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THE USE OF ALLELOPATHY IN A WEED MANAGEMENT STRATEGY

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Introduction

Weed interference occurs in any crop production situation and weed management should focus on combining different methods to prevent and manage weed populations, not only in the short term but also in the long term. Using cultural weed management practices are important. This includes production practices that would improve crop competitiveness such as cover crops in combination with conservation tillage. By using allelopathic cover crops, the release of allelochemicals into the environment can enhance weed management. Allelopathy is the release of allelochemicals by some plants that inhibit the growth of others. Field and tunnel experiments were, and still are, conducted to evaluate the weed control abilities of different cover crop species and cultivars in combination with the application of herbicides.

Materials and methods

The effects of two cover crops, *Lolium multiflorum* (Italian ryegrass) and *Secale cereale* (stooling rye), without herbicide use, on the growth of *Zea* mays (maize) and *C. esculentus* (yellow nutsedge) growth was evaluated in the field. There were three control treatments which included weed residues left on the soil surface, application of herbicides and weed control by hoeing.

In a tunnel experiment, *Avena sativa* (oats), stooling rye and three cultivars of annual ryegrass were used to evaluate their influence on maize and yellow nutsedge growth and development.

Currently a field experiment examines the desiccation times of cover crops on their weed control abilities by spraying them, with glyphosate, four and two weeks before planting and at planting. Minimum tillage maize is planted into the residues with selected spraying of pre- and post-emergence herbicides and its growth and development is evaluated.

Results

In the first field experiment, maize emergence and growth were delayed in the presence of residues of both cover crop species, especially in annual ryegrass residues. *C. esculentus* growth was significantly inhibited in the area between the maize planting rows by the cover crops for the first 14 days after maize emergence, but this growth suppressing effect diminished after 28 days.

In the tunnel experiment, maize and *C. esculentus* growth were suppressed, especially by the root residues of the cover crops with the annual ryegrass cultivar 'Midmar' being the most suppressive. Chemical analysis of the leachate of root residues indicated the presence of allelochemical phenolic acids and benzoxazolin-2(3*H*)-one (BOA).

Results from the current field experiment, indicate that spraying annual ryegrass at planting reduced weed and maize growth the most. Adequate weed control was not achieved by applying only post-emergence herbicides. Combining annual ryegrass residues sprayed at planting with only post-emergence herbicides applied later in the season, resulted in the lowest maize yields.

Conclusions

Weed growth could be reduced by the allelochemicals leached from cover crop residues but in order to achieve prolonged, effective weed control, the combination of mulch retained on the soil surface and the application of herbicides are required. The effect however, is not selective and the crop is also negatively affected. The effect on weed and crop growth is influenced by the cover crop species planted, the choice of cultivar and the climatic conditions. More research is needed to establish principles of cover crop weed management in order to define its role in a weed management strategy. The use of cover crops for weed control should therefore be considered a tool that is supplementary/complementary to standard weed control practices aiming at managing weed populations in the long-term.