GENETIC STUDIES OF SORGHUM CULTIVARS UNDER STRIGA INFESTATION IN NORTHERN GUINEA SAVANNAH OF NIGERIA.

SHOWEMIMO F.A., KIMBENG C.A.

Abstract

Performances of five genetically diverse but homozygote sorghum cultivars were studied under uniform Striga infestation for three years in one location, using randomized complete block design with three replications. The genotypic performance revealed enough variability for further improvement. KSV -4 and SK -5912 are least affected by Striga activities, with their resistance dominant over susceptibility, thus, they are promising resistant cultivars. Genetic analysis revealed genetic component of variance to be higher in magnitude for shoot weight, Striga count and grain yield than those of genotype x year and error component of variance. Inheritance of Striga resistance traits was quantitatively inherited for grain yield (89.96%), Striga count (88.53%), plant height (82.75%), plant vigour (81.33%) and stem girth (51.74%).

Key words: Variance components, heritability, genotypic performance, resistance, sorghum, Striga.

INTRODUCTION

Sorghum (Sorghum bicolor (L.) Moench), commonly called Guinea corn is mainly grown in the tropics and Semi-Arid Tropics, which include Asia and Africa. The grains are harvested for food, animal feeds and other industrial uses (Baidu -Forson and Ajayi, 1995). Recent statistics revealed that percentages of world area and production are on the decline principally due to devastating effect of Striga hermonthica in Semi-Arid Tropics especially in Nigeria, crop loses of up to 90% and an estimated $250 million US are lost due to Striga activities annually (FAO, 1987; Lagoke et al, 1991).

Preliminary and confirmed studies have shown the importance of some agronomic traits in response to Striga. Such traits serve as resistance traits or selection criteria on the basis of their significant genetic variability and correlations (Obilana, 1981; Showemimo et al, 1998; Showemimo, 2003). Knowledge of inheritance of resistance to Striga, genetic variance components and genotypic performance would, therefore, be useful in developing Striga resistant cultivars or genotypes.

This paper reports the genotypic performance, mode of inheritance and magnitude of genetic variance controlling Striga resistance traits in sorghum under Strigainfested field condition for a period of three years in one location.

MATERIALS AND METHOD

The plant materials used for this study are elite sorghum cultivars adapted to the northern Guinea, Sudan and Sahel Savannas of Nigeria (SK -5912, KSV -4, NR-71150, NR-71182 and L-2123).

RESULTS AND DISCUSSION

The research was carried out in the research field of Institute for Agricultural Research Samaru (11°11’N; 07038’E at 686m above sea level), Nigeria. Five sorghum cultivars (referred herein as genotypes) were evaluated for three cropping seasons in one location to avoid Striga spread under uniform Striga infestation following the procedures of Vasudeve Rao (1985). The experiment was laid in randomized complete block design, replicated three times. The plot size was 5m long, 0.75m x 0.25m inter and intra row spacing respectively. Single superphosphate fertilizer was applied at 32kg/ha before planting, while Urea fertilizer was applied in two dosages; 32kg/ha as basal and another 32kg/ha as top dressing 3 and 6 weeks after planting. Weeds apart from Striga hermonthica were manually removed regularly. Other cultural managements to raise a successful was done as prescribed by IAR, (1993)

Data analysis were done for plant vigour (1-5 Visual scale), stem girth (cm), root weight (gm), shoot weight (gm), plant height (cm), Striga count and grain yield (t/ha). Square root data transformation was done for count data. Genetic analyses were done to obtain estimate of variance components $\delta_p^2$ = phenotypic, $\delta_g^2$ = genotypic $\delta_{py}^2$ = genotype x year, $\delta_e^2$ = experimental error) and broad sense heritability ($h^2$). Performance analyses were done to obtain means and analysis of variance as outlined by Comstock and Robinson, (1952); Snedecor and Cochram, (1967); Singh and Chaudhary, (1979); Gomez and Gomez, (1984).
Tab. 1.: Mean grain yield of five sorghum cultivars under *Striga* evaluation.

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Mean grain yield (t/ha)</th>
<th>Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Infested</td>
<td>Non-infested</td>
</tr>
<tr>
<td>SK-5912</td>
<td>2.2</td>
<td>2.5</td>
</tr>
<tr>
<td>KSV-4</td>
<td>2.0</td>
<td>2.1</td>
</tr>
<tr>
<td>NR-71150</td>
<td>1.1</td>
<td>2.0</td>
</tr>
<tr>
<td>NR-71182</td>
<td>1.5</td>
<td>2.3</td>
</tr>
<tr>
<td>L-2123</td>
<td>1.6</td>
<td>2.2</td>
</tr>
<tr>
<td>Mean</td>
<td>1.68</td>
<td>2.22</td>
</tr>
<tr>
<td>C.V (%)</td>
<td>17.6</td>
<td>13.9</td>
</tr>
</tbody>
</table>
Tab. 2.: Estimates of components of variance and heritability (%) for seven *Striga* resistance evaluation traits in sorghum.

<table>
<thead>
<tr>
<th>Component</th>
<th>Plant vigour</th>
<th>Stem girth</th>
<th>Root weight</th>
<th>Shoot weight</th>
<th>Plant height</th>
<th>Striga count</th>
<th>Grain yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\delta^2_p)</td>
<td>0.1189</td>
<td>0.0288</td>
<td>0.7213</td>
<td>14.1051</td>
<td>75.2500</td>
<td>24.5268</td>
<td>0.0757</td>
</tr>
<tr>
<td>(\delta^2_g)</td>
<td>0.0064</td>
<td>-0.0044</td>
<td>0.0397</td>
<td>2.0093</td>
<td>4.2169</td>
<td>2.3589</td>
<td>0.0078</td>
</tr>
<tr>
<td>(\delta^2_{gy})</td>
<td>0.0137</td>
<td>0.0134</td>
<td>0.1027</td>
<td>0.1584</td>
<td>11.0021</td>
<td>1.9400</td>
<td>0.0064</td>
</tr>
<tr>
<td>(\delta^2_e)</td>
<td>0.0169</td>
<td>0.0011</td>
<td>0.0484</td>
<td>0.9409</td>
<td>3.9601</td>
<td>1.7424</td>
<td>0.0025</td>
</tr>
<tr>
<td>H (Bs)</td>
<td>81.33</td>
<td>51.74</td>
<td>5.50</td>
<td>14.25</td>
<td>82.75</td>
<td>88.53</td>
<td>89.96</td>
</tr>
</tbody>
</table>

Fig. 1: The effect of *Striga* on plant vigour, stem girth and root weight of five sorghum varieties.
**Fig. 2:** the effect of *Striga* on plant height, shoot weight and *Striga* count of five sorghum varieties.

**REFERENCES**


Received for publication on August 14, 2002
Accepted for publication on May 25, 2005

Corresponding author:
SHOWEMIMO F.A.
Department of Plant Science
Institute for Agricultural Research
Ahmadu Bello University PMB1044
Samaru Zaria, Nigeria