Host Plant Studies of the Corn Planthopper, Peregrinus maidis (Ashmead), in Hawaii[1]

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The corn planthopper, *Peregrinus maidis* (Ashmead), is a major pest of corn in Hawaii. Besides causing damage by its feeding and ovipositional activities, it is the vector of the corn mosaic virus. An unknown aspect of the seasonal history of this insect in Hawaii is how it survives during the corn-free period of several months. The most likely means would be on alternate hosts. Information on the alternate hosts of the corn planthopper is very sparse and lacks details. It was found on "coarse grass" (Ashmead, 1890) and was reported to live on "native grasses" in the Malay Archipelago and the Philippines (Muir, 1917). Fullaway (1918) stated that "It will oviposit in confinement in the stems of sugar cane and Job's tears (*Coix lachryma*) and in due course eggs so laid will hatch. But the nymphs do not seem to be able to develop on this material as they do on pieces of the stem of corn, on which they can be bred to maturity." Verma (1955) discovered the eggs of the corn planthopper in the roots of the nutgrass (*Cyperus rotundus* L.) which were made accessible to oviposition by ant burrows, but there is no information on egg hatch or survival thereafter.

In this study 9 species, including sugarcane, Job's tears, and nutgrass, were tested as host plants of the corn planthopper.

Materials and Methods

The following plants were tested: napiergrass, *Pennisetum purpureum* Schumach.; vaseygrass, *Paspalum urvillei* Steud.; sugarcane, *Saccharum officinarum* L.; sorghum, *Sorghum vulgare* Pers.; sourgrass, *Trichachne insularis* (L.) Nees; Californiagrass, *Brachiaria mutica* (Forsk.) Stapf; Job's tears, *Coix lacryma-jobi* L.; pangolagrass, *Digitaria decumbens* Stent; and nutgrass, *Cyperus rotundus* L. These plants were obtained from the collection of the Department of Agronomy and Soil Science, University of Hawaii and from other areas on the University of Hawaii campus. The plants were planted in sterile soil in 10 inch plastic pots. To test the plants as hosts, the corn planthoppers were confined on the respective test plant in a cage 12″ × 12″ × 21″ which was placed on top of the pot with the plant extending into the cage through a hole in the bottom of the cage. Three

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sides and the top of the cage were of 30 × 30 mesh plastic screen and the remaining side of window pane glass.

The corn planthoppers used in the tests were from stock colonies maintained on corn, *Zea mays* L., in screen cages. For each trial 50 adults, a mixture of both sexes, and 50 nymphs, a mixture of fourth and fifth instars, were confined in the cage containing the candidate plant. At least 5 trials were conducted for each plant species.

Results and Discussion

Sorghum.—The corn planthoppers were able to complete the life cycle on this species in all 5 trials. They reproduced readily but not as prolifically as on corn. Sorghum can support a substantial population of planthoppers for a long period of time and can be used as a host plant for maintaining stock colonies for research purposes.

Californiagrass.—In 4 out of 7 trials about 50% of the original population survived for 10 days in the test cages. After 25 days of confinement about 20% of the original population was still alive. In 2 of these trials the planthoppers were able to complete the life cycle. One trial was allowed to continue after the first generation and another generation of planthoppers was produced. In the remaining 3 trials about 50% of the planthoppers died within 3 days after caging and a few lived up to 3 weeks of confinement.

Pangolagrass.—In 2 out of 6 trials, the planthoppers were able to complete the life cycle. In other trials, about 50% of the original population died within 3 days of confinement. At 2 weeks after caging, the population was about 10% of the original number caged and in another week all planthoppers were dead.

Napiergrass.—The planthoppers were able to complete the life cycle in 1 out of 7 trials. In the other trials about 50% of the original population lived for nearly 5 days. In another day or two the population decreased to about 10%. Some of these remaining planthoppers lived for more than 40 days in the cages. The corn planthoppers of the original population were able to live on napiergrass for a longer period than on the other plants tested except sorghum.

Sugarcane.—The planthoppers were able to complete the life cycle in 1 out of 5 trials. In the unsuccessful trials, most of the planthoppers were dead within 2 days after caging and none survived beyond the 15th day. In the successful trial the original population decreased at a more gradual rate and survived for a longer period. About 15% of the original population was still surviving after 26 days of caging.

Job's tears.—Fullaway (1918) reported oviposition and hatching of the eggs of the corn planthopper on this plant; however, Fullaway (1918) and Zimmerman (1948) stated that the planthoppers are not able to develop to adults on this plant. In 1 out of the 6 trials we conducted, the plant-

hoppers were able to complete the life cycle. In this trial there was a strong ongoing colony of all stages at 76 days after caging. In the unsuccessful trials, about 50% of the original population was dead within 3 days after confinement. In another 7 days, the population was down to about 20% and 24 days after caging all were dead.

Sourgrass.—The planthoppers were not able to complete the life cycle on this species. Within 3 days after caging about 50% of the original population was dead. There was a rapid decrease in the population and a few of the planthoppers survived up to 23 days.

Vaseygrass.—The planthoppers were not able to complete the life cycle on this species. Within 2 days after caging about 50% of the original population was dead and in another 2 days almost all the remaining were dead. The longest survival time was 14 days.

Nutgrass.—As mentioned previously, Verma (1954, 1955) reported that the corn planthopper laid eggs in the roots of the nutgrass which were made accessible by ant burrows. There was, however, no mention of development or survival of the planthoppers on nutgrass. The planthoppers were not able to complete the life cycle on this plant. About 50% of the original planthoppers died within 3 days and there was a rapid decrease in the population thereafter. In 1 trial a few planthoppers survived for more than 40 days. In the other 4 trials a few survived up to 20 days.

Of all the plants tested sorghum was the best and only sure host of the corn planthopper. Californiagrass was next best, followed by pangolagrass but these plant species were not consistent in sustaining the planthopper. Napiergrass, Job's tears, and sugarcane were able to support the planthoppers for at least one generation but the tests indicated that this seldom occurs. The planthoppers were not able to complete the life cycle on sourgrass, vaseygrass, and nutgrass although a few of them were able to survive on these plant species for a considerable length of time. This points to the possibility of the corn planthoppers surviving on non-host plants in situations such as when migrating from one host plant to another located far away.

In most of the unsucessful trials about 50% of the population, a mixture of adults and nymphs, died within 3 days of confinement with the plants. In preliminary tests, planthoppers confined in similar caged situation, but without plants, died within 3 days. Thus it could be that in the unsucessful trials the planthoppers failed to feed on plants upon which they were confined and died of starvation.

The corn planthopper oviposited in all plant species tested and the newly hatched out nymphs were observed about 10 days after caging of the adults. In the trials where the planthoppers failed to complete the life cycle, the newly hatched out nymphs seldom developed into the second instar but died within a day or two after eclosion. It was observed

that where the life cycle was completed only in one trial such as in the case of sugarcane, napiergrass, and Job's tears, the particular plant involved was young and succulent in comparison to the unsuccessful plants that looked old and tough. It seemed that the successful completion of the life cycle by the planthoppers on these plants would depend much on the condition of the plant at the time when the first instar nymphs emerge from the eggs.

Other than on corn, we have observed ongoing colonies of the corn planthopper in the field on cultivated races of sorghum and johnsongrass, *Sorghum halepense* (L.) Pers., but as this study has shown, small numbers of corn planthoppers most likely can survive and reproduce in the field on marginal host plants other than those tested.

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