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YELLOW SUGARCANE APHID IN HAWAIIAN PASTURES

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Introduction

In Hawaii, entomologists estimate that between 10 and 20 new insect species are introduced to the state annually. Most introductions pose no economic hazard to Hawaii's diversified agricultural industries, but on occasion the intruder may threaten Hawaii agriculture. One such intruder is the yellow sugarcane aphid, *Sipha flava* (Forbes). Officials do not know when, where, or how the aphid entered the state.

Description

Biology. The yellow sugarcane aphid (YSCA) is a grass aphid. It is small, 1.3 to 2 mm long, oval, and hairy (Fig. 1). Its most distinguishing feature is its color, ranging from lemon yellow to mint green. In high infestations, large colonies occur on the leaf blades of grasses. They appear in two forms, apterae (wingless) and alatae (winged), depending on environmental conditions.

Females reproduce in two ways, bisexually and through a method of parthenogenesis; the parthenogenic female can reproduce without the presence of a male. The second unique feature of the female is its ability to lay eggs (oviparity) or give birth to live young (viviparity). The combined effect of parthenogenesis and viviparity creates a rapid population buildup during times of plentiful food supply. As food reserves are depleted, the winged forms develop and spread in search of new sources of food.

Aphids are known to exist with ants in a symbiotic relationship, but no such relationship was observed.

Distribution and hosts. In North America, the YSCA is distributed north as far as New York in the east and Washington in the west, and in the southern states, including Florida. It is also found in the Caribbean and in Central and South America. The YSCA has been observed on 51 species of grasses in Puerto Rico, such as sugarcane (*Saccharum*), sorghum (*Sorghum*), corn (*Zea*), wheat (*Triticum*), various lawn and pasture grasses (*Paspalum, Digitaria, Panicum,* and *Pennisetum*). Of particular concern, the sugarcane aphid is a known host of the sugarcane mosaic virus.

In Hawaii, the YSCA is distributed throughout all of the major islands and has been observed on kikuyu grass (*Pennisetum clandestinum*), pangola grass (*Digitaria decumbens*), crab grass (*Digitaria*), vasey grass (*Paspalum*), foxtail (*Festuca*), and Lyon's, or kangaroo, grass (*Themeda gigantea*).

Damage symptoms. Initial observations of YSCA damage in pastures were noted in semiprotected areas, such as leeward sides of banks or hills, at the bases of trees and fence posts, and along fence lines and gates. But as the aphid population increases, damage symptoms occur in open, nonprotected areas. In these open-area infestations, distinct circular chlorotic (yellow) patches are observed (Fig. 2). Often, damage symptoms occur in isolated spots with no indication of trailing by grazing animals or equipment. At a distance, a general yellowing of the grass leaf blades resembles herbicide injury. The yellowing, however, occurs from the tip downward. In advanced stages of injury, the leaf tips begin to dry and turn brown (Fig. 3). Aphids are found on both upper and lower leaf surfaces. The damage is a result of their feeding behavior of withdrawing plant fluids or injecting a toxin. On the Big Island, aphids affected lush pastures in cool, dry climates at an elevation range of 1000 to 5500 ft. Infestations on Maui, Oahu, and Kauai were found at lower elevations.

Pasture losses. Assessments of pasture grass production and nutritive quality were made, predominantly in kikuyu grass–clover pastures. In a comparison of 20 random paired-samplings of aphid-affected (AA) and non-affected (NA) sites, forage dry matter (DM) percentage and dry matter production (DMP) were analyzed. Forage DM in AA samples was significantly higher than in NA samples, 33.04 percent compared with 22.13 percent. This simply indicates that there was a greater moisture loss, apparently resulting from aphid feeding, in AA samples.

Dry matter production of AA samples was 21.7 percent lower than in NA samples. Based on sampling methods, AA pastures produced 4177 lb of dry matter per acre, compared with 5336 lb of dry matter per acre in NA pastures, a loss of 1159 lb of dry matter per acre, or 45 cow-days of feed per acre.

Crude protein (CP) and neutral detergent fiber (NDF) were analyzed to evaluate the effects of aphids on the nutritional qualities of the forage. A comparison of 10 random paired-samples from two locations was made. Crude protein values for AA and NA samples were 6.28 percent and 7.51 percent, a reduction of 16.4 percent CP in AA pastures. NDF analyses evaluate the amount of total cell-wall content of the forage; components include cellulose, hemicellulose, lignin, and several indigestible fractions. In general, as NDF values increase, digestibility of that particular feedstuff decreases. NDF values for AA and NA samples were 78.48 percent and 76.43 percent, a 2.7 percent increase in AA pastures, indicating a reduction in forage quality.

Over a period of six to eight months, a secondary deleterious effect of the aphids was observed. As the aphid population increased and permeated the pastures, and with its constant feeding pressures, the pasture condition

Fig. 1. *Sipha flava* from Kona, Big Island. Photo by W. Nagamine.

Fig. 2. Initial damage symptoms are circular chlorotic patches, 1 to 2 ft in diameter. Aphids are found on the perimeter of the damaged area.

Fig. 3. A severely affected pasture. Heavy losses occur after rapid aphid population buildup and spread. Aphid-affected pastures resulted in losses of 21.7 percent in dry matter production and 16.4 percent in protein value.

progressively deteriorated. An invasion of weeds established itself in the weakened sward, further reducing pasture productivity and quality.

Control Methods

Chemical. According to the Hawaii State Department of Agriculture, the only insecticide registered for use on pasture, including forage grasses, is Clean Crop Malathion, 57 EC. Based on a preliminary test, malathion reduces the aphid population and speeds pasture recovery, but such practices require additional labor and equipment costs that may not be practical for most ranchers. Early detection of aphid establishment and chemical spot treatment are recommended with reservations.

Biological. With the rapid and widespread distribution of the YSCA, biological agents have been targeted as the primary control method. Presently there are low levels of predator insects observed in aphid-infested pastures: the ladybird beetle, the syrphid fly, and the lace-wing (chrysopid). It is too early to determine the impact of these predators, but it is hoped that their buildup can significantly lower the aphid population. Caution is advised in beginning insecticidal spraying programs, due to their negative impact on the beneficial insect population.

A search for efficient predators of the YSCA is currently under way. The tedious process of searching, testing, and mass rearing will require no less than 12 to 18 months.

Other. Other methods to combat the YSCA have been derived from brainstorming by ranchers and extension personnel; all methods listed are yet untested but may warrant further investigation.

1. Fertilization to increase production of the pasture grass.
2. Grazing management, by extending grazing to limit food reserves for the aphid or to keep cattle grazing on new leaf growth, which is most susceptible to aphid damage.
3. Seeding pastures with other grasses or legumes.

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