Table 2. No. of inflorescences, with flowers and fruit, 25 and 42 days after transplanting (Refer Table 1 for treatments).

Treatment	No. of inflorescences		
	Day 25	Day 42	
	Total	Total	With fruit
1	3.0ab[z]	9.9ab	1.2ab
2	2.0b	7.1b	1.2ab
3	3.4a	11.8a	1.9a
4	0.1c	3.0c	0.0b
5	2.6ab	10.0ab	1.0ab

[z]Mean separation within columns by Duncan's multiple range test, 5% level.

tions led to the conclusion that the salinity of the mycelial waste, although only moderate, was the principal cause of the injury and growth depression of plants.

In the present experiment, however, the regular soil testing of the various treatments showed only minor differences in the concn of soluble salts (Table 3). Furthermore, with the exception of the control, the salinity in all treatments did not change much with time, remaining slightly above 2 mmhos/cm. This is understandable, since the conductivity of a saturated solution of gypsum is 2.2 mmhos/cm (6), and treatments 1 to 4 contain large amounts of gypsum. The salinities at planting time were only modest, and probably not the cause of any damage to the tomato plants, which are considered to be moderately tolerant of salts (1). Others found that tomato yield was reduced by 10% for every 1.5 mmhos/cm increase in conductivity above 2.0 mmhos/cm; however, the yield of shoots was not affected (5). Thus, the assumption that the tomato plants were injured and stunted by the moderate concn of soluble salts is not warranted. Other possible causes for these detrimental effects on plant growth should be investigated, such as chemical compounds and transformations that are operative during and shortly after mycelial wastes are incorporated into soil. Although not yet known or understood, these factors could be related to the initial nitrate-N immobilization reaction in soil observed previously (3).

Table 3. Electrical conductivities in Windsor loamy sand in pots planted with tomatoes.

Days after transplanting	ECe in mmhos/cm				
	Treatment				
	1	2	3	4	5
0	3.2	2.7	2.7	3.0	2.5
3	3.2	2.0	2.6	2.6	2.2
10	2.4	2.6	2.2	2.2	1.2
17	2.4	2.5	2.2	2.8	0.8
25	2.1	2.3	2.2	2.7	1.6

In conclusion, tomato growth in loamy sand is not affected by large applications of gypsum, while additions of mixed fermentation residues caused depressed early growth and foliar injuries. Thus, it appears that the gypsum contained in the mycelial wastes is not the cause of these injuries and suppressed growth of the tomato.

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HortScience 11(3):216–217. 1976.

Cabbage Looper Oviposition and Survival of Progeny on Leafy Vegetables[1]

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Additional index words. Trichoplusia ni, preference, lettuce, *Lactuca sativa,* chard, *Beta vulgaris* (Cicla group), cabbage, *Brassica oleracea* (Capitata group), broccoli, *Brassica oleracea* (Italica group), spinach, *Spinacia oleracea*

Abstract. **When given a choice, the cabbage looper, *Trichoplusia ni* (Hübner), preferred lettuce for oviposition over chard [*Beta vulgaris* L. (Cicla group)], cabbage [*Brassica oleracea* (Capitata group)], broccoli (*Brassica oleracea* L. [Italica group)], and spinach (*Spinacia oleracea* L.). Preference did not appear to be related to leaf area or to any factor that enhances the survival of progeny of a particular plant species. A 20- to 29-fold difference in oviposition was noted on lettuce grown under 2 environmental conditions.**

Although we reported differential oviposition of the cabbage looper, among and within *Lactuca sativa* L., *L. serriola* L., and *L. saligna* L. in the screenhouse (6), none was apparent among *L. sativa* cultivars grown in the field. These discrepant results probably reflect differences in plant age, available hosts, and environmental factors. Variable results such as these have been noted among cruciferous crops. For example, Harrison and Brubaker (3) compared looper populations on 8 crucifers over a 3-year period and found no outstanding resistance in any of the cultigens tested, though any one may be the most resistant in a given year. Radcliffe and Chapman in contrast reported (7, 8, 9, 10), that chinese cabbage 'Michihli' was resistant to oviposition compared with other crucifer cultigens. They reported that ovipositional preferences were modified by prior insect injury though plant size had no effect. They also found that egg and larval counts were usually, but not always, correlated; i.e., Brussel sprouts and collards had relatively fewer eggs than other plants but were susceptible to larval attack. Wolfenbarger (11) reported less damage to *Brassica oleracea viridis* L. (P.I. 236259) than to some commercial cabbages.

We noted fewer loopers (unpublished) on chard than on broccoli in small home gardens. The number of looper eggs in the field is affected by the physiological and chronological age of the plant and the cultivar. However, in screening breeding materials for differential oviposition of the cabbage looper on lettuce, we needed to know the extent of looper ovipositional preference for lettuce (*Lactuca sativa* vs. *L. serriola*) compared with the preference for other leafy vegetables.

Commercial seeds of the test plants were germinated in vermiculite and transplanted into 5.1-cm^2 peat pots containing peat, soil, plasters' sand, silt and vermiculite (1:4:5:5:5 by volume). The potted plants were placed in a screenhouse at La Jolla and watered with half strength Hoagland's solution (5) as needed. As the initial planting of 'Prizehead' lettuce germinated poorly, they were kept in a greenhouse equipped with smog filters, maintained at 20°C (night) and 30°C (day), at Riverside for 1 month before they were transferred to La Jolla. There they were held for 1 additional month before the

[1]Received for publication October 23, 1975. Mention of a proprietary product in this paper does not constitute a recommendation of the product by the USDA.

