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**FEEDING PREFERENCE STUDIES OF ADULT
NEZARA VIRIDULA (HEMIPTERA: PENTATOMIDAE)
MORPHS FROM INDIA AND THE UNITED STATES**

Jerald R. DeWitt¹ and Edward J. Armbrust²

ABSTRACT

Nezara viridula (Linnaeus) morphs from India and the United States were studied in a laboratory comparison of feeding preferences for pods of soybeans, *Glycine max*, and green beans, *Phaseolus vulgaris*. Adults of a morph from the U.S. apparently selected pods at random, while three sympatric morphs from India generally preferred green bean pods.

Nezara viridula (Linnaeus), the southern green stink bug, is a polymorphic pest of cosmopolitan distribution. Although nine distinct morphs of adults (f. = forma) showing variations in color have been described, only three morphs are relatively common (Yukawa and Kiritani, 1965; Singh, 1972). In North America only a single morph f. *smaragdula*, is found, but in Asia several sympatric morphs are common: f. *smaragdula*, f. *viridula*, and f. *torquata*.

N. viridula is a polyphagous feeder attacking a wide variety of hosts including at least 27 legume species (Hoffman, 1935). Soybeans, *Glycine max*, in the United States suffer economic damage from this pest (Kilpatrick and Hartwig, 1955; Miner, 1961). Singh (1972) reported that soybeans are suitable, and at times preferred hosts for *N. viridula* in India.

Few studies have been reported citing differences between *N. viridula* morphs. Kiritani (1970) concluded that f. *smaragdula*, f. *viridula*, f. *torquata* and a fourth type from Japan did not show appreciable differences in survival rate, developmental period of nymphs, fresh body weight of adults, or pre-oviposition period. It was reported that f. *smaragdula* may be superior to other morphs in reproductive ability but inferior to f. *viridula* and f. *torquata* in overwintering survival. DeWitt and Armbrust (1973) showed that allopatric f. *smaragdula* from the U.S. and Asia did not differ in weight and body width and length, but both were larger than f. *torquata* and f. *viridula* from Asia.

One adult morph from the United States and the three adult morphs from India were studied in a laboratory comparison of feeding preferences and frequencies on the pods of various legumes and the results are reported here.

MATERIALS AND METHODS

Adults were reared as nymphs on garden green bean *Phaseolus vulgaris*, pods, in clear plastic containers 13.5 cm tall by 11 cm diam, and were maintained at 26° ± 1°C, 15 hour light photoperiod, 60-70% relative humidity. Adults to be studied were randomly selected from cages containing individuals 5 to 15 days old. All adults were held without food for 12 hours before the initiation of the test.

The test arena was a 15-cm-diam clear glass petri dish. Within the arena, four sections of legume pods (each 2.5 cm long) were placed in the four quadrants on a piece of filter paper. Each test consisted of two standard green bean pods at opposite sides in the arena and two soybean pods which were placed in the remaining two quadrants. An adult *N.*

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viridula was placed within the test arena, and the lid was set in place. The insect was allowed to adjust to the test arena for one hour before observations were initiated. Ten consecutive observations were made at 1/2-hour intervals. The feeding of the insect on any pod was recorded at each observation.

Nine varieties of succulent soybean pods were tested: Harosoy-N (normal pubescence), Harosoy-D (dense pubescence), Clark-N (normal pubescence), Clark-D (dense pubescence), Hill, PI 171451, PI 227687, PI 243519, and PI 243525.

To determine pod preference between each soybean variety and green beans, Chi-square comparisons were made for each morph and for all morphs combined. Chi-square comparisons also were used to indicate general preference for green bean or soybeans without regard for variety.

RESULTS AND DISCUSSION

After data were analyzed, the feeding responses were reported as a) preference for the standard or green bean pod (G), b) preference for the test or soybean pod (S), or c) no preference for either pod (np). Comparisons (Table 1) showed that more morphs generally preferred feeding on the standard or green bean pod than on the test or soybean pod. Morphs preferred the green bean pod in five of nine varietal tests. However, when PI227687 and PI243519 were tested, most morphs preferred the test pod or soybean pod over the standard. The latter pod was unusually large and was sliced to approximately the size of the standard or green bean pod. Perhaps increased volatility of certain chemicals present in the sliced pod caused the observed response. In two tests (varieties Clark-D and Hill) preference was not indicated by most morphs. The strongest overall indication of green bean pod preference was when PI243525 was tested. Only one morph, *f. smaragdula* from the U.S., readily fed on this pod while all other morphs preferred the standard.

Comparisons for combined soybean varieties for each morph indicated that only *f. smaragdula* from the U.S. did not show significant deviations in preference. These data indicate that the U.S. morph selected the host pods at random in these tests. The same morph from India and *f. viridula* and *f. torquata* did not select hosts at random, but significantly preferred the standard or green bean pod.

These data suggest that the *f. smaragdula* population from the U.S. may tend to accept a different host more readily than most morphs from India. It did not show a preference in seven of nine tests. The U.S. morph, if confronted with a choice between soybean and green bean pods, may more readily feed on the soybean pod than any of the Indian morphs. One Indian morph, *f. viridula*, preferred soybean pods in three tests

Table 1. Comparisons of adult *Nezara viridula* morphs feeding on pods of soybeans *Glycine max*, and green beans, *Phaseolus vulgaris*.

Soybean variety	Preference by <i>N. viridula</i> morphs				All morphs
	<i>f. smaragdula</i> (Asia)	<i>f. smaragdula</i> (U.S.)	<i>f. viridula</i>	<i>f. torquata</i>	
Harosoy-N	G	G	S	G	G
Harosoy-D	G	np	G	G	G
Clark-N	G	np	np	G	G
Clark-D	np	np	np	np	np
Hill	G	np	np	np	np
PI 171451	np	np	G	G	G
PI 227687	S	np	S	np	S
PI 243519	np	S	S	S	S
PI 243525	G	np	G	G	G

S = *Glycine max*, G = *Phaseolus vulgaris*, np = no preference. Preferences are significant at 0.05 level.

and fed on both soybean and green bean pods at random in three other tests. These data suggest that this morph may be more similar to the U.S. morph in host feeding than f. *smaragdula* and f. *torquata* from India. All Indian morphs, however, did prefer soybeans in at least one test. Singh (1972) observed that soybeans are fed on in central India by *N. viridula* morphs when this crop fills a gap between the maturation of green gram and fruiting of red gram. He indicated* that the insect did not move into the field until fruiting structures appeared. DeWitt (1972) observed that f. *smaragdula* from the U.S. did not mate or oviposit when fed only nonfruiting structures of soybean leaves or celery in the laboratory.

Although *N. viridula* is considered to be a polyphagous insect (Hoffman, 1935) a morph which more readily accepts different hosts may have a competitive advantage in dispersion and establishment in new regions. The spread of the southern green stinkbug has been marked by the initial observation of only f. *smaragdula* in almost all new regions of expansion. The initial record of this insect in the western hemisphere was of f. *smaragdula* in the West Indies in 1798 (Fabricius, 1798). This was followed by this morph's discovery in Cuba in 1857 (Sagra, 1857). The first observation in the U.S. was of f. *smaragdula* in Texas in 1880 (Distant, 1880). Although data from this study show that f. *viridula* from India may be similar to f. *smaragdula* from U.S. in host preference, DeWitt (1972) observed that the latter morph possesses greater fertility and fecundity than the former morph. These factors, perhaps, would tend to negate the ability of f. *viridula* to readily accept a new host and successfully establish in a new region.

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