CONTROL OF *RUMEX CRISPUS* L. WITH THE RUST FUNGUS, *UROMYCES RUMICIS* (SCHUM.) WINT.: PRELIMINARY INVESTIGATIONS

R.E. INMAN

Current research on this topic is presently being administered via the second of two research contracts between Stanford Research Institute and the Crops Protection Research Branch, Crops Research Division, of the United States Department of Agriculture, for the purpose of determining the potential of phytopathogenic weed control, a field which has not as yet attracted much research activity. The research has been based in Rome, Italy, since its initiation in 1966, at the Instituto Sperimentale per la Patologia Vegetale. Certain greenhouse facilities at that institution have been remodeled for use as temporary quarantine facilities, providing a suitable place in which research with plant pathogens exotic to Italy can be conducted with minimum danger to economic plants.

The main feature of the quarantine facility is a fan-and-filter apparatus which provides a negative pressure inside the work room by exhausting air through a series of absolute filters. The negative pressure acts to restrict air movement from the work room to the anteroom as research personnel enter and leave the facility. Other features of the quarantine procedure include the wearing of disposable paper clothing by research personnel, sterilization of footwear with sodium hypochlorite when leaving the work room, and a double-door sterilizing oven for decontamination of materials taken out of the work room. The entire procedure is designed to restrict the escape of plant pathogens with unknown pathogenicity from the quarantine facility.

Rumex crispus was chosen as a target weed largely because of the observation that it is heavily attacked in Europe by the rust fungus, *Uromyces rumicis*, which is not present in the United States. The weed is of major economic importance in pastures and grazing lands, especially in rich, bottomland pastures of the southern states.

Urediospores of the rust were collected on *R. crispus* at 6 European sites, and also near Cape Town and Stellenbosch, South Africa. The spores were brought to Rome with the permission of the Italian Ministry of Agriculture and Forests, and were used in pathogenicity tests against

four selections of *R. crispus* from the United States in quarantine. Host selections from Wisconsin and South Dakota proved very susceptible, while two selections from California were less so. Twenty crop selections inoculated under greenhouse conditions, and also *R. acetosella* and *Polygonum convolvulus*, two weeds closely related to the target weed, have been immune to infection.

Effects of infection with the Rome collection of urediospores on seed production, seed weight, and fall growth of *R. crispus* transplanted from the area around the Instituto were observed under natural conditions in garden studies. Reproductive potential of sample tillers from inoculated plants was 10% lower than of those from plants protected with a fungicide. Infected plants were essentially defoliated by mid-June, whereas protected plants remained green to the time of harvest in July. The fall growth of plants which had been protected during the rust season was also much more luxuriant than that of plants which had been infected.

The 10% reduction in seed yield on sample tillers, even when coupled with the added observation that rusted plants produced fewer tillers than protected plants, cannot seriously be considered as an effective factor in reducing the host population, because of the large numbers of seeds that were still produced by infected plants. A more significant effect of infection was that on plant vigour. Only 43% of the garden plants which had been infected during the spring and summer of 1968 had resumed growth by the beginning of spring, 1969, compared with a figure of 95% for plants which had been protected from rust infection with a fungicide. Thus, the severe defoliation to which rusted plants had been subjected had a seriously debilitating effect on rootstock vigour. Since seed set had occurred prior to the advent of serious foliar injury, seed production was not seriously affected, but the host's ability to produce new growth following such extensive damage was reduced considerably.

Current tests are underway to determine the effect of rust infection on seed production by the Wisconsin host selection infected with the Rome isolate of the pathogen. Selection for strains with higher pathogenicity is also being conducted under greenhouse conditions. Overseas testing will be concluded in 1969, whereupon introduction of the rust into the United States will be considered.