EVALUATION OF *MICROSPHAEROPSIS AMARANTHI* FOR THE BIOLOGICAL CONTROL OF WATERHEMP. David A. Smith and Steven G. Hallett, Graduate Research Assistant and Associate Professor of Weed Science, Department of Botany and Plant Pathology, Purdue University, West Lafayette, IN 47907.

Waterhemp, *Amaranthus tuberculatus* Sauer., is a troublesome weed in Midwestern cropping systems. Herbicide resistant biotypes and a prolonged emergence period make waterhemp difficult to control. Waterhemp is dioecious and has extreme genetic variability. *Microsphaeropsis amaranthi* is a fungal pathogen isolated from *Amaranthus* sp. in Arkansas that has a narrow host range limited to the Amaranthaceae. Since *M. amaranthi* infects waterhemp, which is only part of the complex weed communities in Midwestern cropping systems, it is important to evaluate the potential for integration into current weed management practices. Three experiments were designed to examine different attributes of the fungus in order to evaluate its potential for further development as a bioherbicide for the control of waterhemp. Epidemiological experiments were designed to determine the optimum and limiting environmental conditions for the activity of the fungus. Herbicide interaction experiments were designed to investigate the potential for the fungus to be integrated into cropping systems with herbicide-dominated weed management strategies.

Tank-mix experiments were performed to see if conidial germination was directly inhibited by commonly used herbicides or adjuvants. Conidia were incubatedin solutions of herbicides and adjuvants for two hours and then potato dextrose broth was added to stimulate conidial germination. Conidial germination was counted under a compound microscope. Conidial germination was decreased by most adjuvants and herbicides, and most formulated glyphosate products completely hindered conidial germination. After testing several glyphosate formulation blanks and several different technical grade glyphosate salts, we found that the surfactants in glyphosate formulations were the major source of incompatibility with *M. amaranthi* conidia.

Since direct inhibition of *M. amaranthi* conidia by glyphosate products precluded the preparation of tank mix applications we examined split-applications of glyphosate and conidia on waterhemp seedlings in order to investigate the existence of a physiological interaction between the fungus and glyphosate. When glyphosate (at various concentrations) was followed by *M. amaranthi* ($3*10^6$ conidia/ml) one day later, waterhemp was predisposed to increased infection by the fungus, and greater dry weight reductions were found.

We tested a range of dew periods and temperatures that may be suitable for *M. amaranthi* to infect 3-4 leaf waterhemp. The optimum conditions for *M. amaranthi* impact were found using 18 hours of dew at 18 to 23^{o}C under which conditions, *M. amaranthi* caused girdling stem lesions and high levels of plant mortality. Infection and impact by *M. amaranthi* was severely limited by dew periods shorter than 12 hours, and only scattered infection was seen with a dew period of 6 hrs.

In conclusion, application of sub-lethal rates of glyphosate can predispose waterhemp to increased infection and impact by *M. amaranthi*. Direct inhibition of *M. amaranthi* conidia by glyphosate products, however, will make the exploitation of this interaction in the field problematic. The environmental requirements of this fungus for optimal activity are unlikely to be frequently encountered in the field when waterhemp control would be desired.

2003 North Central Weed Science Proceedings 58:67.