

# Conditions that Affect Populations of *Carpophilus humeralis* F. (Coleoptera: Nitidulidae) in the Pineapple Fields of Puerto Rico<sup>1, 2</sup>

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## ABSTRACT

A survey of the factors that affect the population of *Carpophilus humeralis* (a sap beetle pest of pineapple fruits) was conducted in the pineapple growing areas of Puerto Rico. Soil moisture as well as bad phytosanitary practices are the principal factors related to the increase of the insect population. The use of varieties resistant to gummosis, a condition of the fruit that helps the penetration of *C. humeralis* into the fruit, and good cultural practices decreased the insect population and the damage caused by it.

## INTRODUCTION

High populations of the sap beetle, *Carpophilus humeralis* F. in the pineapple fields of Puerto Rico reduce the quality of the fruit. The small size of the insect (0.5 to 4.1 mm) makes it difficult to prevent the entrance of infected fruits to the canning plant. Also, ripe fruits are lost in the field by rotting, which is accelerated by the presence of *C. humeralis*.

In Hawaii and Malaysia this insect was reported as one of the main problems in pineapple<sup>4, 5</sup> and its population was correlated with the presence of ripe fruits in the field. In Puerto Rico other species of the same family have been found in other crops.<sup>6</sup> *C. humeralis* was first reported in pineapple in Puerto Rico in 1975.<sup>7</sup>

In order to determine the factors that affect the presence and abundance of *C. humeralis* in the pineapple areas of Puerto Rico, a survey was conducted in 1979-80. The pineapple growing areas are Palmarejo

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<sup>4</sup> Schmidt, C. T., 1935. Biological studies on the nitidulid beetles found in pineapple fields, Ann. Entomol. Soc. Am. 28 (2): 476-511.

<sup>5</sup> Tan, K. M., Wee, Y. C. and Chang, W. S., 1969. Bionomics of *Carpophilus foveicollis* Murr in pineapple, Malays. Agric. J. 47 (1): 4-13.

<sup>6</sup> Wolcott, G. N., 1948. The insects of Puerto Rico, J. Agri. Univ. P. R. 32 (1-4): 1-975.

<sup>7</sup> Pennock, W. and Gandía, H., 1975. Effect of slip size, and time of planting on yield of Red Spanish pineapple in Puerto Rico, J. Univ. P. R. 59 (3): 141-64.

(Lajas) in the south, and Vega Baja to Arecibo in the north. The plantations of the Land Authority of Puerto Rico lie in the northern area.

#### MATERIALS AND METHODS

The determination of the presence and abundance of the insect was conducted on ripe fruits of variety Red Spanish cultivated in the northern area of the island and variety Cabezona (Bull Head) planted in the southern area. A sample of ten ripe fruits was randomly picked from the border and center of pineapple rows every month for a year.

Individual fruits were placed into a plastic funnel which was inserted in a rearing container where the insects were collected. Each fruit was shaken for 1 minute in the funnel and the sap collected. The samples were put in the freezer for 1 day before the sap beetles were counted. Records of humidity and rainfall of the two areas surveyed were obtained from the Weather Bureau reports. The phytosanitary and agricultural practices followed and any other special conditions found in the field which might influence the nitidulid populations were also recorded.

#### RESULTS AND DISCUSSION

In the northern area the average population of *C. humeralis* was 260 insects per ripe fruit of the Red Spanish variety, as shown in Figure 1 and the following tabulation, with the highest populations occurring from June through September.

<i>Month</i> 1979-1980	<i>C. humeralis</i> average per fruit	<i>Rainfall</i> average (cm)
April	212	24.04
May	290	22.86
June	402	19.76
July	370	19.78
August	340	29.89
September	316	15.28
October	228	10.49
November	215	28.19
December	208	6.70
January	196	7.36
February	209	8.86
March	139	7.39
$\bar{x}$	260	16.71
Maximum	402	29.89
Minimum	139	7.36

The highest number of insects per fruit was 1,083 and the lowest was 33. In the northern area there was a direct correlation ( $r = .72$ ) between rainfall and insect population (fig. 2). The data collected and the studies on the life cycle indicated that humid soil is necessary for the completion of the life cycle of this insect. High humidity helps in the formation of organic matter making the soil loose, an ideal condition for the development of immature stages of this insect.

