The Effects of Striped Cucumber Beetle Larval Infestations and of Plastic Film with Trickle Irrigation on Yield of Butternut Squash

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Introduction

Butternut squash, *Cucurbita moschata*, has the potential to become a major vegetable crop for Southwestern Indiana if adequately promoted. The fruit can be prepared as a variety of main dishes or preserved as pie filling providing a high quality substitute for pumpkin. The nutritional value of baked butternut is equivalent to that of baked potato both having high concentrations of vitamin A, exceeding the daily minimum requirement in a 100 gm baked serving (2). The crop can be stored for an average of 50 days (4) allowing a marketing period of up to 140 days when plantings are made sequentially.

Consumer acceptance of squash is on the increase as evidenced by the growth of frozen summer squash sales during the last decade, but sales of butternut squash are currently not large enough to be reported in Agricultural Statistics (1).

Buternut squash grow well in Southwestern Indiana where growers have the general knowledge and equipment necessary to grow the crop due to the similarities between its production practices and those of the melon crop. Before the potential of butternut squash can be reached, the consumer must be educated on the use and nutritional value of the crop; research must be conducted to evaluate production practices, optimal storage procedures, and control measures for insects and diseases; and the growers must be convinced of the potential for marketing and informed of the most profitable production techniques.

Materials and Methods

Butternut squash, variety Waltham, was evaluated when grown on plastic mulch with trickle irrigation and when infested with striped cucumber beetle larvae *Acalymma vittatum*. A randomized complete block design with four replications was used to compare the four treatments: mulch and trickle-uninfested, mulch and trickle-infested, no mulch or irrigation-uninfested and no mulch or trickle-infested. Each treatment was applied to a 15.85 m (52 ft) ft row of plants spaced 1.73 m (68 in) apart in rows spaced 1.83 m (6ft) apart. One and one quarter mill, .9 m (36 in) wide, plastic mulch and 1.9 1/m (.5 GPM), Tri-Wall® drip irrigation hose (Chapin Watermatics, Inc.)[1] were applied together using a Mechanical Transplanter (Model 90) mulch applicator[1] on May 22, 1981. The squash was direct seeded by hand, 3 seeds per hill, on June 11 and covered with ½ cup of Jiffy-Plus to prevent crust formation. Seedlings were thinned to one per hill on June 19.

When the plants had three true leaves, June 26, they were infested with 500 striped cucumber beetle eggs per plant. The number of infested eggs per plant was chosen arbitrarily as we have no estimate of field population of either adults or eggs. The eggs were from a colony that had been reared in the lab for five generations on squash seedlings. The eggs were suspended in 10 ml of .25 percent agar

[1] Mention of a proprietary product in this paper does not constitute an endorsement of that product by the USDA.

solution (3). A finger was pressed into the soil adjacent to the plant stem to allow placement of the eggs in the root zone, the egg solution dispensed into the cavity, and the cavity covered with moist soil. Eggs were dispensed with a 10 ml tipping pipettor. Egg hatch occurred on June 27-28 with 85.5% of the eggs hatching.

The infestation happened to coincide with the driest period of the summer and thus with the first irrigation. Starting June 26, the plots received one hour of irrigation each day totalling 20,373 1/Hect (2178 G/A) of water. July 10 and weekly thereafter, 11-4-4 N,P,K fertilizer was applied at a rate of 46.77 1/Hect (5 G/A) through the irrigation water.

An application of Prefar combined with three cultivations were used to control weeds. Applications of Bravo were made on ten day intervals to control plant diseases. One application of sevin was made during mid-August to control insects. Vines were turned back into the rows weekly to separate the plots for yield evaluations.

A one time harvest was made September 22 to determine plot yields. All of the squash in each plot were gathered and each fruit weighed individually. The yield data were analysed and the treatments seperated using least significant differences.

Results

Butternut squash plants responded to plastic mulch and trickle irrigation by producing larger more luxurient foliage throughout the growing season. This response was noticeable prior to irrigation, however, the initiation of irrigation, during the summers only dry spell, produced a dramatic increase in foliage.

The seedlings responded to larval root feeding of the striped cucumber beetle by producing visibly smaller plants, both when grown on sand or irrigated mulch. The relative differences in plant size diminished as the season progressed, but at the end of the growing season noticeable differences still existed between infested and uninfested plants on mulch.

Three yield parameters, fruit/plant, weight/plant, and weight/fruit were considered in analysing the effects of cultural practice and of striped cucumber beetle larval infestation. The data for the three parameters are presented in Table 1. Plants grown on irrigated mulch produced significantly more fruit and total weight than plants grown without irrigated mulch. Plants grown on irrigated mulch produced significantly fewer fruit and total weight when infested with striped

TABLE 1. *Yield of butternut squash grown with plastic mulch and trickle irrigation and infested with larvae of the striped cucumber beetle*

	Treatment					
#	Plastic mulch	Trickle irrigation	SCB larval infestation	Fruit/ plant	Wt./ plant (g)	Wt./ fruit (g)
01	No	No	No	3.89	6447	1312
02	No	No	Yes	4.54	6084	1339
02	Yes	Yes	No	8.95	12076	1353
04	Yes	Yes	Yes	6.68	9670	1448
LSD				0.40	607	NS

cucumber beetle larvae. Larval infestation did not significantly effect yield of plants grown without irrigated mulch. Neither irrigated mulch or larval infestation effected average fruit weight.

Discussion

Larval infestation by root feeding striped cucumber beetle larvae caused a reduction of 1.8 tons or $540. per acre. Larval infestations did not significantly reduce yield of plants grown on sand, probably because the infestation coincided with a period of considerable moisture stress. We have observed in the lab that larval survival is affected adversely by dry soil environment long before the squash plants begin to wilt.

The results of this research are drawn from a single season, but irrigated mulch appears to have considerable potential. Rainfall during 1981 was typical of most years in Southwestern Indiana where periods of overabundance are interspersed with dry periods.

Larvae of the striped cucumber beetle apparently benefit from the change in the soil climate caused by the trickle irrigated plastic mulch. The adult striped cucumber beetle has historically been considered a pest of cucurbits but the effect of larval root feeding has never been evaluated. The larvae have the potential to be serious pests of butternut squash and probably of most other cucurbit crops as well.

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