

Allelopathic Control of Weeds with Crop Residues

Allen V. Barker and Prasanta C. Bhowmik
Department of Plant and Soil Sciences

Allelopathy refers to the suppressive effects that one plant has on the growth of another plant. The effects arise from the transmission of chemicals from the donor plant into the environment. Allelopathy occurs widely in natural plant communities and alters the patterns of vegetation in these communities. Allelopathy is suggested as a mechanism by which weeds interfere with crop growth. Also, allelopathic effects of crops on weeds have been reported for many crop species. Release of allelopathic chemicals by decomposition or by leaching by water from seeds and vegetative residues of crops have been shown to inhibit growth of weeds and of other crops. Residues of soybean, sunflower, corn, and cereal grains have been reported to have suppressive effects on growth of some weeds.

Experiments

Control of Weeds in Squash and Tomato by Mulches and Incorporated Residues

This experiment was established in June 1992 on 'Celebrity' tomato and 'Black Beauty' squash. Vegetative residues of corn and seeds of sunflower and soybean were applied as mulches or shallowly incorporated into the soil. Mulches were applied at 0.5 lb/sq ft (10T/A), and incorporated residues were applied at 0.12, 0.25, or 0.5 lb/sq ft (2.5, 5, or 10T/A). Weed-free plots and unweeded plots were included also. Transplants of tomato and seeds of squash were planted into the plots on the day following the application of residues.

Emergence of weeds was recorded weekly for 4 weeks and at 6 weeks after application of residues. Labor to control weeds in each plot was recorded also. Allelopathic effects of the residues on tomato and squash were evaluated by counting dead plants of tomato or nonemerging hills of squash.

After 6 weeks, the canopy of squash had covered the plots, and weeds were allowed to grow for determination of their mass at the end of the season in 1992. Yields of squash and tomato are being measured by weekly harvests.

For this experiment to be conducted in 1993, corn, sunflower, and soybean are being grown on adjacent sites for production of vegetative residues to be applied at planting of the crops in 1993.

Control of Weeds in Squash and Tomato by Residues Grown on Site

This experiment was started in 1992 to grow residues that will be incorporated into the soil at the end of the season in 1992 for evaluation in the 1993 crop year. Corn, sunflower, and soybean were planted at two densities, narrow, 12-inch rows, and wide, 36-inch rows, in June 1992. In each block of treatment, a weed-free, fallowed plot and an unweeded plot are maintained in each block of treatments. This experiment will evaluate the effects of residues grown on-site in one season on the growth of weeds and yield of crops in the following season. The allelopathic effects of weeds and crops will be assessed.

Expected Benefits of this Research

Control of weeds is a time-consuming process for all growers of crops. Mechanical cultivation must be repeated on an unscheduled basis throughout a growing season. Mulches can lighten the load of weed control but are expensive and labor-intensive to apply. In diverse plantings, such as vegetable production, weed control by herbicides may not be successful. Also, in an environment in which emphasis is on lessening applications of pesticides, growers may not have the equipment, knowledge, or desire to apply herbicides. Use of crop residues with allelopathic effects may provide an effective and environmentally safe method of weed management.