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Biological control of green turkey bush

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IN the mulga lands of semi-arid south-western Queensland, green turkey bush (*Eremophila gilesii*) is an important woody weed.

Up to 1·62 million hectares, particularly on the better watered slopes of the Warrego and Paroo River catchments, have been rendered useless for grazing because of dense stands of this weed. Although the bushes are lightly browsed during prolonged droughts, they compete strongly with grasses and other useful plants. Moreover, in recent years, the stands have increased rapidly in density where stocking rates were low and in sites completely protected from domestic stock.

Research by officers of the Charleville Pastoral Laboratory has shown that, although they are effective, mechanical and chemical treatments have only limited application because of high cost.

Spectacular control of small areas of dense, green turkey bush has occurred through the action of two species of grasshopper, *Monistria discrepans* (Walker) and *M. pustulifera* (Walker). Recommendations were made by Departmental officers and the United Graziers Association that the feasibility of a release programme of these grasshoppers be studied. With financial support from the Australian Wool Board, detailed studies were started in January, 1973.

These studies, which are now complete, were centred on *M. discrepans*, as initial surveys showed this insect to be the more common of the two. The conclusion arrived at is that this species has poor prospects as a bio-control agent. The reasons for taking this view involve an undertaking of many facets of the grasshopper's biology, the important ones being summarized below.

Disadvantages

In the Charleville area, *Monistria discrepans* has only one generation a year because eggs of the insect must undergo the cold temperatures of winter before they can hatch. Hatching occurs in late September or early October and the emergent nymphs develop to adults by early April at the latest. Adults are present in the field during February-March and egg laying commences in early March, but no hatching occurs until the following spring.

Owing to this restricted life cycle a large increase in numbers is not possible within a single year and the grasshopper is unable to take advantage of occasional seasonal conditions which might otherwise be ideal for the species.

Parasites Limit Usefulness of Grasshopper

Populations of the grasshopper are attacked by mites, flies and a fungus. The mites have little effect on their hosts but the two species of flies are important factors regulating population levels of the grasshopper. In the event of mass releases being made, parasitism by large populations of the flies could quickly reduce grasshopper numbers to the present low level. Both species of fly feed on the internal organs of the host, ultimately causing death or reduced egg production.

Infections of the fungus remain localized on the host during dry weather but spread rapidly after rain or under conditions of high humidity. Symptoms such as loss of function of limbs, surface colour changes and decreased food intake, appear three to four days before the death of the insect.

Difficulty in Rearing Large Numbers

One of the most important characteristics which a good biological control agent should possess is a potential for mass-rearing under laboratory conditions. This is necessary so that field releases of large numbers of the agent can be made at the most appropriate time. Under laboratory conditions, *M. discrepans* has a low reproductive rate which, coupled with a long period of development, would make it unsuitable for mass rearing.

A synthetic or at least semi-synthetic diet would be more useful in such a rearing programme than fresh leaf material. Two such diets have been tested for rearing *M. discrepans* and both have proved to be unsuitable.

Poor Dispersal

The term "wingless grasshopper" is often used to describe *M. discrepans*. This is not strictly correct since all adults have wings, although in most individuals these are reduced to small stubs and hence cannot be used. Even those individuals which have fully-developed wings are unable to fly. Thus the dispersal ability is poor and populations of the grasshopper remain localized.

Advantages

Points which favour the use of *M. Discrepans* as a bio-control agent in the Charleville area are few. The species is restricted to green turkey bush and other unloved relatives such as bastard sandalwood and Ellangowan poison bush. The species certainly does not eat grasses.

The life cycle of the grasshopper also fits in well with the period of best growth of green turkey bush. Nymphs and adults are present during summer and autumn, when most rain falls in the Charleville area, and prune new growth of the weed thus improving the chances for grass establishment and growth.

Future

The conclusion derived from the study was that *M. discrepans* is basically of low potential as a mass-reared biological control agent. However, there could be limited potential in "seeding" uninfested sites with the grasshopper but this would depend on detailed surveys of the distribution of the weed coupled with either field collection or limited mass-rearing of the grasshoppers—practices which would be costly and which would yield rather uncertain results.

