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1) Insect population dynamics in relation to soybean narrow and broad leaf isolines.

A broad spectrum of stimuli can be an important factor influencing insect orientation, feeding and oviposition on most plants. Behavioral responses to visual and chemical stimuli are important factors in host selection. Color and form of plants and plant parts are among these stimuli (Saxena, 1975). Within commercial soybean varieties, leaf form varies in width and, therefore, is a factor which could influence insect orientation and ultimate population establishment.

A study was initiated in 1980 to evaluate the response of insect populations to soybeans of narrow and broad leaf types. Knowledge of significant differences in the establishment of pest populations on either growth type could be beneficial due to the simple nature of inheritance of the phenomenon and its ease of incorporation into planting practices.

Throughout the growing season, 13 major insect species were monitored on two isoline pairs, V75-776 (narrow), V75-778 (broad), V75-811 (narrow), V75-814 (broad), (obtained from Dr. Glenn Buss, Virginia Polytechnic Institute). Populations of beneficial species as well as those of most pest species were uniform among growth types. However, a difference in responses between lines and between leaf types may have occurred for two pest species. Although differences were significant only at the 10% level, green cloverworm populations were greater in all years on the narrow leaf type V75-811 than on the broad leaf type V75-814. Potato leafhopper populations responded similarly on the second isoline pair V75-776 and V75-778. It is noteworthy that the two insect species responded similarly to the narrow leaf type of different isolines.

Elicited stimuli are specific to each plant species as are perceived stimuli to each insect species. In association with the isolines included in the study and with narrow leaf commercial varieties, environmental factors and plant-elicited stimuli other than leaf type could serve to enhance or mask a response to leaf type such that population differences could be important.

Reference

Saxena, K. 1975. Physiological factors governing susceptibility or resistance of crop plants to leafhoppers. U.S. Department of Agriculture PL 480. Final Report. pp. 77.

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2) Tactics for management of soybean pest complexes: Potential of entomopathogens and commercial microbial insecticides for suppression of the silver-spotted skipper soybean pest.

The silver-spotted skipper (*Epargyreus clarus*), having become increasingly more destructive to Maryland Eastern Shore soybeans, is being studied as a candidate for biocontrol. Nordin (1975) described a possible viral pathogen isolated from a decayed skipper. Without a clear knowledge of the micro-flora population of a live insect it is difficult to conclude, from the presence of a microorganism on a dead insect, that a pathogen exists, since numerous species of bacteria multiply rapidly in dead insects. Thus, in this preliminary study, skippers were examined before they were moribund or dead.

Laboratory rearing of the silver-spotted skipper was unsuccessful. In late July, 1982, through September, 10 collections (different periods) of young larvae were made and reared each time in batches of 25 on soybean leaves in quart size paper cans at 86-88^{0}F. After three days, five larvae from each container were randomly picked and prepared for examination. Preparation consisted of ligaturing each insect at the anterior and posterior orifices to prevent entrance of surface sterilizing agents into the hemocoel; dipping into 70% ETOH (2 sec), sodium hypochlorite (4 min), 10% sodium thiosulphate (4 min), and then three changes of sterile distilled water. After placing the insect in a sterile dissecting dish a cut was made along the dorsal line to enable a capillary tube to be inserted into the hemocoel to withdraw blood and body fluids. The blood and fluids were diluted in 2 ml sterile water and plated onto nutrient agar. The resulting bacterial colonies were selected, subcultured and the isolated organisms were identified by the following: Gram, spore, capsule and flagella stains; production of acetoin and acetylmethylcarbinol, hydrolysis of starch, gelatin, protein, and lipids; nitrate reduction; indole, urease, oxidase and catalase production; citrate utilization, phenylalanine deaminase and production of arginine, ornithine and lysine decarboxylase, and metabolism of carbohydrates: glucose, lactose, sucrose, xylose, maltose and arabinose. Seventy-seven isolates were made and, on comparison of characteristics, these were found to comprise replicates of several different strains.

