INVESTIGATIONS FOR THE POSSIBILITIES OF BIOLOGICAL CONTROL OF SLUGS IN HONDURAS

PROGRESS REPORT FOR OCTOBER 1984 - APRIL 1985

*F. D. Bennett**
*M. Yaseen**

RESUMEN

Búsqueda de enemigos naturales de la babosa (Sarasinula sp.) con el objeto de ser importados a Honduras fue conducida por la Commonwealth Institute of Biological Control en Trinidad. Se inició la búsqueda en la época seca de 1985. En las localidades de Valsayn y Macoya fueron obtenidas un total de 317 babosas y 8 masas de huevos. Estas muestras fueron confinadas al laboratorio en espera de encontrar parásitos. Cinco de estas babosas recolectadas fueron disectadas en busca de evidencia de parasitismo. Ambos esfuerzos fueron infructuosos. La mortalidad de las babosas en confinamiento no pudo ser determinada. Observaciones de campo detectaron la presencia de dos especies de escarabajos (Carabidae) en el mismo habitat de la babosa pero no hubo evidencia de depredación. En el laboratorio Scarites orientalis consumio completamente de una a más babosas pequeñas en un período de 24 horas. La otra especie sólo les causó daño sin consumirlas totalmente. Hasta el momento la búsqueda no ha revelado ningún enemigo natural de importancia. Sin embargo, los esfuerzos serán continuados en la próxima época lluviosa.

---

* Commonwealth Institute of Biological Control, Gordon Street, Curepe, Trinidad, W. I.

The veronicellid slug [Sarasinula (=Vaginulus) plebeia] has during the past two decades become a serious pest of beans and certain other food crops in Central America. Andrews (1983) considers it a recent introduction in the region mainly in Nicaragua, El Salvador, Costa Rica and Guatemala. The slug is known to be widespread in the Caribbean and South America but of little economic consequence; probably natural enemies keep it below the economic threshold and hence it is considered a reasonable target for biological control in the areas of introduction. The natural enemies in the areas of natural distribution are little known perhaps because their hosts are of economic insignificance. In fact in her review of natural enemies of pest slugs and snails there is no mention of any natural enemy of the genus Vaginulus by Godan (1983).

A project for CIBC to search for the natural enemies of the slug S. plebeia in Trinidad and possibly later in Brazil was sponsored by Escuela Agrícola Panamericana/USAID with a view to evaluate them for introduction into Honduras. Although an understanding for the agreement of the project had been made earlier, funds became available only in December 1984. The following is a preliminary report for the work done up to April 1985.

Distributon of slug Sarasinula plebeia

In addition to areas of recent outbreaks reported by Andrews (1983), S. plebeia is reported from New Caledonia, Fiji, Borneo, Australia and other Oceanic localities, Brazil, Trinidad, Guadeloupe, St. Thomas, Puerto Rico, Dominican Republic, Jamaica, Cuba and Florida (Aguayo, 1964).

This species is recorded as a pest of various ornamentals (including orchids, begonias and lilies), lettuce, coffee seedlings, etc. (Aguayo, 1964). In both Nicaragua and Honduras, the crop most heavily damaged is common bean, but other vegetable crops are attacked as well (van Huis, 1981; Andrews, 1983). It is also reported to harbour human parasites (K. Andrews, pers. comm. 1984).

SURVEYS IN TRINIDAD

Callen (1945) has reported sporadic damage to sweet potato by the slug Vaginulus (=Veronicella) langsdrofi in Trinidad. Reports of slug damage received by the Ministry of Agriculture are occasional and usual-

ly during the early part of the wet season (May-June). Although inquiries were made in early 1984 no reports had been received by the Ministry. When surveys were finally initiated later in the year populations were generally low.

METHODOLOGY

The search for slugs and their natural enemies were mainly conducted along irrigation ditches and drains in vegetable gardens at Macoya and Valsayn Park. Occasional collections were also made at Santa Margarita, Curepe and the Campus of the University at St. Augustine. During day collections, slugs were collected beneath debris and vegetation or were dug out from hiding places in cracks in the soil. Collections per man hour were very small. During night collections, larger numbers were obtained as the slugs forage at night.

