Studies of New Organisms in Iran for the Biological Control of Skeleton Weed (Chondrilla Juncea)

by
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INTRODUCTION

A general survey of skeleton weed (*Chondrilla juncea* L.) and associated organisms in Iran has revealed that three organisms which are absent in Mediterranean Europe (Wapshere *et al.*, 1974, 1976) are highly damaging to the weed in Iran and have been partially assessed as candidates for its biological control. These are (1) the tortricid crown moth, *Oporopsamma wertheimsteini*, REBEL; (2) the root coccid, *Neomargarodes chondrillae* ARK and (3) *Sphenoptera clarescens* KERR, a root attacking buprestid. This paper gives a brief account of the biology, effectiveness and host range of the three insects.

OPOROPSAMMA WERTHEIMSTEINI REBEL

This tortricid crown moth is common in the north-western province of Azerbaidan, Iran. It has been reported from Eastern Europe and southern Russia (Razowski, 1959, 1965) and during the course of this study it was also found near Ankara in Turkey.

The larvae of *O. wertheimsteini*, often more than one to a plant, cut deep holes in the collar region of skeleton weed, frequently causing the death of the plant or placing it under extreme physiological stress. The young larvae hatching out in early spring search for and feed on the sprouting *Chondrilla* rosettes and then descend into the soil and feed on the collar region of the plant. At this stage they form a silken cocoon attached to the plant and continue feeding from one end of the cocoon until they transform into pupae. The adults emerge in autumn, fly about and lay eggs immediately after. The eggs overwinter in the soil around *Chondrilla* plants. Observations made at different times of the year to evaluate the effectiveness of the moth demonstrated that the skeleton weed populations heavily infested by *O. wertheimsteini* in nature were considerably reduced between early spring and early summer, the period during which the larvae remain active. The fact that no further reduction of the weed population was noticed although the observations continued until late autumn indicated that the reduction in skeleton weed population during spring was due to the activity of the tortricid larvae (Hasan and Wapshere, 1976).

The host range of the insect was studied mainly in relation to wild and cultivated compositae. Under greenhouse conditions it was shown that the first instar larvae would feed only on *Chondrilla* and not on any other plant, but the mid- and late instar larvae fed on most of the species of compositae on which they were placed. In the field, early stage larvae also fed only on *Chondrilla* when given a choice (Hasan and Wapshere, 1976).

NEOMARGARODES CONDRILLAE ARK

This root coccid, which also occurs in southern USSR (Rudakova, 1932), is most common in the cold, dry climates of north-western Iran. After a short period of activity the first instar larvae hatching out in autumn overwinter in soil and again become active in early spring. They feed on the young rosettes and seedlings of *Chondrilla* before descending into soil to attach themselves to the rootstock by the rostrum. In this position the larvae continue feeding and become cyst-like, growing in size until they become mature in late spring. The adult males and females emerge from the cysts and leave the root. Eggs are laid in the soil towards late summer. Numerous larvae of *N. chondrillae* attack each plant, thereby causing the rootstocks to split. Severely attacked plants are placed under physiological stress, the effect of which becomes apparent later in the season. Observations made at different times of the year on *Chondrilla* populations infested by *N. chondrillae* showed that the weed densities are reduced to a low level subsequent to the attack of the coccid during the dry summer. However, the coccid was found attached not only to *Chondrilla* plants in the field but also

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to two other Cichoraceae closely related to this plant, *Lactuca orientalis* and *Cichorium intybus* L. This placed the specificity of the coccid so much in doubt that further screening tests were not conducted.

SPHENOPTERA CLARESCENS KERR

This buprestid beetle is most common in the central northern areas of Iran around Tehran. The larvae of *S. clarescens* attack the rootstocks of skeleton weed and remain active for a considerably longer period than the other two insects described above. Adult beetles emerge during a prolonged period, extending from April to September, with maximum numbers in June and July. Eggs are laid on the main stem of the skeleton weed and the newly hatched larvae make their way into the central cylinder and feed inside the stem before descending into the underground parts of the plant. They come out of the rootstock below the soil at several points, feed on the external parts of the rootstock and later enter it again to overwinter as mid-instar larvae. The attacked rootstocks are often killed and the larvae continue feeding on the dead material still remaining inside. The life-cycle lasts for more than one year. The insect is very effective in nature. Most of the attacked plants are killed, but the insect population remains at a low level. The infestation causes a reduction of the skeleton weed density in the infested *Chondrilla* populations.

Larvae and adults of *S. clarescens* were recovered not only from the rootstocks of *C. juncea* but also from those of other wild Cichoriaciae including *Lactuca orientale* Boiss. and *Chichorium intybus* L. growing alongside *Chondrilla*. Screening tests under greenhouse conditons showed that the larvae feed on a number of wild and cultivated compositae including *Lactuca sativa* and *Cichorium endivia*. For this reason no further testing of this species was attempted.

DISCUSSION

Among the three insects described above, *O. wertheimsteini* and *S. clarescens* were found to be the serious enemies of skeleton weed in Iran. *O. wertheimsteini* larvae often cut the entire crown from the plant, whilst *S. clarescens* larvae eat up the food reserves of the rootstock and kill the plant. *N. chondrillae* damages skeleton weed but its effects are not as spectacular as those of the other two insects. However, *N. chondrillae* and *S. clarescens* are too polyphagous to introduce into Australia as biological control agents since their host range under field conditions includes general of Cichoriaceae which contain the cultivated plants lettuce (*Lactuca sativa*) and endive (*Cichorium endivia*). The same does not apply to *O. wertheimsteini* since, although the mid- and late-instar Larvae of the tortricid feed on various compositae under insectary conditions, the first instar larvae are specific to *Chondrilla*. As it is the first instar larvae which selects *Chondrilla* as host and as the subsequent larval instars remain attached to the same host, there is every possibility that the insect is for all practical purposes restricted to skeleton weed. As proof of this contention *O. wertheimsteini* has not been found under natural conditions on any other composite species except *C. juncea*. On these grounds this insect was recently introduced into Australia for further testing in quarantine.

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