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moth release. In the first test 4 plants of each cultivar were arranged in a partially balanced incomplete block design (plan 11.2 (2)). Then about 210 pairs of 4 to 5-day old cabbage looper moths reared by the methods of Henneberry and Kishaba (4) that had been allowed to mate in the laboratory for 1 night were released into the screenhouse. (6) Eggs were counted on all plants 5 nights later. A second test was made with plants maintained in the greenhouse until the moths were released. The test design was a 4 × 4 balanced lattice (2) with pots of each test cultigen representing a treatment. Egg counts were made as before. Then each plant was cut and labeled, and an outline of each leaf was taken on light-sensitive blueprint paper. The outlines were used to measure total leaf area of each plant and were measured with a digital planemeter.

A third test was made to check the development and survival of the confined cabbage looper larvae. When the greenhouse grown plants were about 2½ months old, 4 plants/cultigen were confined individually with 15 1st instar looper larvae, in a mylar[1] covered aluminum framed cage (51 × 28.5 × 28.5 cm) and arranged on greenhouse benches in a randomized block layout. The cages were force ventilated by sucking air through the cotton organdy top so that the inside cage temp was no higher than 2°C above ambient greenhouse temperatures. Plants were added as needed and as pupation occurred pupae were collected and checked daily for moth emergence.

A fourth test was made to compare the effects of 2 environmental conditions on 'Prizehead' lettuce and on oviposition by looper moths. One set of plants was held in the screenhouse at La Jolla during late Sept. and Oct. A comparable set of plants was held for 3 weeks in a growth chamber maintained with 21.6 klx light, 16 hr day length; 25°C (day and night), and ambient relative humidity about 70%. Seeds for both sets were planted in 1-liter, black polyethylene containers filled with peatlite (1) and watered twice daily with half-strength Hoagland's solution. Sufficient nutrient solution was added each time to leach out excess salts.

Just prior to the test, both sets of plants were arranged in a screenhouse at La Jolla in four 5 × 4 blocks. Within each block, plants grown in the 2 environments were alternated within columns and rows. After egg counts were made, 5 representative plants of each treatment were sampled and the leaf area was measured.

The egg counts for tests 1 and 2 demonstrated that the cabbage looper had demonstrated ovipositional preference among species of leafy vegetables regardless of leaf area (Table 1). For example, spinach had the smallest leaf area, but looper oviposition on these plants was next to highest (1.62 eggs/cm^2) among the cultigen tested.

Table 1. Differential oviposition and development of cabbage looper on leafy vegetables.

		Test 1	Test 2		Test 3		
					Mean days to looper emerg.		% survival of looper
Cultigen	Cultivar	Eggs/ plant	Eggs/ plant	Eggs/ cm^2	♀	♂	from 1st instar to pupation
Lettuce	Prizehead	1016	662	3.88 a[w]	26.6	26.7	87
Lettuce	(34176 M-1)[z]	–	751	2.14 b	24.9	25.8	92
Spinach	5068[y]	–	86	1.62 bc	34.6	35.0	62
Spinach	6093	67	–	–	–	–	–
Swiss Chard	Rhubarb 6202	115	187	1.30 cd	37.00	x	27
Chinese Cabbage	Burpee Hybrid 6067	–	345	.80 de	25.2	26.6	82
Chinese Cabbage	Mastushima Early	92	–	–	–	–	–
Chinese Cabbage	Michihli	–	292	.76 de	25.8	26.8	93
Broccoli	Calabrese 6007	–	66	.54 e	27.6	28.3	73
Swiss Chard	Lucullus 5134	45	107	.49 e	x	x	17
Cabbage	Danish Roundhead 5001	–	58	.35 e	27.8	28.0	85
Spinach Beet	5305	23	–	–	–	–	–
Swiss Chard	Fordhook Giant 6195	41	–	–	–	–	–

[z]La Jolla breeding line selected from 'Empire' x *Lactuca serriola* PI 274372.

[x]All loopers were in larval stage when test terminated.

[y]W. Atlee Burpee stock numbers.

[w]Mean separation by Duncan's multiple range test, 5% level.

The survival of looper larvae was not correlated with greatest oviposition. For example, oviposition on chard was as great as on crucifers, but survival on chard when confined was only 0–27% compared with 73–82% on broccoli.

In the third test, we found a definite relationship between leaf area and the number of eggs laid on lettuce grown in the 2 environments, but the difference in numbers of eggs, was disproportionately larger (20–29 times) than the difference in leaf surface (5.9 times); (Table 2). This result supported our earlier finding (6) that loopers can differentiate between lettuce planted 1 week apart and that egg count is to a certain degree, independent of plant size.

Lettuce was plainly preferred by the cabbage looper for oviposition over other leafy vegetable species of different plant families. Our data and the fact that loopers oriented to newly-emerged lettuce for oviposition may indicate that these insects are positively attracted to lettuce for oviposition. These findings may explain why the cabbage looper is such a damaging pest on fall-grown lettuce in the Southwestern United States. Looper oviposition on crops such as cabbage and spinach may be neutral, physical, or forced by the physiological condition of the moth.

Table 2. Differential oviposition of the cabbage looper on 'Prizehead' lettuce grown in 2 environments (Test 4).

Condition	No. eggs/plant[z] (±SD)	Mean leaf[y] area cm^2
Environmental chamber	194 ∓ 23	876
La Jolla screenhouse	8 ∓ 3	148

[z]Mean for 40 plants.

[y]Mean for 5 representative plants.

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