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# Correlations of biophysical and biochemical characters with shoot bug incidence in *rabi* sorghum

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## ABSTRACT
The studies were carried out during *rabi* 2004-05 on selected twenty sorghum genotypes with varied level of shoot bug infestation. The plant morphological characters (plant height, distance between two leaves, number of leaves per plant and leaf angle) and biochemical parameters (total sugar, reducing sugar and total phenols) were correlated with shoot bug population recorded at 45 days after emergence of the crop. There was no significant correlation between any of the morphological characters and shoot bug infestation. However, there was a positive correlation between plant height, distance between leaves and leaf angle with shoot bug. Whereas, number of leaves per plant showed negative correlation with shoot bugs. Similarly, there was no significant correlation between shoot bug population and the biochemical constituents of all the twenty sorghum genotypes selected for comparison. Even then reducing sugars was positively correlated whereas, total sugars and total phenols were negatively correlated. However, these correlations were non-significant and very weak.

**Key words:** Biophysical, Biochemical parameters, Shoot bug, Sorghum.

## INTRODUCTION

Sorghum is vulnerable to over 150 insect species from sowing to the final crop harvest (Sharma, 1985). Among the different insect pests of sorghum the shoot bug, *Peregrinus maidis* (Ashmead) (Homoptera : Delphacidae) previously considered to be of minor importance, but now with the introduction of new sorghum genotypes of different maturity periods in certain parts of Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu has become a serious pest. According to Hosamani and Chittapur (1997), shoot bug can cause a crop loss to an extent of 41 per cent.

Both macropterous and brachypterous nymphs and adults suck the sap from the leaves by congregation in the plant whorl and inner sides of the leaf sheath. Severe attack of shoot bug results in leaf chlorosis, stunted growth, shriveled and chaffy grains (Prabhakar *et al.*, 1981). The top leaves start drying first, but leaf death gradually extends to older leaves and some times, death of the whole plant occurs. Severe infestation at boot leaf stage results in twisting of top leaves thus preventing the emergence of panicles (Agarwal *et al.*, 1978). Further, the honey dew excreted by nymphs and adults favours the growth of sooty mould fungus (*Capnodium* sp.) which inhibits the photosynthetic activity. It was also reported as a vector of sorghum stripe disease (SStD) and the other hosts of shoot bug include maize, bajra, sugarcane, ragi and other grasses (Peterschmitt *et al.*, 1991)

## MATERIALS AND METHODS

This trial was carried out during *rabi* 2004-05. Sixty five entries received from National Research Centre for Sorghum, Hyderabad and fifteen entries from Senior Sorghum Breeder, RARS, Bijapur were used for screening against shoot bug. Totally eighty lines were screened against shoot bug under field conditions. Each genotype was sown in two rows of 3.5 m length with a spacing of 60 x 15cm with two replications on 4-10-2004. All the recommended package of practices was followed except plant protection measures. Five plants in each genotype were selected randomly for observations. Varietal susceptibility to shoot bugs was assessed, by scoring number of shoot bugs (both adults and nymphs) per plant on these five plants at 45 days after emergence of the crop.

Based on preliminary screening results, twenty genotypes with varied level of shoot bug infestation were selected for ascertaining the probable cause of resistance. The test entries included 104B, M 31-2B, RS 29, SPV 1626, M 148-138, RS 615, IS 2312, IS 37190, JP 1-1-5, M 35-1, DSV 4, DSV 5, SFR 7, 61505, 61506, 61507, 61512, 61532, 61551 and Hathi kunta. Plant morphological characters like plant height, distance between two leaves, number of leaves per plant and leaf angle were recorded at milky stage of the crop. These plant morphological characters were correlated with shoot bug population recorded at 45 days after emergence of the crop. Leaf samples collected from field at 45 days after sowing were subjected to biochemical analysis. Biochemical constituents namely total sugar, reducing sugar and total phenols in leaves of sorghum genotypes were determined. These biochemical parameters were correlated with the shoot bug population recorded on different genotypes.

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## RESULTS AND DISCUSSION

### *Correlations of biophysical characters with shoot bug:*

There was no significant correlation between any of the morphological characters and shoot bug infestation. There was a positive correlation between plant height, distance between leaves and leaf angle with shoot bug. Whereas, number of leaves per plant showed negative correlation with shoot bugs. The genotypes *viz.,* 61507 and 61512 were having less plant height, less distance between leaves and less leaf angle than others. While the population of shoot bug was more in case of Hathi kunta, 61506 and 61532, which were susceptible to infestation by shoot bug where number of leaves per plant was less (Table 1). However, these correlations are non-significant and very weak.

