

Effect of *Elymus repens* on yield of winter wheat, spring barley and faba bean in an organic crop rotation experiment

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The impact of crop rotation, nutrient levels and use of catch crops on effect of *E. repens* on a sandy soil at Jyndevad on yield of winter wheat (2006), spring barley (2007-2008) and faba bean (2006-2008) was studied in an existing organic crop rotation experiment (Olesen et al., 2000; Rasmussen et al., 2006). Some of the objectives were to determine the yield loss at different levels of infestation of the weed, and to determine whether this relationship was influenced by the treatments.

Small plots of 1 m² were established in the larger plots of the crop rotation experiment. 2 small plots at high density of the weed, and 2 small plots at medium density were marked early in the season. In addition, 2 small plots with initial low density were kept free of the weed during the season. All small plots were kept free of other perennial weeds during the growing season, but annual weeds were allowed to grow, since this would be the normal situation in organic farming. Just prior to harvest, the central ½ m² part of the small plots were hand-harvested, the *E. repens* shoots were counted, biomass was determined for this as well as for crop and annual weeds, and the crop was threshed and the biomass of kernels/seeds determined.

In this paper, the total biomass of the crop is referred to as the “yield”. For winter wheat and spring barley, there was a close relationship between total biomass of the crop and kernel yield, even across years. This relationship was not as good for faba bean. The results were analysed in a non-linear mixed model as a competition model:

$$Y = \frac{(a_m - a_y)_i - (c \times z)}{1 + b_i(x^d)}$$

Where Y is the total biomass of the crop (g m⁻²), a_m is a parameter for the total biomass of the crop with no weeds present as a mean of the years, a_y is a parameter for the effect on yield of the year, c is a parameter for the effect of annual weeds, z is the biomass of annual weeds (g m⁻²), b is a parameter for the effect of *E. repens*, x is the number of *E. repens* shoots (# m⁻²), d denotes whether the function is linear or not, and i indicates the treatment.

For all crops, the treatments had a high impact on the yield. The two treatments that had no manure applied for up to 12 years consistently had the lowest yields. In spring barley, the two treatments with manure and with catch crops consistently had the highest yields. In faba bean, the treatment with manure and without catch crops had the highest yields. As for the effect of *E. repens* shoots on yield, in spring barley, there was a larger decrease in the system without grass clover. The same tendency was seen for winter wheat. For spring barley and faba bean, within each system (with or without grass clover), the yield in treatments without manure was less influenced by *E. repens* than in treatments with manure.

References

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