

Varietal Susceptibility of Cucurbits to Cucumber Beetle Attack¹

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Damage by insect pests to the various cucurbit crops is so common and frequent that few growers attempt to grow a commercial crop without following a regular schedule of spray or dust applications. In Indiana the major pest of all cucurbits is the striped cucumber beetle (*Acalymma vittata* (F.)), although both the squash bug (*Anasa tristis* (DeG.)) and the squash vine borer (*Melittia cucurbitae* (Harris)) often cause serious losses to squash and pumpkins. During 1954 and 1955 the squash bug population was so high that much of the commercial pumpkin acreage was destroyed. Field tests were initiated in the Brownstown area in 1955, while other plots have been located on the Agronomy farm, Lafayette, from 1955 to 1958. In each year a program to control cucumber beetles has been necessary in order to have plants for tests against the other two insects. However, the squash bug and the vine borer have been absent during the past three years and as a consequence differences observed between treatments have been due to either the insecticide or a susceptibility of the plants to beetle feeding.

Resistance or susceptibility to insect attack has been noted in cucurbit crops by numerous workers. Gaylord & Hartman (2) reported certain cantaloupe varieties resistant to aphids in Indiana. Many workers have found Butternut squash and other varieties belonging to *Cucurbita moschata* (Duchesne) resistant to squash vine borer. Howe (3), perhaps, has the best explanation of this resistance and states that plants of *C. moschata* are avoided by the moth for oviposition and have a low rate of larval establishment. These plants have a hard, compact, woody stem with closely ranged, tough vascular bundles. Plants of *C. pepo* (Duchesne) showed moderate resistance even though they showed a high oviposition preference, high larval survival and high resistance to the spread of disease. Plants of *C. maxima* (L.) showed a high attractiveness for oviposition, high survival of larvae and high susceptibility to infections of decay causing organisms.

In our tests at Lafayette in 1956 six varieties of squash or pumpkins representing the three botanical species were planted. These were as follows:

| | |
|--------------------------------|---------------------------------------------------------------|
| <i>Cucurbita maxima</i> (L.)— | Golden Delicious squash Hubbard squash Buttercup squash |
| <i>C. moschata</i> (Duchesne)— | Butternut squash Kentucky Field pumpkin |
| <i>C. pepo</i> (Duchesne)— | Table Queen squash |

¹Purdue University, Agricultural Experiment Station, Journal Paper No. 1356.

As soon as the plants came up, all plots but one were treated with an insecticide to control the striped cucumber beetle. Applications were repeated as necessary at 2 to 7 day intervals until fruits were forming. Since no squash bugs appeared in any of the plots, no further treatments were applied. Records were kept on stand, survival from attack, length of vine when stand was reduced from 15 plants per plot to the standard of 5, and the number and weight of fruits at harvest. For this paper the data obtained on the untreated plots has been compared with that from plots treated with the same insecticide in 1956, 1957 and 1958.

In 1957 two squash varieties, Hubbard and Butternut, were compared with three other cucurbits, Purdue Hawksbury watermelon, Pride of Wisconsin muskmelon and Straight-8 cucumber. The procedures followed and the data taken were the same as in 1956. In 1958 watermelons were dropped from the experiment and only the other four varieties grown.

Plants of each variety were grown in blocks of seven rows with each row receiving a different treatment. Each replication had a block of rows of each variety with the location of treatments and of blocks completely randomized. Small plants were thinned to 15 per plot when in the seedling stage and later to 5 per plot at vining time. Records of death of plants from beetle feeding, bacterial wilt and other diseases were kept on both the stand of 15 and later of the 5. Table 1 gives the percentage of plants dying in the treated and untreated rows. This data indicates few Butternut squash plants died even in the untreated plots, while Hubbard squash suffered the greatest loss.

TABLE 1

The mortality of plants dying in plots untreated and treated for the control of the striped cucumber beetle

| Variety | 1956 | | 1957 | | 1958 | |
|--------------|---------|-----------|---------|-----------|---------|-----------|
| | Treated | Untreated | Treated | Untreated | Treated | Untreated |
| | % | % | % | % | % | % |
| G. Delicious | 0 | 18 | .. | .. | .. | .. |
| Hubbard | 13 | 30 | 0 | 39 | 4 | 10 |
| Buttercup | 0 | 34 | .. | .. | .. | .. |
| Butternut | 0 | 0 | 1 | 2 | 4 | 2 |
| Ky. Field | 0 | 0 | .. | .. | .. | .. |
| Table Queen | 0 | 3 | .. | .. | .. | .. |
| Watermelon | .. | .. | 0 | 10 | .. | .. |
| Muskmelon | .. | .. | 2 | 9 | 4 | 20 |
| Cucumber | .. | .. | 2 | 16 | 5 | 20 |