### *Correlations of biochemical constituents with shoot bug:*

There was no significant correlation between shoot bug population and the biochemical constituents of all the twenty sorghum genotypes selected for comparison. Even then reducing sugars positively correlated whereas, total sugars and total phenols negatively correlated. The genotypes having less reducing sugars *viz.*, SPV 1626, JP 1-1-5 and DSV 4 and 104B recorded more infestation of shoot bug population. Total sugars and total phenol showed very weak correlations with shoot bug population. The maximum number of shoot bug population was recorded in genotypes having less total sugar *i.e.* M 35-1, 61532 and IS 37190. Similarly, for total phenols, the genotypes *viz*, IS 37190, DSV 4 and M 35-1 showed less total phenols (Table 1). The higher content of total phenols in the genotypes 61506, JP 1-1-5, 104B and Hathi Kunta which recorded more number of shoot bug populations per plant. The plant secretes total phenol as a defensive mechanism against the infestation of shoot bug. These findings are in agreement with Mote and Shahane (1994) who reported increased content of total phenol in infested plant that resulted in suppression of pest by hindering the food digestion particularly protein digestion in insects.

Table 1: Bio-physical and bio-chemical characteristics of the sorghum genotypes and their correlations with shoot bug incidence

| Sl. No. | Genotype | Shoot bug population (no./plant) | Plant height (cm) | Distance between leaves (cm) | No. of leaves/ plant | Leaf angle (degrees) | Reducing sugars (%) | Total sugars (%) | Total phenols (mg/g) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 104B | 8.5 | 93.4 | 18.2 | 7.6 | 72.3 | 1.46 | 5.43 | 3.06 |
| 2 | M 31-2B | 2.5 | 133.0 | 14.6 | 11.0 | 74.5 | 1.17 | 5.49 | 2.80 |
| 3 | RS 29 | 1.9 | 99.4 | 14.4 | 8.2 | 63.3 | 2.03 | 5.14 | 2.96 |
| 4 | SPV 1626 | 5.4 | 179.2 | 18.2 | 10.0 | 68.5 | 0.95 | 5.73 | 2.77 |
| 5 | M 148-138 | 6.3 | 126.6 | 17.8 | 7.6 | 66.8 | 1.17 | 4.76 | 2.72 |
| 6 | RS 615 | 7.2 | 119.4 | 14.2 | 9.4 | 65.4 | 1.27 | 5.17 | 2.73 |
| 7 | IS 2312 | 4.1 | 131.2 | 14.0 | 10.6 | 66.3 | 1.17 | 5.16 | 2.16 |
| 8 | IS 37190 | 12.1 | 153.8 | 14.2 | 9.8 | 64.0 | 1.77 | 4.94 | 2.26 |
| 9 | JP 1-1-5 | 9.3 | 142.2 | 12.4 | 13.2 | 62.8 | 1.01 | 4.72 | 3.06 |
| 10 | M 35-1 | 11.5 | 134.2 | 16.8 | 9.0 | 70.8 | 1.54 | 4.69 | 2.76 |
| 11 | DSV 4 | 12.5 | 140.6 | 16.2 | 9.6 | 69.7 | 1.27 | 5.65 | 2.96 |
| 12 | DSV 5 | 10.3 | 162.0 | 14.6 | 11.0 | 62.7 | 2.71 | 5.73 | 2.66 |
| 13 | SFR 7 | 7.3 | 167.2 | 19.8 | 9.0 | 61.6 | 2.51 | 5.64 | 2.98 |
| 14 | 61505 | 4.9 | 78.0 | 9.0 | 8.4 | 72.8 | 1.63 | 5.61 | 3.01 |
| 15 | 61506 | 12.1 | 71.0 | 11.4 | 6.2 | 72.6 | 1.54 | 5.64 | 3.40 |
| 16 | 61507 | 2.6 | 39.2 | 4.9 | 11.2 | 66.1 | 1.24 | 4.96 | 3.43 |
| 17 | 61512 | 2.8 | 41.9 | 6.3 | 9.8 | 58.6 | 2.01 | 5.66 | 2.92 |
| 18 | 61532 | 8.2 | 99.0 | 13.5 | 6.6 | 74.5 | 1.96 | 4.92 | 2.92 |
| 19 | 61551 | 5.3 | 81.8 | 10.9 | 7.6 | 69.9 | 2.12 | 5.32 | 3.16 |
| 20 | Hathi Kunta | 10.2 | 85.2 | 21.8 | 6.0 | 79.0 | 2.41 | 5.78 | 3.15 |
| Correlation coefficient (r) with shoot bugs | | - | + 0.34 | + 0.41 | - 0.21 | + 0.22 | + 0.14 | - 0.02 | - 0.05 |

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