Cultivation of faba bean in mixtures with spring wheat and triticale in sustainable agriculture

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Results

The average seed yield of two differentially faba bean morphological types cultivated as pure sowing or in mixture with wheat and spring triticale was 3.38 t/ha. Heavy precipitation in July 1997 caused plant lodging, particularly traditional Sonet cv., and plant infection with fungal diseases, which decreased the yields to 2.42 t/ha. The faba bean mixture with spring triticale produced better yields as compared to faba bean in pure stands. Comparing conversion yields it turned out that its highest energetic value was obtained from determinate cultivar and spring triticale. The difference in yield as compared to pure sowing was 28%. The contribution of cereal grain in harvested yield increased to 30% in mixture with traditional cultivar and to 35% for determinate cultivar as compared to 25% share of cereals in sowing material. Over the three-year course of studies the traditional Sonet cv. (grown alone) was characterized by a 11% higher seed yield and also produced the highest yield of crude protein (936 kg/ha) than Optimal cv. Cultivar with top inflorescence (Optimal) proved best for mixtures. Faba bean cultivated in mixtures with spring cereals (wheat and triticale) caused both a decrease of soil Nmax and N-NO3 (to the depth of 90 cm), which is very important as it diminished potential nitrogen leaching during the late autumn and early spring seasons. In November the highest N-NO3 (Fig. 2 and 3), and Nmax concentrations, respectively 0.89 and 1.99 mg/100 g soil were detected in the 0-30 cm layer. It seems that decreased N-NO3 concentrations in the 0-90 cm soil layer during the second term (after faba bean harvest) in comparison to the first term (green pod phase) were caused by nitrates migration into deeper soil layers. Probably at that time they could not be utilized by plant root system.

Materials and methods

The field experiments were carried out in 1997-1999 at the Experimental Station in Praxy near Krakow on degraded chernozem soil formed from loess. Two-factor experiment was set up with randomised split-split method in four replications. The following factors were examined: cultivars - Sonet (traditional) and Optimal (with top inflorescence); the method of sowing faba bean — in pure sowing, mixture with spring wheat (Henika cv.) and with spring triticale (Gabo cv.). The plot area was 10.5 m². In the years 2004-2005 was conducted farm scale experiment (in Cieszyn), in them cultivated two cultivars of faba bean with spring triticale. The yields of mixtures were converted into energetic values using the following conversion factors: 18.49 [MJ kg⁻¹ dm⁻¹] for faba bean, 18.41 — spring wheat, and 18.66 — spring triticale.

An analysis of mineral nitrogen forms (NO₃⁻, NH₄⁺) contents in soil up to 90 cm depth was performed at the green pod phase, after the plants harvesting and in late autumn. The soil profile was divided into 3 layers of 30 cm each. The assessment was done using ionometric method by CK-731 multifunctional computer device.

Conclusions

1. Over the three-year course of studies the traditional Sonet cv. (grown alone) was characterised by a 11% higher seed yield and also produced the highest yield of crude protein than determinate (Optimal).
2. Cultivar with top inflorescence (Optimal) proved best for mixtures. Its conversion yield in mixture with spring triticale was 68.6 GJ per hectare on an average, which was 28% higher in comparison to pure sowing.
3. Cultivation of faba bean (determinate and indeterminate-zero tannin cultivars) in mixtures with spring triticale in the farm scale assures obtaining highest yield of seeds and can be valuable substitute of soybean meal.
4. As compared to pure sown, faba bean mixtures with spring cereals contributed to decreased concentration of nitrates in soil, particularly in the late autumn season, which lowers the potential of their later leaching into ground waters.

Literature:

Kulić B., Koster B. 2005: "Jóra warzywo i mięsozamek z dżemami". Gazeta farmerska 1, 19-21.