

## Research Note

### NATURAL ENEMIES OF LEAFHOPPER OF THE GENUS *EMPOASCA* (HOMOPTERA: CICADELLIDAE) IN PIGEON PEAS<sup>1</sup>

The leafhoppers *Empoasca* spp. has been reported as a major pest from all the pigeon pea growing areas in Puerto Rico.<sup>2,3</sup> Its presence has always been a difficult problem for the growers of pigeon peas, and its damage has often resulted in the complete failure of this crop.<sup>4</sup> Leafhoppers also attack other crops and ornamental plants.<sup>5,6,7,8</sup> Injuries are apparently more severe during hot dry weather. Control by chemical means has been the only method used. No work has been conducted and no information appears to have been published regarding control by natural enemies of *Empoasca* spp. However, biological control measures have been emphasized in other countries with other crops. The search for natural parasites and predators in commercial pigeon peas, both introduced and newly developed varieties, might result in a permanent safe and less expensive control of the leafhopper.

The purpose of this investigation was to gather preliminary information on the occurrence of natural enemies in pigeon pea fields.

A survey of leafhoppers was undertaken on the farms of Isabela and Fortuna Experiment Stations. We collected plant material, natural parasites and predators from June to November 1980. Six plots of pigeon peas of variety 2 B-Bushy were planted in both locations to increase populations of leafhoppers and natural enemies. No pesticides were used on these plots. Specimens were collected and observations were made on each plot and in each area twice monthly. We collected samples by sweeping with an insect net near the center of each plot. The bag containing the samples was carried to the laboratory and then the leafhoppers were transferred to rearing cages with food. Plant samples containing *Empoasca* spp. eggs were reared for possible egg parasites. Leaves and stems infested with leafhopper populations were removed from the plant and taken to the laboratory and placed on moist filter paper in petri dishes inside rearing cages and in half gallon ice cream containers. Observations were made daily to detect emerging parasites. Parasites and predators were also observed in pigeon pea fields.

<sup>1</sup>Manuscript submitted to Editorial Board 16 June 1988.

<sup>2</sup>Cruz, C., 1975. Chemical control of the leafhopper *Empoasca fabae* (Harris) on snap beans. *J. Agric. Univ. P. R.* 59 (1): 82-4.

<sup>3</sup>—, 1979. Thiodan y Lannate registrados para controlar los insectos del gandur. *Esta. Exp. Agric. P. R. Adelantos Científicos* 89.

<sup>4</sup>Estación Experimental Agrícola, U. P. R., 1977. Conjunto tecnológico para la producción de gandules: su situación y sus perspectivas. *Esta. Exp. Agric. Univ. P. R. Publ.* 116: 21.

<sup>5</sup>Wolcott, J. N., 1948. The insects of Puerto Rico, *J. Agric. Univ. P. R.* 32 (1-4): 975.

<sup>6</sup>—, 1955. Entomología Económica Puertorriqueña. *Esta. Exp. Agric. Univ. P. R. Bul.* 125: 124-5.

<sup>7</sup>Caldwell, J. S. and L. F. Martorell, 1950. Review of the Auchenorrhynchos Homoptera of Puerto Rico. *J. Agric. Univ. P. R.* 34 (1): 116-32.

<sup>8</sup>Martorell, L. F., 1976. Annotated food plant catalog of the insects of Puerto Rico. *Agric. Exp. Stn. Univ. P. R.*

TABLE 1.—Predators observed feeding on *Empoasca* spp. in Isabela and Fortuna Substations (June 1980–November 1980)

Order	Family	Scientific Name
Neuroptera	Chrysopidae	<i>Chrysopa collaris</i> Schneider
Hemiptera	Anthocoridae	<i>Orius insidiosus</i> Say
Hemiptera	Reduviidae	<i>Zelus longipes</i> (L.)
Diptera	Dolichopodidae	<i>Chrysotus</i> spp.
Diptera	Microppezidae	<i>Taenaptera</i> sp
Coleoptera	Coccinellidae	<i>Chilocorus cacti</i> L.
Coleoptera	Coccinellidae	<i>Cycloneda sanguinea</i> L.
Coleoptera	Coccinellidae	<i>Hyppodamia convergens</i> (Guer)
Hymenoptera	Formicidae	<i>Solenopsis geminata</i> (Fabricius)
Hymenoptera	Vespidae	<i>Polistes crinitus</i> Felton
Odonata	Coenagrionidae	<i>Enallagma civile</i> (Hagen)
Araneida		Miscellaneous spiders

A number of predators (table 1) were observed feeding upon adults and nymphs of *Empoasca* spp. in the pigeon pea fields. Some of the predators reached high population levels in the fields and must be influencing leafhopper population levels. The nature and extent of this influence was not determined, because studies were confined to casual observations in the field. Most of these predators are general feeders<sup>9,10,11</sup> which prey upon other insects in the pigeon pea fields such as aphids and pod borers (*Heliothis*, *Etiella*, *Fundella*).

