

On Insect-plant Associations in Agriculture and the Selection of Agents for Weed Biocontrol¹

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Abstract

Hokkanen & Pimentel (1984) proposed a novel approach for the selection of biocontrol agents. They advocated the selection of agents from a relative of the weed plant rather than from the target weed species itself. The new relationship that such agents would have with the weed would be characterised by a relative lack of homeostasis compared with the old herbivore-plant associations traditionally used in weed biocontrol, and would consequently be more effective. There are few examples to support these contentions because of the traditional use of old herbivore-plant associations in weed biocontrol. In the present study, herbivore-plant associations in agricultural situations, which are analogous to agent-weed associations, are examined to assess the potential of new associations for weed biocontrol. The herbivores on 14 introduced crop plants which have salient similarities to the major weeds in the south-western Cape were surveyed: (a) 68% of the 188 insect and mite herbivores are indigenous species in new associations with these host plants and (b) of the five most damaging pests on each of 13 of the crop plants, 53% are in new associations with the plants. Of the 40 most important agricultural pests in South Africa, 58% are in new associations, confirming these results. About 50% of the insect and mite herbivores in new associations with their host plants are oligophagous, indicating that new associations are not necessarily characterised by polyphagy and hence unsafe for use in weed biocontrol. We conclude that new associations between herbivore species and host plants have strong potential in weed biocontrol because (a) their frequency in agriculture indicates that they can easily be established in weed biocontrol situations, (b) they are as damaging as old associations, and (c) they are not necessarily unsafe as regards host specificity. We therefore advocate the use of both the classical approach and that of Hokkanen & Pimentel (1984). Our support for Hokkanen & Pimentel (1984) is, however, based on evidence and rationale clearly different to theirs, and we provide novel guidelines which can be routinely and practically applied in the selection of agents for weed biocontrol.

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