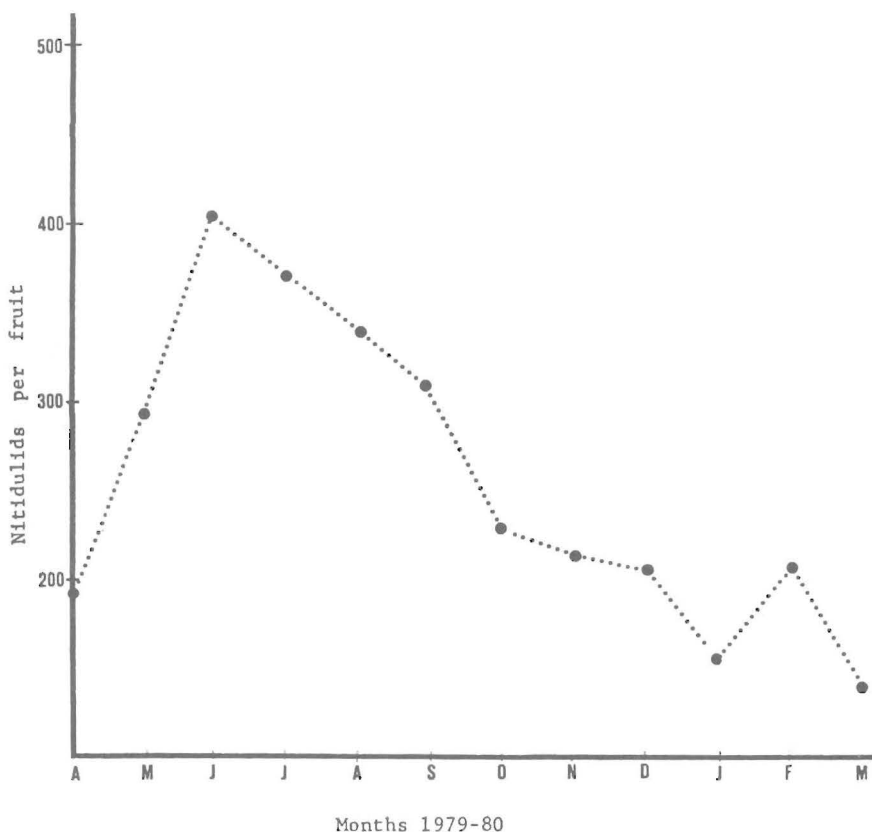


FIG. 1.—Average monthly population of *Carphophilus humeralis* F. in northern pineapple area of Puerto Rico.

It appears that the following practices and conditions found in the southern area (Lajas) kept the population of *C. humeralis* low: 1) absence of rotten fruits in the field; 2) the use of variety Cabezona (Bull Head), which is resistant to gummosis (a condition that facilitates the entrance of *C. humeralis* into the fruits); and 3) low rainfall, which maintains the soil hard and compact. This last condition has an effect on the pupal

stage of this nitidulid, since it needs a humid loose soil for the normal development of the pupa. The following phytosanitary practices are the main control measures that should be implemented to reduce the populations of this insect: 1) destroy all pineapple fruit residues; 2) discontinue the incorporation into the soil of all crop residues; 3) collect and destroy all damaged pineapples left in the fields and 4) selection of good pineapple slips.

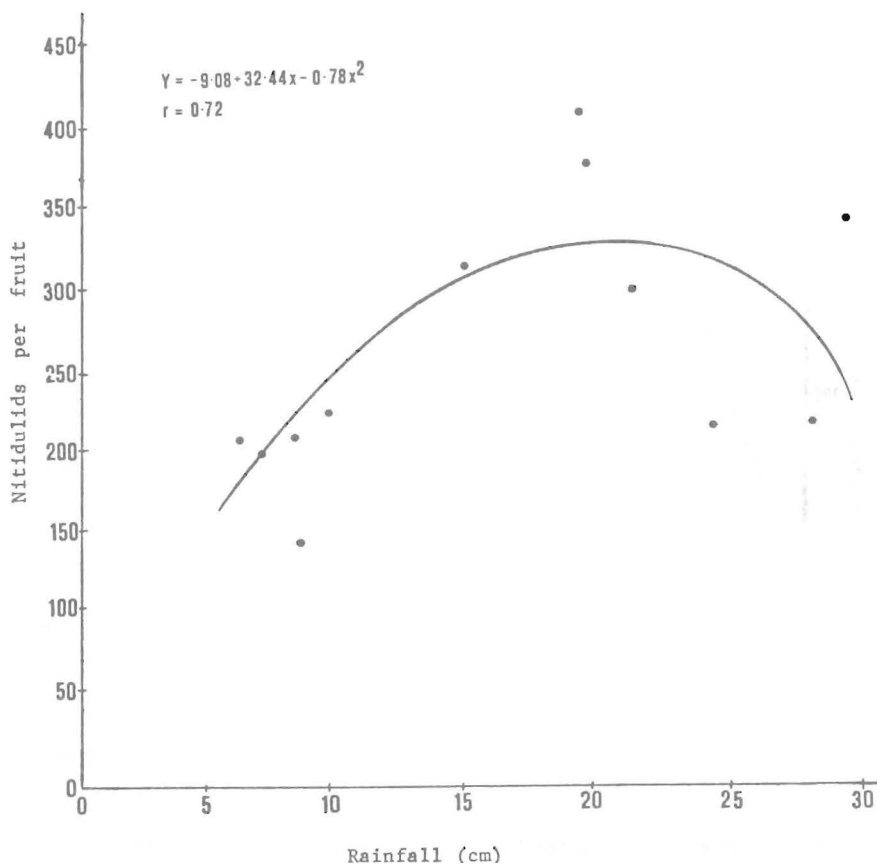


FIG. 2.—Correlation of rainfall with population of *C. humeralis* in the northern pineapple area of Puerto Rico.

Low incidence of *C. humeralis* was recorded in the southern area, only five beetles.

#### RESUMEN

Un reconocimiento para determinar los factores que afectan las poblaciones de *Carpophilus humeralis* F. se realizó en los piñales de Puerto

Rico. Se encontró que la humedad del suelo, al igual que las prácticas indeseables, tales como dejar frutas podridas en el campo, fueron los principales factores para la invasión y multiplicación de este insecto. El uso de variedades resistentes a la gomosis (condición que favorece la penetración de la fruta por *C. humeralis* y buenas prácticas fitosanitarias disminuyen el daño de esta plaga.