The following isolates were obtained from the hemocoels of the silver-spotted skippers: achromogenic *Serratia marcescens*, *Pseudomonas aeruginosa* and *P. putida*, *Enterobacter aerogenes* and *E. cloacae*, *Micrococcus luteus*, *Citrobacter freundi*, *Alcaligenes faecalis*, *Flavobacterium* sp., and *Bacillus cereus*.

Although some of these organisms are known to be associated with insects, they are not necessarily considered pathogenic (e.g., *Alcaligenes* and *Flavobacterium*). Therefore, experimental tests on pathogenicity are required. Larvae from which *Bacillus cereus* were obtained did not appear sick. Strains of *Bacillus cereus* would appear to be the best candidate for biocontrol because of its spore-forming ability. The insecticidal organism *Bacillus thuringiensis* is an entomogenous strain of *B. cereus*. However, some strains vary in their abilities to produce lecithinase and phospholipase which render them more powerful as pathogens.

The silver-spotted skipper is presently in hibernation. Corn earworms will, therefore, be used to test the pathogenicity of some of the isolates, primarily the lipolytic and proteolytic isolates and the *Bacillus cereus* strain in particular, using only feeding tests. Those organisms found to be pathogenic to corn earworms will be tested against the skipper this spring as well as commercial insecticides.

Reference

Nordin, G. L. 1975. A nuclear polyhedrosis virus from the silver-spotted skipper, *Epargyreus clarus* (Lepidoptera: Hesperiidae). J. Invertebr. Pathol. 16:131-132.

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3) Harvest index of selected soybean germplasm.

The distribution of total dry matter accumulation or biological yield in crop plants is very important in achieving high crop yields. In crop plants where the seed portion constitutes the product of economic or agricultural yield it is desirable that a greater proportion of available energy will be utilized for seed than nonseed production. The proportion of biological yield represented by economic yield was defined as harvest index (HI) by Donald (1962) and as seed yield efficiency (S.Y.E.) by Joshi and Smith (1976).

There is evidence that improvement in yield of crops has resulted in part from unconscious selection for high HI, especially where the reproductive parts constitute economic yield. Van Dobben (1962) demonstrated that, in 50 years of wheat breeding, the grain:straw ratio increased from 0.51 to 0.66 representing 29% increase in yield. Similar changes have been observed in barley (Thorne, 1958; Watson et al., 1958, and 1963), rice and peas (Donald, 1962), corn (Stinson and Moss, 1960; Sowell et al., 1961) and drybeans (Wallace and Munger, 1966). It is likely that, among the 10,000 soybean plant introductions in the germplasm collection maintained by the USDA, sufficiently high variability in HI exists. PIs with high HI may be utilized to increase the seed yielding ability of the present commercial soybean cultivars if they can be identified in a screening test. This report represents efforts at the University of Maryland Eastern Shore Soybean Research Institute to evaluate the HI of several soybean plant introductions within the RR3 project.

Seed of soybean plant introductions belonging to maturity groups III to VI, obtained from the USDA germplasm collection at Urbana, Illinois and Stoneville, Mississippi, were used in experiments at the University of Maryland Eastern Shore experimental farm. A number of PIs in MG III, IV and V were tested in the field in 1982. The field tests consisted of three-row plots in three replications for each PI entry. A plot measured 6 m x 0.5 m and entries were randomized in each replication. At physiological maturity, four plants were harvested from the center row of each plot, oven dried at 70°C for 24 h and the seeds and straw weighed separately. HI was calculated as seed dry matter and nondry matter.

Table 1 represents a ranking of HI of MG IV material. HI ranged between 0.41 and 1.68. About 50% of the entries in MG IV had HI equal to or greater than 1.00. Several of the PIs were found in the group that had high HI.

Almost all the entries matured at the same date. Yield data are being analyzed for statistical differences and correlations. However, trends seem to suggest positive correlations that may be exploited in improving the yield of commercial soybeans with some of the PIs which so far have not been utilized.