Although limited efforts were made from October, the dry season had commenced in early December when the project agreement was signed. Populations decreased rapidly as the dry season progressed. In Valsayn, slugs were collected from under vegetation along the banks of a concreted drain. These yielded 16 slugs per man-hour in August, 19 in September, 14 in December but dropped to 12 in January, 10 in February and 6 in March. Collections in Macoya commenced after the dry season had started. There was no appreciable difference in collection size in January and February; an average of 12 slugs per man-hour was obtained during day collections. Collecting at night the number per man-hour was considerably higher. The best catch was 132 slugs in 2 man-hours. Small, medium and large-sized individuals were represented in most collections. These were placed individually in separate plastic half-litre cups and provided a section of carrot to serve as food. One hundred and ninety-seven obtained from Macoya survived for 2 - 48 days (average 28.1) and 120 from Valsayn lived for 4 - 38 days (average 26.0).

Two batches of slugs were sent to Prof. Dr. José Willibaldo Thomé, President, Fundacao Zoobotanica do Rio Grande do Sul, Porto Alegre, Brazil for determination, but identifications have not been received.

In addition a search was made for slug eggs. These were only occasionally encountered at both main collecting sites. Only three batches

of eggs were found at Valsayn and five at Macoya. Eggs were laid in batches of 4-11 eggs.

NATURAL ENEMIES

Most of the slugs collected in the field were kept under observation until they died to ascertain whether any arthropod parasitoids would emerge. Also five slugs from each of the areas, Valsayn and Macoya, were dissected but no evidence of parasitoids was obtained. Similarly, the field collected eggs hatched indicating an absence of egg parasitoids and phorid predators.

At Macoya, two species of ground beetles (Carabidae) were present in the same habitat but there was no direct evidence that they were feeding on slugs. Several adults of each species were confined individually in plastic containers and offered one slug each. One species (Scarites orientalis) completely consumed one or more small slugs within 24 hours. The other species damaged the slugs but did not fully consume them. Scarites spp. are known to be snail predators but some species might be adapted to slug predation.

DISCUSSION

Investigations in earnest only commenced as the dry season set in when slug activity was already at a low ebb. Our studies have not revealed many important natural enemies. The method of holding the slugs, i.e. in half-litre plastic cups with vented or unvented plastic lids requires improvement. Although under this method the slugs may live long enough to ascertain whether arthropod parasitoids are present, larger cages containing soil and additional sources of food, e.g. sprouted bean plants to provide conditions conducive to oviposition and to permit a study of the life cycle of the slug and its predators will be required. The design of these cages will be based on the most appropriate types recommended at the Slug Symposium held in Honduras in April 1985.

The causes of mortality of the slugs held in rearing containers could not be ascertained. With the onset of the rainy season when larger collections are anticipated slugs will be monitored for pathogens as well as for parasitoids and predators. Several species of Carabid beetles are known to prey on slugs and snails in various parts of the world. Altieri

et al. (1982) have manipulated Scaphinotus striatopunctatus for control of the slugs Limax maximus and Helix aspersa in California. The ground beetle (Scarites orientalis) obtained during our preliminary studies requires further investigation to determine its potential in regulating slug populations.

Although there are several records of other natural enemies of slugs (Stephenson & Knutson, 1966; Godan, 1983) these are from non-veronicellid slugs. Van Huis (1981) reported a mermithid nematode from S. plebeia in Nicaragua but its biology and its effect on slug reproduction have not been elucidated. It is perhaps surprising that a species of this group has not been reared in our studies. The relative scarcity of references to natural enemies of veronicellid slugs is probably due to the lack of investigations. Hopefully the current investigations will reveal promising natural enemies during the next wet season in Trinidad.

REFERENCES

AGUAYO, C. G. 1964. Notas sobre la distribución de la babosa Vaginula plebijus Mollusca:Veronicellidae. Carib. J. Sci. 4(4):549-551.

ALTIERI, M. A., K. S. Hagan, J. Trujillo and L. E. Caltagirone. 1982. Biological control of Limax maximus and Helix aspersa by indigenous predators in a daisy field in central coastal California. Acta Oecologia/Oecologia Applicata 3:387-390.

ANDREWS, K. L. 1983. Slugs of the genus Vaginulus as pests of the common bean Phaseolus vulgaris in Central America. Proc. 10th Int. Congr. Pl. Prot. Brighton, England. 1 pp.

GODAN, D. 1983. Pest Slugs and Snails. Biology and Control. Springer-Verlag. New York. 441 pp.

STEPHENSON, J. W. and L. V. Knutson. 1966. A resume of recent studies of invertebrates associated with slugs. J. Econ. Entom. 59:359-360.

VAN HUIS, A. 1981. Integrated pest management in the small farmer's maize crop in Nicaragua. Mededelingen Landbouwhogeschool Wageningn. 81-6:222 pp.