

Mid-summer bare fallow effective in controlling perennial weeds

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The amount of perennial weeds, especially *Elymus repens*, becomes often a problem in long-term leys. Weeds can effectively replace the crop when the sown grass plants thin out. In organic farming, where it is not possible to control weeds chemically, the conventional ploughing when terminating the leys is not effective enough in reducing weeds. Yet, legume-containing long-term leys are rich in nitrogen and are used as organic fertilizer for the subsequent crop. However, in organically grown spring barley (*Hordeum vulgare*) this slowly released nitrogen is not enough to meet the nitrogen demand of barley at early growth stages.

The aim of this study was to find ways to bring the long-term ley to an end, which are more effective than traditional autumn or spring ploughing. In addition to controlling perennial weeds our aim was to accelerate the nitrogen release from the ley in order to increase the availability of nitrogen to barley in the early summer.

The field trial was situated at Juva in Eastern Finland. The ley was 3-year old in 2000, consisting of timothy and red clover. The percentage of red clover was about 50%. As an alternative to plain ploughing there were two treatments with stubble cultivation before ploughing. Both treatments were ploughed late in the autumn (in October). The mid-summer bare fallow treatment – stubble cultivation combined with succeeding catch crop (barley + ryegrass + clover) – was started in mid-summer after the first forage yield was harvested. In the alternative treatment, the stubble cultivation was started after the second harvest and no catch crop was sown. There were three treatments of plain ploughing with different ploughing times. The first was in September shortly after the second forage harvest, the second was at the end of October just before winter and the third in May next spring. Difference between ploughing in September or October was that by October the aftermath had time to grow. The effect of different treatments on *E. repens* was assessed in barley in 2001.

The alternative methods reduced *E. repens* infestation better than ploughing. When stubble cultivation was started after the first or second harvest, the density of *E. repens* in the next year was 27 and 94 shoots m⁻², respectively. After plain ploughing the number of *E. repens* varied from 147 shoots m⁻² to 182 shoots m⁻². The grain yield and hectolitre weight of barley were also highest, 2390 kg ha⁻¹ and 61,6 kg hectolitre⁻¹, respectively, after combination of stubble cultivation and a catch crop. The second highest grain yield was harvested after late plain ploughing. Plain ploughing shortly after second harvest resulted in the lowest grain yield: 1945 kg ha⁻¹. The availability of nitrogen was affected by the treatments. In the plots cultivated in mid-summer there was 40 kg ha⁻¹ soluble nitrogen on the top soil (0–30 cm) next year in May. The lowest content of soluble nitrogen was after springtime ploughing. Despite the efficiency of nitrogen usage and control of weeds, the grain yields in this study remained quite low. One reason is that even the lowest amount of *E. repens* after treatments was high enough to reduce grain yield.

The results of this study suggest that stubble cultivation before ploughing is the most effective way to reduce the amount of *E. repens* when bringing the long-term ley to an end. Terminating the ley in mid-summer is an effective way to induce nitrogen release in the beginning of the next summer, just in time when barley needs it. The question still remains whether it is possible at all to get enough nitrogen for barley from leys without additional manuring.