Table 1. Ranking of harvest index (HI) in soybean cultivars and plant introductions (PI) in Maturity Group IV

Cultivar or PI no.	HI	Cultivar or PI no.	HI	Cultivar or PI no.	HI
Hurrelbrink	1.68	83.944	1.16	82.509	1.01
80.828-2	1.66	86.007	1.16	Virginia	1.00
82.295	1.56	Patterson	1.15	82.534	1.00
81.042-2	1.51	Bethel	1.14	83.925	1.00
70.013	1.50	FC31.630	1.14	FC31.685	0.99
Lawrence	1.48	62.202-2	1.14	19.976-2	0.99
Clark 63	1.46	62.248	1.14	80.479	0.99
85.658	1.45	86.060	1.14	83.853	0.99
80.834-1	1.42	19.979-4	1.13	85.505	0.99
80.498-1	1.41	83.891	1.12	85.619	0.99
81.764	1.41	85.663	1.12	Ebony	0.98
Cutler	1.40	Chief	1.11	Perry	0.98
70.467	1.39	Emerald	1.09	68.449	0.98
80.837	1.39	Kaikoo	1.09	82.259	0.98
84.679	1.37	Patoka	1.09	85.506	0.98
Douglas	1.35	Wilson 6	1.09	82.263-1	0.97
85.590	1.35	FC31.946	1.09	19.979-1	0.95
Imperial	1.34	54.606-2	1.08	60.269-2	0.95
Jefferson	1.33	82.218	1.08	85.519	0.95
80.828-1	1.33	82-264	1.08	Higan	0.94
82.296	1.33	Crawford	1.07	54.615-2	0.94
85.624	1.32	Kahala	1.07	82.555	0.94
Desoto	1.31	70.208	1.07	83.858	0.94
Oksoy	1.31	82.527	1.07	Kailua	0.93
84.669N	1.31	85.420	1.07	82.326	0.93
83.889	1.30	Shiro	1.05	84.594	0.93
Green & Black	1.29	64.747	1.05	85.550	0.93
84.944	1.29	79.870-4	1.05	Aoda	0.92
Franklin	1.28	80.777	1.05	82.307	0.92
80.847-2	1.27	84.985	1.05	83.923	0.92
Pixie	1.26	Kent	1.04	84.912	0.92
82.291	1.26	19.979-3	1.04	AK(FC30.761)	0.91
84.939	1.25	70.825-1	1.04	84.724	0.91
54.617	1.17	82.210	1.04	Emperor	0.90
80.834-2	1.17	54.600	1.03	FC31.557	0.90
81.037-5	1.17	54.610-4	1.03	80.030	0.89
83.945-4	1.17	54.606-1	1.02	83.893	0.89

Table 1. *Continued*

Cultivar or PI no.	HI	Cultivar or PI no.	HI	Cultivar or PI no.	HI
84.713	1.17	Cutler 71	1.01	84.807	0.89
84.959	1.17	Sango	1.01	85.469	0.89
Miles	1.16	82.312N	1.01	86.112-1	0.89
19.979-4	0.89	Hokkaido	0.81	86.103	0.74
Kingston	0.88	Wilson	0.81	55.887	0.73
62.199	0.88	84.639	0.81	61.944	0.72
63.945	0.88	AK(Kansas)	0.80	56.563	0.71
70.490	0.88	80.488	0.80	58.955	0.71
80.034-1	0.88	81.037-1	0.80	Wilson 5B	0.67
Wabash	0.87	86.062	0.80	80.473	0.66
Custer	0.85	Morse	0.79	83.881A	0.66
Hahto/Michigan	0.85	84.908-1	0.79	60.970	0.65
84.960	0.85	19.979-6	0.78	Peking	0.64
68.011	0.84	83.946	0.77	54.608-4	0.63
85.424	0.84	19.979-7	0.76	Sooty	0.62
Gibson	0.83	64.698	0.76	82.558	0.61
61.947	0.83	84.660	0.76	86.109B	0.61
82.325	0.83	FC03.546	0.75	83.915	0.53
83.892	0.83	Wilson 5	0.74	63.468	0.41
86.134-1	0.83	84.664	0.74		

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