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Screening Soybean (*Glycine max* (L) Merril) lines for morphological resistance to the southern green stink bug, *Nezara viridula* (L) (Hemiptera: Pentatomidae).

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Abstract

A study was carried out during the first and second seasons of 1997 at Namulonge Agricultural and Animal Production Research Institute (NAARI) to determine whether there were some soybean varieties in the NAARI germplasm which were resistant to the southern green stink bug, *Nezara viridula* and to establish the basis of morphological resistance to this stink bug. Some morphological characteristics of the soybean plant were considered for the study. During the first season, the soybean genotypes NG11-36/93A, NG11-9/93A and NG2-19/92A were significantly less infested by the stink bugs, while NG9-5/92A and NG1-23/92A were the most infested. In the second season, the most infested genotypes were NG1-28/92A and NG9-5/92A. The correlation coefficients between the stink bugs and the selected soybean morphological characteristics were very low but significant at P = 0.05. This suggested that the resistance observed was not only attributed to morphological factors, but to many other factors probably bio-chemical factors causing antibiosis.

Keywords: Soybean, Nezara viridula, resistance

Introduction

The southern green stink bug, *Nezara viridula* is one of the major insect pests damaging soybean. Damage is mainly on the fruiting structures and this results into high yield losses of 25 - 60% (Jackai *et al*, 1986). Studies show that farmers rely on insecticides to control stink bugs (IITA, 1985). Besides insecticides being expensive, they are harzadous to the environment. As an alternative to chemical control, it is necessary to emphasise measures that are affordable to farmers and are environmentally friendly such as resistant cultivars.

Objectives of the study

The objectives of the study were therefore:

(i) To determine whether there were some soybean varieties in the NAARI germplasm which are resistant to the southern green stink bug

(ii) To establish the basis of morphological resistance to the southern green stink bug in soybean

Materials and methods

The study was carried out at NAARI during the first and second rains of 1997. Fifteen soybean genotypes were used in the experiment namely:- NG2-19/92A, NG2-20/92A, NG1-23/92A, NG1-25/92A, NG1-28/92A, NG1-33/92A, NG9-5/92A, NG9-6/92A, NG3-4/92A, NG11-9/93A, NG11-19/93A, NG11-36/93A, NG9-14/92A, DSPS and NAM1. The soybean was planted in a randomised complete block design at a spacing of 60 cm and 5cm between and within the rows respectively.

Data collection and analysis

~~Data were collected for plant heights, trichome lengths,~~ trichome density on leaves and pods, days to maturity and stink bug populations. All the data were analysed using MSTATC statistical programme. Multi-regression, MSTATC statistical sub programme was used to obtain correlation matrices of the variables.

Results

Results from this study showed significant differences (P = 0.05) in leaf and pod trichome densities, plant heights and days to maturity among the 15 soybean genotypes (table 1).

Table 1. Summary of the ANOVA table for the selected soybean morphological characteristics
(a) Season1 (97a)

	Plant height	Abaxial trichome density	Adaxial trichome density	Pod trichome density	Days to maturity
Source	genotype	genotype	genotype	genotype	genotype
Degrees of freedom	14	14	14	14	14
F-value	9.34	3.96	6.67	3.45	4.01
Prob	0.0000	0.0073	0.0005	0.0136	0.0009

(b) season 2 (97b)

	Plant height	Abaxial trichome density	Adaxial trichome density	Pod trichome density	Days to maturity
Source	genotype	genotype	genotype	genotype	genotype
Degrees of freedom	14	14	14	14	14
F-value	20.22	11.45	30.4	4.44	11.35
Prob	0.0000	0.0000	0.0000	0.0043	0.0000

Stink bug population densities on the 15soybean genotypes

Results of the stink bug populations are presented in table 2. The mean number of stink bugs varied very significantly at P = 0.05 in the soybean genotypes. The highest populations were recorded on the genotypes NG9-5/92A and NG1-23/92A while the lowest populations were observed on NG11-36/93A.

Table 2. Stink bug population densities on the 15 selected soybean genotypes

Genotype	*population density per two rows
NG2-19/92A	0.064 bc
NG2-20/92A	0.104 abc
NG1-23/92A	0.339 ab
NG1-25/92A	0.243 abc
NG1-28/92A	0.195 abc
NG1-33/92A	0.176 abc
NG9-5/92A	0.369 a
NG9-6/92A	0.176 abc
NG3-4/92A	0.072 bc
NG11-9/92A	0.060 bc
NG11-19/92A	0.160 abc
NG11-36/93A	0.020 c
NG9-14/92A	0.112 abc
DSPS	0.192 abc
NAM1	0.217 abc
LSD(5%)	0.2931

*Means separated after log (x+1) transformation

Correlation matrices between the stink bug populations and the soybean morphological characteristics

Positively significant correlations were observed between plant heights, maturity periods and the stink bug populations. On the other hand, negative correlations were observed between the trichome densities and the stink bug populations (table 3).

Table 3. Correlation matrices between the stink bug populations and the soybean morphological characteristics

	Plant height	Adaxial trichome density	Abaxial richome density	Pod trichome density	Days to maturity
Season 1					
Correlation matrix	0.455	-0.196	-0.177	-0.045	0.070
Probability	0.011*	0.029*	0.035*	0.014	0.021*
Season 2					
Correlation matrix	0.266	-0.226	-0.258	-0.052	0.388
Probability	0.001*	0.011*	0.047*	0.016*	0.034*

*corrections signficant at P = 0.05

Discussion and conclusion

Results from this study indicated that there was differential preference by *Nezara viridula* for certain soybean genotypes. A negative correlation observed between the trichome densities and the stink bug populations suggests that there were low stink bug populations on soybeans with high trichome densities. This is in agreement with Daugherty *et al.*, (1964) who reported that trichome density on the adaxial and abaxial leaf surfaces interfere with feeding and ovipositional behaviour. The positive correlation between the maturity periods and the stink bug populations indicate that the longer the soybean crop stayed in the field the more it was exposed to stink bug infestation. Similarly, tall soybean genotypes were found to be an important attraction of the stink bugs.

Generally, this study revealed that some morphological traits such as high trichome densities, short maturity periods and short growth habits exhibited by some soybean genotypes make stink bugs reluctant to colonise plants (non-preference) while others such as low trichome densities, tall growth habits and long maturity periods favour the insects. Genotypes NG11-36/93A, NG11-9/93A and NG2-19/92A posses the former traits and they were found resistant to *Nezara viridula*. Genotypes NG9-5/92A, NG1-23/92A and NG1-28/92A posses the latter traits. The study therefore revealed that non-preference is not an extaminant. It should however be noted that non-preference may be useful if there are alternative hosts. In absence of alternative hosts, it may break down. This implies that non-preference should not be a basis for a breeding programme.

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