

The effect of grasses grown for seed in mixture with legumes on the incidence of weeds and soil nitrogen content

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ABSTRACT

The incidence of weeds and the content of soil nitrogen were investigated in the first year of a field trial with organic grass seed production in which the grasses were grown with companion legumes. Two grass species, timothy (*Phleum pratense* L.) cv. Sobol and perennial ryegrass (*Lolium perenne* L.) cv. Baca, were tested together with three legumes: red clover (*Trifolium pratense* L.) cv. Start, white clover (*Trifolium repens* L.) cv. Vysocan and black medick (*Medicago lupulina* L.) cv. Ekola. The N-nutrition and control of weeds were provided by three “ecological” methods and a conventional one (bacterial nodules of legumes, mulch, organic manure and mineral fertilizer). Plots with red clover had the lowest number of weeds, those with black medick the highest. Perennial ryegrass was more competitive than timothy against weeds and the companion legume. Soil nitrogen was highest in plots with white clover and red clover. During the vegetative period the level of soil nitrogen increased in the combinations with red clover, stayed the same in combinations with white clover, but decreased in those with black medick and in control plots.

Keywords: organic weed control, soil nitrogen

INTRODUCTION

The acreage of organic agricultural production in the Czech Republic has increased in the last few years, with much of it being grass swards. The demand to establish such grasslands by using only seed grown ecologically (in organic condition) led to the project “Grass seed production in ecological agriculture”. The essential problems of that project are: supply with nitrogen, which is important for the formation of fertile tillers, and the control of the weeds. To find answers to these problems we established in 2000 a field trial with grasses sown together with legumes and in combination with different types of management.

MATERIAL AND METHODS

The field trial with two grasses, perennial ryegrass cv. Baca and timothy cv. Sobol, in combination with the three legumes red clover cv. Start, white clover cv. Vysocan and black medick cv. Ekola was established at the Grassland Research Station at Zubří in April 2000; all combinations were compared with plots without companion legumes. Nitrogen level and weed control were assessed after applying four types of management:

- a) harvest of green matter from the first cut (25/5/2001); harvest of the seed of legumes from the 2nd cut (21/9/2001);
- b) mulch (four times, on 18/5, 26/6, 7/8 and 16/10 2001);
- c) type a) plus organic manuring with slurry at two times;

d) type a) plus mineral fertilizer at two times.

In the first harvest year were recorded the incidence of weeds and the content of soil nitrogen at a depth of 30 cm (before manure/fertilizer in spring or autumn). The size of each plot was 20m², each combination was replicated four times. The results were evaluated by ANOVA.

RESULTS

To grow grass seed in a mixture with legumes (1st seed harvest year, legumes; seed harvest years 2 and 3, grasses) is a traditional method (DEMELA 1947) still practised in some European countries (e.g. Denmark). AAMLID (1999) reported that the seed yield of timothy grown in a mixture with white clover or alsike clover without mineral fertilization was nearly the same as in the conventional method (using a fertilizer instead of a companion legume). However, in the first type of production the purity of the seed was lower than in the conventional one. In our field trial we will be able to compare the effects of different types of growing in 2002.

The lowest incidence of dicotyledonous weed species (mostly dandelion) was in plots with red clover, while those with black medick had the highest incidence of this weed. When different types of management were compared, the conventional plots with timothy had the significantly lowest incidence of weeds, whereas there were no differences in perennial ryegrass. The latter species had a better competitive ability against weeds and the companion legume than timothy. The highest content of soil nitrogen was recorded in combinations with white clover (3.25 mg.kg⁻¹ in timothy and 1.60 mg.kg⁻¹ in perennial ryegrass) and with red clover (2.96 mg.kg⁻¹ in timothy and 1.46 mg.kg⁻¹ in perennial ryegrass). The lower content of soil nitrogen in perennial ryegrass was caused probably by the low proportion of legumes in the sward. Throughout the vegetative period and with both grasses the content of soil nitrogen increased in combination with red clover, it stayed about the same in combinations with white clover, but decreased in combinations with black medick and in the control plots.

CONCLUSION

First results showed that growing grasses together with red clover and white clover could give adequate control of dicotyledonous weeds and, in combination with organic manuring, also a sufficient nutrition of the sward.

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