

Summary

Peas are an important crop in organic farming. This legume provides the soil with nitrogen and supplies fodder for the livestock. Generally, the cultivation of peas in organic farming is difficult through their high liability for pests, and the economic profitability comparing to winter wheat is low. In stockless farming, despite the nitrogen fixation by peas, negative nitrogen balances can occur because of the removal of high amounts of nitrogen by the harvested grains. Selected field and green pea varieties in pure stands and mixtures have been tested in field trials for several years regarding to their suitability for cultivation in organic farming, their precrop effect and their feeding value (*Subproject A*). To optimize the cultivation of peas in organic crop rotations, the effects of a legume and non-legume catch crop on the main crop pea and a subsequent legume catch crop on the main crop wheat were tested (*Subproject B*). Both trials (*Subproject A* and *B*) were performed on the organically cultivated fields of the University of Natural Resources and Applied Life Sciences in Raasdorf (Marchfeld, Eastern Austria). Furthermore, to estimate the impact of weather conditions on the crude protein content and grain yield of peas, a collection of pea samples from 113 farms in 4 federal states (Lower Austria, Upper Austria, Burgenland, Carinthia) were carried out in the year 2003 (*Subproject C*).

Subproject A: The precrop value of field peas was similar to that of green peas because of equal values of nitrogen fixation (green peas 64 kg ha^{-1} , field peas 51 kg ha^{-1}), nitrogen balance and amount of crop residues, resulting in comparable grain yields and protein contents of the subsequent crop wheat (mean value of all variants: 3639 kg ha^{-1} , 11.7 % crude protein). The crude protein concentration in field peas was higher than in green peas. The highest protein content showed the variety Rhea in the year 2002 with 26.3 %, in 2003 the variety Dora with 23.8 %. Despite the higher total content of amino acids in the field peas compared to the green peas, the use as fodder is restricted by the relatively high content of Tannin. The varieties Erbi (green pea, leaf-type) and Gotik (green pea, semi-leafless type) were the most successful varieties for the Marchfeld region. Due to a stronger suppression of weeds by shading and great grain yields (Bohatyr 2283 kg ha^{-1} , Erbi 2843 kg ha^{-1}), the leaf types of the green pea were better suitable for organic farming than the semi-leafless types. Mixtures showed no advantages compared to pure stands with respect to grain yields, nitrogen fixation, and precrop effects on the following crop winter wheat. During humid weather conditions the mixtures were characterized by a higher resistance to lodging compared to the types with low stability in pure stands (green pea leaf types and field peas).

Subproject B: The hot and dry weather conditions in summer 2003 caused a very low shoot dry matter yield and nitrogen fixation of the legume catch crop (common vetch 2003: 112 kg ha^{-1} shoot dry matter) with no pronounced positive effects on the following main crop pea (mean value of all pea variants 2004: 1938 kg ha^{-1} grain yield, 55 kg N ha^{-1} nitrogen fixation). The shoot dry matter of the left peas after harvest was greater in field peas (mean value of all variants: 761 kg ha^{-1}) compared to green peas (mean value of all variants: 135 kg ha^{-1}),

because of a lower weed infestation later in the vegetation period of the preceding main crop field peas. The seeding of common vetch by direct drilling into the left peas after harvest of both pea cultivars resulted in increased yields only with the poorly competitive green peas (shoot dry matter of common vetch in the left green peas: 180 kg ha⁻¹, common vetch in the left field peas: 74 kg ha⁻¹). Because of the high mineral nitrogen content in soil, the nitrogen fixation of the catch crops after pea was negligible. Therefore the cultivation of this legume catch crop following pea did not affect the yield (mean value of all variants: 3574 kg ha⁻¹, no differences between variants) and protein content (mean value of all variants: 15.5 %, no differences between variants) of the subsequent crop winter wheat.

Subproject C: The average crude protein content of the 132 analyzed pea samples was 21.5 %. The variety Bohatyr showed the highest protein content (24.1 %), although no statistical differences were determined between the pea varieties. The lowest grain yields (1296 kg ha⁻¹) but the highest protein contents (22.9 %) of peas were found in regions with low temperatures in June/July (18.0-19.5°C) independent of the federal state affiliation. The amount of precipitation during the vegetation period had no effect on the grain yield and the protein content of peas.

Keywords

Green pea, field peas, nitrogen fixation, precrop effect, catch crops, feeding value, legumes, crop rotation