

FIELD AND GREENHOUSE SCREENING FOR RESISTANCE TO LEAFHOPPERS AND THRIPS  
IN COWPEA

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Of the many insect pests of cowpea, the cowpea foliar thrips, Sericothrips occipitalis Hood, and the green leaf hoppers, Empoasca spp., are particularly damaging and have been reported as major insect pests during the pre-flowering plant growth stage in the southern part of Nigeria. Infestations of cowpea foliar thrips are particularly severe during the first season (March-April) and heavy populations (up to 15 per plant) have been encountered on young cowpea plants at IITA during the first season of 1975. Thrips usually feed on the surfaces of leaf tissues, inducing a severe veinal and epidermal necrosis that results in the formation of a silvery sheen, due to air occupying the empty cell cavities. Severely infested plants die at seedling stage and less infested plants are stunted with distorted leaves. The foliar thrips have also been reported to transmit cowpea mosaic virus. It is suspected that they also damage foliage buds and flower buds and may also mechanically carry several foliage and stem diseases. Investigations are being conducted at IITA to check these observations.

Leaf hoppers (Empoasca spp.) are mainly present in large numbers during the late season. Heavy populations were recorded during August to November 1974, causing severe damage to the young cowpea crop. They suck the plant sap, resulting in stunted plants with curled leaves. In susceptible cowpea cultivars the leafhopper damage can reduce yields by more than 50%. Earlier the leafhoppers on cowpeas were identified as Empoasca fascialis. Recent identification has indicated it to be Empoasca dolichi.

Use of insecticides has been the only method for protecting cowpea crops from damage caused by these insects. Recent studies at IITA have found that certain cowpea cultivars are moderately resistant to these insects. Reported herein are studies undertaken to identify additional sources of resistance in cowpea varieties and the nature of resistance in resistant cultivars.

A total of 4,705 entries representing a large part of the World Cowpea Germplasm at IITA were screened for resistance to leafhoppers and thrips under field conditions during the late season 1974. All the cowpea accessions were planted in a single 3 meter row. Cowpea cultivar TVu 76 was used as a control and 1 meter space row of this cultivar was planted along with each cowpea accession used in screening for resistance. Plant damage was rated by a 5 point scale: 1 = 0-1%, 2 = 2-5%, 3 = 6-25%, 4 = 26-50%, 5 = 51-100%. A plant was considered significantly damaged if more than 25% of the leaf was damaged. Damage less than 25% (categories 1, 2 and 3) was assumed not to affect plant growth significantly. Plant damage was rated when there were distinct damage symptoms on the susceptible control.

A total of 800 cowpea varieties indicated high to moderate levels of resistance to leafhoppers and thrips. All these cultivars were replanted during the early season of 1975 and damage comparisons for leafhoppers and thrip damage were made with some of the known resistant and susceptible cultivars of cowpea. A total of 100 cowpea cultivars have been identified with high degree of field resistance. All these cultivars will be further evaluated.

Field experiments conducted at IITA revealed that some cowpea cultivars - TVu 1190E, TVu 662E, TVu 123, and TVu 59 - indicated a certain level of resistance of leafhoppers. Greenhouse tests were carried out on these cultivars to determine the causes of resistance.

The cumulative effects of varietal resistance on leafhopper population were investigated by confining an identical number of leafhoppers separately on resistant and susceptible cultivars of cowpea. The number of early instar and late instar nymphs developing from each cowpea cultivar were observed periodically. The results obtained indicate that TVu 662E is highly resistant to the green leafhopper. Infestations of individual 12-day old seedlings with 30 adults leafhoppers caused no damage. The fecundity studies indicated that there was either a lack of feeding stimulus or some toxic materials which interfered with the growth and development of the green leafhopper.

Cowpea cultivars TVu 59, TVu 123, and TVu 1190E indicated tolerance. TVu 59 had in addition a certain level of antibiosis. Cultivars TVu 533 and TVu 76 were susceptible, supported greater numbers of nymphs and were severely damaged at the end of 18 days after infestation. All the test plants in these two cultivars died within 20 days after infestation. All the test plants in the other four resistant cultivars survived beyond the observation period, 50 days after infestation. TVu 662E was rated 1, TVu 59 as 2, and TVu 1190E and TVu 123 as 3 at 50 days after infestation, indicating that the resistant cultivars varied in their damage reaction to leafhoppers.

The identified resistant varieties are being used in a hybridization program that seeks to combine leafhopper resistance with improved plant type and other desirable characters.

Table 1. Fecundity of 30 leafhoppers Empoasca dolichi on resistant and susceptible cowpea cultivars in greenhouse tests at 14 days after infestation. IITA April 1975

| Cultivar  | Resistant Rating | Nature of Resistance identified | Fecundity     |                   | Total Nymphs | Damage Rating* (20 days after infestation) |
|-----------|------------------|---------------------------------|---------------|-------------------|--------------|--|
|           |                  |                                 | Instars 1 & 2 | Instars 3, 4, & 5 |              |  |
| TVu 662   | Resistant        | Antibiosis                      | 0.0           | 0.0               | 0.0          | No visible damage                          |
| TVu 59    | Resistant        | Tolerance/<br>Antibiosis        | 22.0          | 6.0               | 28.0         | 2 to 5% of leaves curled and yellow        |
| TVu 123   | Resistant        | Tolerance                       | 69.0          | 17.0              | 86.0         | 6 to 25% of leaves curled and yellow       |
| TVu 1190E | Resistant        | Tolerance                       | 58.0          | 7.0               | 56.0         | 6 to 25% of leaves curled and yellow       |
| TVu 533   | Susceptible      |                                 | 72.0          | 17.0              | 89.0         | All test plants dead                       |
| TVu 76    | Susceptible      |                                 | 163.0         | 19.0              | 182.0        | All test plants dead                       |

\*All resistant test plants survived beyond 50 days after infestation observation period.