NO-CHOICE OR MULTIPLE-CHOICE? HOST PREFERENCE ASSESSMENT OF THE GREGARIOUS EGG PARASITOID TRICHOGRAMMA PLATNERI

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ABSTRACT. The first step in the risk assessment of a proposed biological control agent is definition of the physiological host range or the complete group of species on which the agent can survive and develop under controlled conditions. If the agent is not monophagous when tested in a no-choice situation it is useful to assess host preference through choice tests with more than one host species present. Choice tests indicate if the target host is preferred over other physiologically acceptable hosts or if all acceptable hosts are equally suitable.

Here we present a comparison of different methods for estimating host preference using the egg parasitoid Trichogramma platneri Nagarkatti as a model for risk analysis in biological control. Egg parasitoids of the genus Trichogramma are generally polyphagous, but host preferences have been demonstrated for several species. These parasitoids are widely used for inundative biological control of lepidopteran crop pests and concern over non-target effects from large-scale releases have been raised. Trichogramma platneri was chosen for these experiments because it is used as an inundative biological control agent against codling moth, Cydia pomonella (L.) in California, and the host preferences of this species have not been examined before.

Selective exploitation of six host species (Chrysoperla carnea [Stephens], Cydia pomonella [L.], Ephestia kuehniella Zeller, Helicoverpa zea [Boddie], Manduca sexta [L.] and Sitotroga cerealella [Olivier]) by T. platneri was evaluated in no-choice, paired-choice and multiple-choice tests, using number of parasitoids emerged and proportion of female offspring as different measures of preference. Helicoverpa zea, M. sexta, and C. carnea were the most preferred hosts and S. cerealella the least preferred, in the no-choice and choice tests. More T. platneri emerged from C. carnea, H. zea, and M. sexta than from S. cerealella, and a greater proportion of female offspring emerged from M. sexta than from C. pomonella, H. zea, and S. cerealella in the no-choice tests. A greater percentage of progeny and a greater proportion of females emerged from H. zea and M. sexta when paired with any of the other four host species. In the multiple-choice tests H. zea produced the greatest percentage of parasitoids and the highest proportion of females, whereas S. cerealella was not parasitized at all.

The most appropriate variable to measure selective host exploitation will depend on the type of hosts offered and the type of parasitoid (solitary or gregarious). Percent parasitism is a suitable measure for solitary parasitoids, but should be used for gregarious parasitoids only if the host species tested are of similar size and quality for the parasitoid. If the host species differ in size or quality, the quantity of progeny emerged (measured as absolute numbers or proportions) is more appropriate for gregarious parasitoids. The sex ratio of progeny emerged from different host species although an indicator of host quality was not as effective for determining relative preference of T. platneri for the six host species. The number of progeny emerged is the most suitable variable for estimating host preference among gregarious parasitoids. Although no-choice and multiple-choice tests provided the same preference ranking for T. platneri, a polyphagous species, the latter tests are likely to be more realistic for more specialized control agents.