Emphasis was placed upon the hymenopterous parasites of the eggs of *Empoasca* spp. However, no insect parasites were found in any of the leafhopper stages.

During the rainy season the parasitic fungus *Metarrhizium anisoplae* (Moniliales: Moniliaceae) attacked the adults of this species. The host, after death, turns to a pale yellowish, whereas the fungus growth varies from white to green. The attack was sporadic, not enough to exert con-

trol upon leafhopper population levels during the period of this study. According to Wolcott<sup>5,6</sup> and Cruz<sup>2,3</sup> rainfall and humidity affect *Empoasca* spp. in Puerto Rico. It becomes abundant during dry weather and scarce during rainy season. The variations in weather conditions may also contribute to the variations and fluctuations in fungus and leafhopper populations.

Table 2 is a partial list of beneficial insects (predators, parasites and pollinators) found in pigeon pea fields. Although not observed feeding on leafhopper, they have some influence or importance upon this insect.

Further studies should be conducted to determine the relationship between the entomophagous insects and leafhopper populations. They appear to be responsible for maintaining the equilibrium of insect pest populations.

The failure to obtain parasites could not be due to decreased leafhopper populations. According to Subba Rao<sup>12</sup> as the number of

<sup>9</sup>Mancia, J. E. and M. L. Cortés, 1972. Estudio preliminar sobre los enemigos naturales (parásitos y predadores) de las principales plagas del frijol. XVIII Reunión Anual PCCMA. Managua, Nicaragua, Mayo 6-10, 194-203.

<sup>10</sup>Subba Rao, B. R., P. Balder, R. Atma, R. P. Singh and M. L. Srivastada, 1965. Studies on the parasites and predators of *Empoasca devastans* Distant (Jassidae: Homoptera). *Indian J. Entomol.* 27: 104-6.

<sup>11</sup>Van Den Bosh, R. and K. S. Hagen, 1966. Predaceous and parasitic arthropods in California cotton fields. *Cal. Agric. Exp. Stn. Bul.* 820: 1-32.

<sup>12</sup>Subba Rao, B. R., P. Balder, R. Atma, R. P. Singh and M. L. Shrivastada, 1968. Distribution of *Empoasca devastans* and its egg parasites in the Indian Union, *Ent. Exp. El. Appl.* 11: 250-4.

TABLE 2.—*Partial list of predators, parasites and pollinators found on pigeon pea fields at Isabela and Fortuna Substations (June 1980-November 1980)*

Scientific name	Order	Family	Predator	Parasite	Other
<i>Calosoma</i> sp.	Coleoptera	Carabidae	*		
<i>Photinus</i> sp.	Coleoptera	Lampyridae	*		
<i>Thonalmus</i> sp.	Coleoptera	Lycidae	*		
<i>Scymnus</i> sp.	Coleoptera	Coccinellidae	*		
<i>Baccha</i> sp.	Diptera	Syrphidae	*		
<i>Apis mellifera</i> L.	Hymenoptera	Apidae			Pollination
<i>Xilocopa brasilianorum</i> (L.)	Hymenoptera	Xilocopidae			Pollination
<i>Aphidius</i> sp.	Hymenoptera	Braconidae		*	
<i>Enicaspilus</i> sp.	Hymenoptera	Ichneumonidae	*		
<i>Brachymeira</i> sp.	Hymenoptera	Chalcididae		*	

leafhoppers per leaf decreases the percentage of parasitism increases. In order to promote parasitism, if chemical control is necessary in pigeon pea fields, a selective insecticide must be used, so that a fair chance is given to the parasites or predators to build up their populations. In search for parasites the investigator must select pigeon pea fields where pesticides have not been applied for many years.

The pest control program using chemicals on pigeon peas in Puerto Rico has expanded in recent years. On the other hand, the integrated control program emphasized by the Extension Service is based primarily upon careful field evaluation of insect popu-

lations, judicious use of insecticides and preservation of native predators and parasites. Considering that chemical control for *Empoasca* spp. in pigeon peas is generally necessary, particularly during dry periods, we must recommend the use of selective insecticides whenever possible.

Further research on selective insecticides and the biology and ecology of the arthropod fauna in pigeon pea fields would be needed in order to implement an integrated control program.

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