Competitiveness of winter wheat stands against weeds: Effects of cultivar choice, row width and drilling direction

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Introduction

The need for competitive crop stands can be regarded as a basic requirement for weed control, potentially reducing the need for direct control measures. One way the crop may suppress weed growth is by the restriction of light through crop shading. As part of the EU-project ″Strategies of weed control in Organic Farming″ (WECOF) trials with winter wheat were carried out to evaluate the potential of wheat shading ability as a weed control measure. Factors included were cultivar, row width and drilling direction. Results of the first experimental year are presented.

Materials and methods

In 2000/2001 a three factorial experiment was carried out at two different sites (WG, KL resp.) in Hennef, Germany. Mean annual temperature is 9.5 °C and mean annual precipitation is 750 mm. Three wheat cultivars (*Greif, Astron, Pegassos)* with different shading ability (low, medium and high) due to variation in phenological features were combined with three row widths (12 cm, 17 cm and 24 cm) and two drilling directions (east-west, north-south). No direct weed control measures were undertaken at either site. At different wheat developmental stages plant number, ground cover and shoot dry matter of weeds and wheat, as well as light interception (PAR), plant height and leaf area index of wheat, were assessed. Results were statistically evaluated by analysis of variance and Tukey-test (α=0.05).

Results and discussion

At site WG the influence of wheat on weed growth was first apparent at EC 39 (flag leaf stage). Weed ground cover was significantly negatively correlated with wheat ground cover, plant height and light interception. Lemerle et al. (1996) also considered wheat ground cover and height as the most important traits for wheat shading ability and thus weed growth. Cultivar choice and row width both influenced weed growth. The results corroborate the hypothesis that tall and planophile cultivars as well as narrow row distances increase the shading ability of wheat stands. Weed ground cover was significantly lower in *Pegassos,* the cultivar with the highest ground cover and plant height and an almost planophile leaf inclination. At 12 cm row width weed ground cover and weed dry matter were significantly lower than at 24 cm row width. In contrast to Eisele and Köpke (1997) weed growth was not affected by drilling direction. These authors detected a lower weed ground cover at east-west row direction due to more effective shading in row interspaces. It might be that water deficiency during May 2001 confounded the influence of light exposure on weeds within the north-south row interspaces. At wider row spacings wheat growth features became more important. At the wider row spacings of 17 and 24 cm only the planophile cultivar *Pegassos* was able to maintain weed suppressive ability at the same level as at 12 cm row width. At site KL total weed density was similiar to that of site WG, but weed competition was high due to a vigorous growth of *Vicia hirsuta.* Under these conditions suppression of weed growth through wheat shading ability was not detectable.

Conclusions

The results show that an increase of wheat shading ability through cultural measures can be a successful approach to control weeds without additional input of energy. However, the success depends on weed species. This emphasises the need to take into account the ecology of weed species when developing strategies of weed control. Investigations to optimise weed control through wheat shading ability are continuing.

References

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