DAMAGE TO SOYBEAN SEEDS BY SOUTH AMERICAN STINK BUGS[1,2]

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ABSTRACT

Tests with caged soybean plants in the field near Palmira, Colombia, showed that two stink bugs which are common there in soybean fields, *Thyanta perditor* (F.) and *Acrosternum marginatum* (Beauv.), damage soybean seeds by piercing the pods. The damage, consisting of punctures, wrinkling and staining of the seed coat and discoloration of the cotyledons, matches published descriptions of damage to soybeans by North American and Brazilian stink bugs.

INTRODUCTION

Stink bugs cause serious losses of soybean yield and quality in North America by piercing the pods and feeding from the developing seeds. Several stink bugs occur on soybeans in South America, but little is known about their effect on this crop. This paper shows that two of the more common stink bugs of soybean fields near Palmira, Valle, in the Cauca Valley of Colombia cause significant damage to soybean seeds.

Stink bugs known to damage developing soybean seeds in North America are: *Acrosternum hilare* (Say) and *Euschistus servus* (Say) (Daugherty et al., 1964); *E. euschistoides* (Vollenhoven), *E. tristigmus* (Say), *E. variolarus* (Beauv.), and *Thyanta custator* (F.), (Daugherty, 1967); *Nezara viridula* (L.) (Miner, 1966; Todd and Turnipseed, 1974).

From February to July of 1971 I collected the following numbers of stink bugs from soybean fields near Palmira: *Piezodorus guildinii* (Westw), 207; *Thyanta perditor* (F.), 78; *Euschistus crenator* (F.), 50; *Acrosternum marginatum* (Beauv.), 40; *Mormidea* sp. 1, 24; *Posidus nigrispinus* (Dall.), 23; *Edessa meditabunda* (F.), 19; *Thyanta antiguensis* (Westw.), 4; *Oebalus pugnax torridus* (Sailer), 3; *O. ornatus* (Sailer), 2; and *Euschistus atrox* (Westw.), 1.

The cosmopolitan *Nezara viridula* damages soybean seeds in Argentina and Brasil (Rizzo, 1972: Link & Costa, 1974; Link et al., 1971 &

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1973). In Brasil *Piezodorus guildinii* attacks soybean pods, and *Edessa meditabunda* attacks the stems but not the pods (Panizzi, 1975; Panizzi & Smith, 1977). *O. pugnax*, the Rice stink bug, occurs on grassy weeds in soybean fields and does minor injury to soybean seeds (Miner, 1966). The effect of the other species which were taken on soybeans in Colombia has not been previously reported.

MATERIALS AND METHODS

On June 28, 1971 I enclosed 8 soybean plants of an experimental plot of 'I.C.A. Lili' in individual cages, gauze cylinders supported by wire frames fastened to stakes. Some leaves touched the gauze, but the pods were inaccessible to insects outside of the cages. The plants were searched for egg masses and sprayed with 0.2% DDVP, an insecticide with a short residual life. On July 2, six of the cages were infested with field-collected stink bugs, one group of 3 cages with *Thyanta perditor* and another nearby group of 3 with *Acrosternum marginatum*. Each group included a fourth, uninfested control cage. The numbers and stages of the bugs placed in each cage are shown in Table 1. The plants then had soft green seeds which were nearly full-sized (stage R5-R6 according to Fehr et al.,1971). On July 12 the surviving insects were removed from the cages and counted, and the plants sprayed with Sevin® to prevent further insect injury. On July 26 the seeds were harvested by hand, counted, weighed, and examined for damage.

RESULTS AND DISCUSSION

I had already seen *T. perditor* and *A. marginatum* attack soybean pods in the field near Palmira, and had reared them on soybean pods in the laboratory. The field cage experiments (Table 1) confirm these observations, leaving no doubt that these species damage soybean seeds. Plants caged with 12 stink bugs of either species had over 80% damaged seeds, and at least 73% of these seeds bore recognizable feeding punctures. This is well above the injury level found in either uninfested control cage: 14% or 24% damaged seeds with only 2.4% or 3.5% of them showing recognizable feeding punctures (Table 1). Some damage was to be expected on the control plants because they were accessible to stink bugs before they were caged.

In the cages with 6 or 3 stink bugs there was not a clear correspondence between infestation level and the percent of damaged and punctured seeds. This was because mortality tended to equalize the infestation levels in these cages, and because on one plant there was feeding by a few nymphs from an egg mass which was missed when the plant was caged. Nevertheless, plants with lesser infestations had damage levels well above those in the control cages, but below those in the cages with 12 bugs each; from 40% to 63% of their seeds had been damaged, and from 23% to 37% of these seeds bore visible feeding punctures (Table 1).

