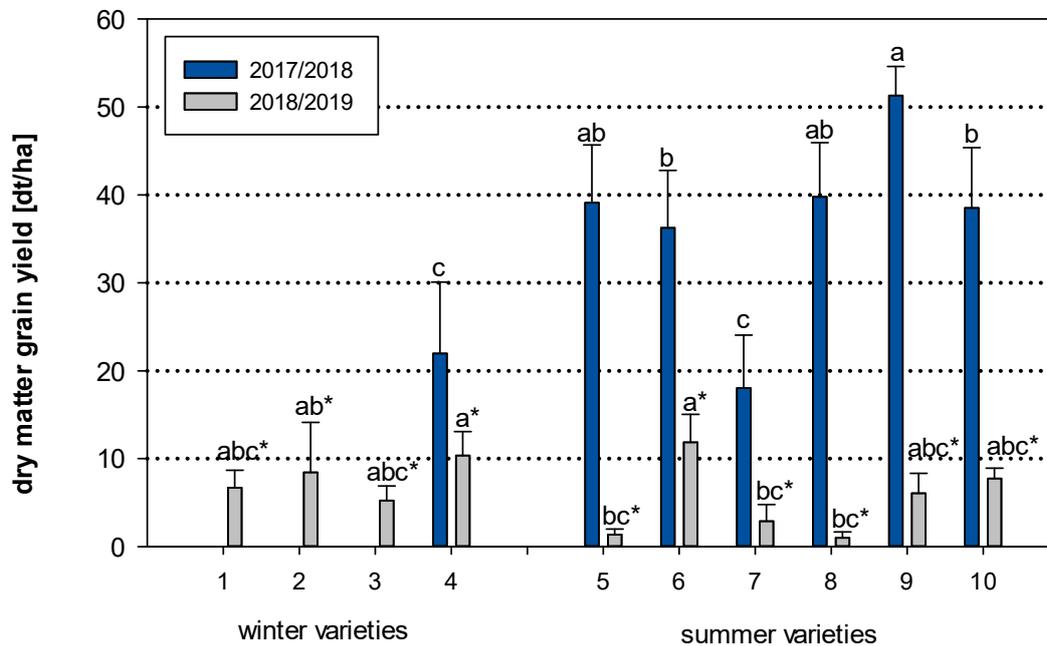
Winter variety of field bean at the time of emergence assessment (autumn 2018, Schönbrunn)

Overwintering assessment – winter grain legumes

The examination of the first trial in April 2018 revealed that all grain legume plants labelled during the emergence assessment were frozen. Triticale plants were still to be found. The lowest temperatures reached $-14.4\text{ }^{\circ}\text{C}$ in March 2018 (Agrarmeteorologisches Messnetz Sachsen). GEORGIEVA ET AL. (2018) studied the sensitivity of winter pea to cold temperatures and observed that 51.2 % of the tested pea plants had damage from frost at -11°C . The germination process was decelerated in both experimental years, which led to an insufficient development of the plants. URBATZKA ET AL. (2011) points out that the overwintering success of the variety *E.F.B. 33* is greater when the peas build a compact leaf rosette. The field bean is even more sensitive to cold than the pea and is damaged already at -5°C (STEMANN 2019).

In the following trial (April 2018, Schönbrunn) there were no black frost periods, which allowed the grain legumes to overwinter successfully and some plots even revealed improved emergence in the spring. The major improvement had the winter pea (pure stands) and increased the emergence mean up to 16%. The winter pea in mixture however, registered an emergence decrease and was only 1.7%.

Dry matter grain yield [dt/ha]



Dry matter grain yield [dt/ha] after threshing date (1- field bean, 2 – field pea, 3 – field bean/ field pea, 4 – field bean/ field pea/ triticale, 5 – field bean, 6 – field pea, 7 – blue lupin, 8 – field bean/oat, 9 – field pea/ barley, 10 – field pea/ blue lupin). Single-factor ANOVA, no significant interactions. Different letters indicate significant difference at 0.05

The analysis of the dry matter grain yield revealed that the summer varieties of the field pea (in a mixture with barley) and the summer varieties of the field pea (as a pure stand and in a mixture with oat) recorded the highest dry matter grain yields in a difference of the winter variety (triticale) and the blue lupin variant. Due to the total loss of the grain legumes during the winter period in the first experimental year (2017/2018), only the triticale grain yield was determined. The extreme drought and heat period during the second trial (2018/2019) had an impact on the plants and decreased the average dry matter yield drastically. The average daily temperature in the period between June and July 2018 was on the average 20.7 °C. The mean daily temperature during the same period one year later (2019) had passed 40.7 °C, which explains the very low dry matter obtained from the field bean variants.

An analysis of the protein yield revealed a different display of the yield results. The field delivered the highest protein yields reaching 1228 kg/ha. The field bean registered high protein yield not only in pure stand, but also as a mixture with oat. The field pea and blue lupin protein yields did not pass 1000 kg/ha (921 kg/ha and 552,6 kg/ha). Considering the fact, that the

second experimental year was influenced by a long drought and heat period, it is important to point out, that the field bean is a good alternative to field peas in the crop rotation, allowing dairy farmers to obtain high protein yield without a risk of *Mycosphaerella pinodes* infestation, which could lead to longer rotation break of the field pea cultivation (PFLUGHÖFT et al. 2010).

Summary:

*Grain legume cultivation as a combination of different varieties (winter and summer crops) and as pure stands and mixture (with grains and with legumes) under highland conditions revealed that winter grain legumes do not have a stable yield due to adverse weather conditions. The cultivation of field bean (in pure stands and in a mixture with oat) is a good alternative to field peas, which need a longer rotation break, in order to keep the *Mycosphaerella pinodes* infestation under control. Field beans are also able to deliver higher protein yield in a difference of field peas and blue lupin.*

References:

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