The length of vine measurements reflects both the influence of beetle feeding and in the case of treatments the possible phytotoxic effects of the insecticide. Of the insecticides only lindane reduced vine length and the subsequent yield of fruits. Vine length of Butternut squash was slightly longer in the treated than in the untreated, while Hubbard squash, cucumber and muskmelon showed greater increases. The greatest differences between treated and untreated plants were shown in the yield of fruits. Butternut had the smallest percent increase with an

average of only 22 in the three years. Cucumbers had an increase of 160 percent and Buttercup squash 226 percent in one season each, while Hubbard squash had an average increase of over 600 percent (see Table 2).

TABLE 2

The increase in vine length and fruit harvested from plots treated for control of the striped cucumber beetle over untreated plots

| Variety | Vine length | | Pounds of fruits harvested | | |
|--------------|-------------|------|----------------------------|------|------|
| | 1957 | 1958 | 1956 | 1957 | 1958 |
| | % | % | % | % | % |
| G. Delicious | .. | .. | 44 | .. | .. |
| Hubbard | 94 | 91 | 38 | 1780 | 117 |
| Buttercup | .. | .. | 226 | .. | .. |
| Butternut | 33 | 18 | 22 | 38 | 6 |
| Ky. Field | .. | .. | 56 | .. | .. |
| Table Queen | .. | .. | 32 | .. | .. |
| Watermelon | 30 | .. | .. | 82 | .. |
| Muskmelon | 33 | 100 | .. | 43 | 55 |
| Cucumber | 53 | 78 | .. | .. | 160 |

Of special interest was the direction of migration of the cucumber beetle and the concentration of live beetles on different varieties of cucurbits. It was noted in 1958 as in many previous years that plants on the northeast part of the plots were infested first and usually had the largest populations throughout the season. Beetles were perhaps migrating against the prevailing winds (southwest), as the plots were in a general farming area. The nearest vegetable patch and wooded area was 150 yards to the west. Beetle counts were made on the various treatments and varieties on several dates and that of June 26 was found to be extremely high. In the treated plot a total of 26 live and 45 dead beetles were counted on 240 plants (60 of each variety). The numbers and distribution of live beetles on the untreated rows are given in table 3. Hubbard in each of the four replications had far more beetles

TABLE 3

The number of live cucumber beetles found on 15 untreated plants of four varieties of cucurbits, each replicated four times

| Direction of replication | Varieties | | | |
|--------------------------|-----------|-----------|----------|-----------|
| | Hubbard | Butternut | Cucumber | Muskmelon |
| SW | 148 | 0 | 5 | 0 |
| NW | 94 | 5 | 13 | 0 |
| NE | 465 | 0 | 26 | 24 |
| SE | 111 | 0 | 4 | 2 |

than any other variety and on the northeast replication had 465 beetles on the 15 plants. Most of the plants were devoured in a few days, although one plant in this plot did survive and produced two fruits.

In 1942 the writer found a beetle similar to the striped cucumber beetle on plots of squash and cucumbers. This beetle was later described as *Acalymma gouldi* by Barber from the 28 specimens collected here and single specimens from Marion County, Indiana, (Blatchley 1910) and from Berthierville, Quebec. This beetle was found primarily in the blossoms of squash and accounted for about five percent of the total population of striped beetles collected over a three weeks period in June and July. Even though our plots have been located about two miles from the 1942 location for the past 10 years, not a single beetle of the new species has been seen since the original collection.

Summary

Varieties of squash belonging to the species *Cucurbita moschata* were found to be less affected by the feeding of cucumber beetles than were varieties of *C. maxima* and *pepo*. Differences were apparent not only in the number of plants dying from feeding and bacterial wilt but also from the length of vines at thinning time and the yields of fruits at harvest. Butternut squash showed the least effects of beetle attack and Hubbard squash the greatest. In some seasons beetles destroyed most or all of the plants in the Hubbard plots and many in the Buttercup plots before harvest. Of the other cucurbits used in these tests cucumbers and muskmelons were more affected than watermelons but not as much as the squash belonging to *C. maxima*. The Hubbard squash attracted many more beetles than did the Butternut squash, cucumbers and muskmelons. The predominant direction of early beetle migration has been from the northeast.

Literature Cited

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