EFFECTS ON WEEDS OF SOIL-INCORPORATED WHEAT

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INTRODUCTION

The chemical identified as the most active allelopatic compound in wheat is DIMBOA and this compound as well as its transformation products MBOA have been shown to inhibit germination and suppress the growth of several plant species (1). Wheat varieties differ in the DIMBOA production (2). The objective of the present study was to assess the effect of soil-incorporated plant material of 6 different wheat varieties at various growth stages on the growth of selected weed species and to examine if the phytotoxic effects could be correlated to the content of allelochemicals.

MATERIALS AND METHODS

Plant material

Plant samples of 6 different winter wheat varieties (Astron, Stakado, Ritmo, Portal, Bill and Solist) were collected from field plots in an organic farming system at growth stage 9-10, 12, 21 and 31 and in a conventional farming system at growth stage 9-10. Both fields were located at Research Centre Flakkebjerg and each plot was replicated twice. The plant material was cut into 0.5 cm long pieces and 0.4 to 1.6 g fresh plant material depending on growth stage was mixed carefully with 300 g dry soil. No incorporation of plant material was included as control. The soil was filled in 9 x 9 x 9 cm pots. The content of DIMBOA, MBOA and BOA in the plant samples was quantified as described by (3).

Weed species

The allelopathic effect of the soil-incorporated wheat plant material was examined on the following 12 weed species: *Echinochloa crus-galli* (ECHCG), *Setaria viridis* (SETVI), *Poa annua* (POAAN), *Apera spica-venti* (APESV), *Alopecurus myosuroides* (ALOMY), *Stellaria media* (STEME), *Abutilon theophrastis* (ABUTH), *Galium aparine* (GALAP), Triplerospermum inodorum (MATIN), *Chenopodium album* (CHEAL), *Papaver rhoeas* (PAPRH) and *Amaranthus retroflexus* (AMARE). In each pot nine seeds of each weed species were sown by hand. Each treatment was replicated twice. The pots were placed in a heated glasshouse and sub-irrigated daily. Four weeks after sowing the number of germinated plants and fresh and dry weight of the plants were recorded.

Analysis

Data from replicated field plots and replicate pots were combined for statistical analysis. For each weed species the data was subjected to a Least Squares Means test comparing the results of the soil-incorporated wheat varieties with the control.

RESULTS AND DISCUSSION

The germination varied significantly between weed species and was very poor for ECHCG, SETVI, ABUTH and AMARA. Incorporation of large amounts of plant material had a pronounced influence on the physical properties of the soil resulting in a very poor germination. Consequently the results of the 4 weed species and of soil-incorporation of wheat plant material at growth stage 31 was not included in the analysis. Due to a non-uniform germination of some of the other weed species all data are expressed as the average fresh weight per plant.

The soil-incorporated wheat plant material from the first growth stage in the organic farming system significantly inhibited the growth of POAAN, APESV, STEME, MATIN, CHEAL and PAPRH while the wheat plant material from the conventional farming system only reduced the growth of APESV and GALAP. The incorporation of wheat from the second growth stage had no significant effect on the growth of the weed species, while wheat from the third growth stage only reduced the growth of MATIN.

At the first growth stage all the wheat varieties grown in the organic farming system inhibited the growth of MATIN and CHEAL. For the other weed species the results were inconsistent between varieties but in general inhibition was more frequently observed with Portal, Ritmo and Bill. The highest concentration of DIMBOA, MBOA and BOA was detected at growth stage 9-10 in the wheat varieties grown in the organic farming system and soil-incorporation of plant material from this sampling also resulted in the highest effects on the weed species. We did, however, not find a clear correlation between weed suppression ability of the wheat varieties and their content of DIMBOA, MBOA and BOA.

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