TABLE 1 - Damage to soybean seed by various numbers of *Thyanta perditor* or *Acrosternum marginatum* caged on single soybean plants in the field near Palmira, Valle, Colombia. A total of 18 plants is included in the experiment. The insects were on the plants for 10 days, starting when the plants were R5-R6.

No. stink bugs:		Seeds:						
Placed in cage	Surviving at end of experiment	Total on plant	Damaged[a] (%)	Punctured (%)	Undeveloped (%)	With purple seed-stain (%)	$\bar{x}$ wt. uninjured	$\bar{x}$ wt. injured[a]
T. perditor								
12	11	173	83.8	76.3	12.1	6.4	0.14	0.11
6	1	150	63.3	35.3	8.7	4.0	0.12	0.10
3	2	139	48.9	37.4	4.3	0.7	0.12	0.10
0	0	248	24.2	2.4	15.7	6.0	0.14	0.06
A. marginatum								
12[b]	10	98	80.6	73.5	0	3.1	0.14	0.13
6[c]	3	176	39.8	23.3	1.1	2.8	0.13	0.09
3[d]	2[e]	138	47.9	31.9	10.9	0.7	0.12	0.09
0	0	199	14.1	3.5	2.5	4.0	0.14	0.10

[a]Includes all punctured and undeveloped seeds but not seeds with purple seed-stain.
[b]Includes 9 large nymphs.
[c]Includes 4 large nymphs.
[d]Includes 2 large nymphs.
[e]In addition there were a few small feeding nymphs from an egg mass missed when the plant was caged.

The damage matches published photographs and descriptions of damage to soybean seeds by other stink bug species (Daugherty, 1967; Jensen & Newsom, 1972; Kilpatrick & Hartwig, 1955; Miner, 1966; Todd, 1976; & Turner, 1967). Damage varied from nothing more than feeding punctures to varying degrees of wrinkling and discoloration. The punctures are dark, circular spots usually located in a depression, and often accompanied by a wrinkling and staining of the seed coat which varies in extent, but may cover an entire seed. The cotyledon underlying the wrinkled area is usually chalky white and more or less sunken. Some seeds failed to develop. They were shriveled, dry, and about 3 mm in diameter.

The percentage of undeveloped seeds was not correlated with the level of infestation in my cages (Table 1), but this does not mean that this injury is not associated with stink bug feeding. It probably occurred before the plants were caged. Daugherty et al., 1964, found a significant correlation between the number of undeveloped seeds and the level of stink bug infestation on caged soybean plants. However, they caged and infested their plants at a much earlier developmental stage, when the plants were still blossoming and had only small pods at the lower nodes. Feeding punctures were visible on about 6% of my undeveloped seeds, but were probably obscured on the remainder by the extreme shriveling.

Some of the seeds from my experiment were apparently infested by the purple seed-stain fungus, *Cercospora kikuchii* (Mat. & Tomoy). Kilpatrick and Hartwig, 1955, found that stink bug injury is not important in the spread of this fungus. My findings agree; purple seed-stain was not associated with level of infestation in the cages (Table 1), and only a few of the stained seeds bore feeding punctures. There is no possiblity of punctures being obscured because none of the stained seeds were severely shriveled.

Table 1 shows that damaged seeds were much lighter than undamaged seeds. The mean weights of all seeds damaged by *T. perditor* and *A. marginatum* respectively were 27% and 22% less than the mean weights of undamaged seeds from the same plants.

In addition to the above experiment, I assessed the extent of stink bug damage to a commercial soybean planting at Palmira by examining the mature seeds from 12 plants picked at random from a field of 'I.C.A. Pelicano' which, when the plants were green, had an infestation of *Acrosternum marginatum*, *Euschistus crenator*, *Piezodorus guildinii* and *Thyanta perditor*. Twenty-eight percent of the 2178 seeds had been injured. The uninjured seeds had a mean weight of 0.186 g each, while the injured seeds weighed only 0.130 g each, a weight reduction of 30%. If the same level of injury prevailed throughout the field, the yield had been reduced 8.5% by weight. This proportional relationship between the percentage of damaged seeds and the overall reduction in yield is remarkably similar to that obtained by Miner, 1966. He found an overall yield reduction of 8.4% when comparing stink bug infested plants with 33% damaged seeds with control plants with 9% damaged seeds.

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RESUMO

Testes de campo com plantas de soja mantidas em gaiolas, nas proximidades de Palmira, Colombia, demonstraram que duas espécies de percevejos (Hemiptera: Pentatomidae) -- *Thyanta perditor* (F.) e *Acrosternum marginatum* (Beauv.), causam dano à soja através de picadura das vagens. Estas espécies são as mais comuns nos campos de soja daquela região. O dano consistindo de perfurações, enrugamento da casca da semente e descoloramento dos cotilédones, corresponde a descrições publicadas sobre o dano causado por percevejos da soja no Brasil e nos Estados Unidos.