Evaluation of S₁ Maize (Zea mays L.) Families at Seedling Stage for Fodder Purposes

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Abstract
Seeds from five hundred S₀ families were used to evaluate their S₁ families for seedling traits. Based on the performance of five hundred S₀ families at seedling stage, the values of coefficients of variation were high for fresh shoot and root weight (29.91 and 36.06%, respectively). Dry root weight was negatively and significantly correlated with fresh shoot length. However, dry shoot weight with fresh shoot length; dry root weight with fresh root length were positively and non-significantly correlated. Fresh shoot weight was found to be significantly and positively correlated with fresh shoot length, fresh root length, fresh root weight, dry shoot weight and dry root weight. However, fresh shoot weight might be used as selection criteria to select promising families for green fodder yield evaluation.

Introduction
Maize (Zea mays L.) is an important kharif fodder crop, adaptable to widely varying climatic and soil conditions. It is extensively grown in the irrigated and rainfed areas of Punjab. The staggered planting of maize from February to September helps cope with the fodder scarcity problems faced in May-June and October-November (Nazir, 1994). Its nutritious fodder is relished by all kinds of livestock especially milch animals. Maize is a cash crop for growers, as around cities it is widely grown for sale as green fodder. Significant variation exists for nutritional quality traits of the stover and whole-plant forage in maize (Wolf et al., 1993). Differences in the rate of dry matter accumulation in different parts of the plant are related to changes in morphological structure. However, peak yield of green herbage occurs at the beginning of milky ripeness (Kirilov and Naidenov, 1990).

The production of maize fodder crop per acre is very low in Pakistan as compared to many other countries of the world. This is because, very little attention has been paid in the past to the improvement of maize as fodder crop. An adequate and regular supply of nutritious fodder is needed in Pakistan for livestock production in order to meet the requirements of milk, meat, butter and other products for human population. Therefore an organized fodder research program is initiated to meet the said problems.

Materials and Methods
In order to initiate this experiment, maize germplasm was collected from different research organizations of the country as indicated in Table 1. From the said maize germplasm, five hundred S₀ families were produced for their further seedling evaluation.

The experiment was conducted in a wire house in the Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad on February 21, 1998. Five hundred S₀ families were raised in 20 blocks and each block was assigned with 25 S₀ families. The experiment was conducted in a modified randomized complete block design with two replications. Ten seeds per family were sown in iron trays filled with river sand by keeping row-to-row and plant-to-plant distances of 5.0 and 3.5 cm, respectively. Water was applied to the seedlings regularly and was not a limiting factor for growth.

Table 1: Sources of Maize germplasm collected from different organizations.

<table>
<thead>
<tr>
<th>Name of the organization</th>
<th>Name of the germplasm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize Section, AARI, Faisalabad</td>
<td>B-42</td>
</tr>
<tr>
<td>Cargil Seed Co. (Pvt.) Lahore</td>
<td>Hybrid-707, 777, 919, 922, 927, 929, 787, 7879</td>
</tr>
<tr>
<td>Dept. Of PBG, UA, Faisalabad</td>
<td>Izono Populations, S, Families</td>
</tr>
<tr>
<td>Univ. College of Agri., Rawalakot, Azad Kashmir</td>
<td>Kashmir Gold</td>
</tr>
</tbody>
</table>

The experiment was harvested after eighteen days planting and data were recorded for fresh shoot length (cm), fresh root length (cm), fresh shoot weight (g), fresh root weight (g). Fresh samples were left for drying in the oven. When they were completely dried, data were recorded for dry shoot weight (g) and dry root weight. Data were analyzed for the analysis of variance technique.
Mehdi and Ahsan: Maize, seedling, correlation, fodder

Steel and Torrie, 1980). Thereafter simple correlation coefficients were estimated by using the method of Kwon and Torrie (1964). Mean and coefficients of variation (CV) were also calculated for each seedling trait.

Results and Discussion

Table 2. Coefficient of variation (CV %) for seedling traits among five hundred S1 families are given in Table 2. The CV (%) magnitudes were found lower for shoot and root length per plant (17.51 and 19.01%, respectively). They were also found lower for fresh shoot weight (CV = 17.85%), dry root weight (CV = 19.47%) and germination percentage (CV = 12.16%). However, the values (CV %) for fresh shoot weight per plant, fresh root weight per plant were found to be higher (29.91 and 31.06%). These results indicate that there was more variability among S1 lines for fresh shoot weight and fresh root weight. Therefore, fresh shoot weight variability will be useful in developing the population for fodder purposes. But, Suwantaradin et al. (1975) compared the selectivity of two sets of arbitrarily assigned relative genetic weight to several agronomic traits in 144 S1 lines maize and reported that both sets were found effective in improving percentage emergence, emergence index and dry matter responses were predicted for other. Dhillon (1991) reported two new methods of selection, alternative parent selection of S1 and half-sib families. The new methods have greater expected genetic gains/year than S1, modified S1, full-sib, modified full-sib, half-sib, diallel ear-to-row and alternative modified S1-half sib selections.

Table 2: Pooled means ± standard deviation and CV% for seedling traits among five hundred S1 families

<table>
<thead>
<tr>
<th>Trait</th>
<th>Mean ± SD</th>
<th>CV%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoot length per plant (cm)</td>
<td>13.72 ± 2.4019</td>
<td>17.51</td>
</tr>
<tr>
<td>Shoot length per plant (cm)</td>
<td>11.12 ± 2.1144</td>
<td>19.01</td>
</tr>
<tr>
<td>Shoot weight per plant (g)</td>
<td>1.29 ± 0.3859</td>
<td>29.91</td>
</tr>
<tr>
<td>Root weight per plant (g)</td>
<td>0.96 ± 0.3462</td>
<td>36.06</td>
</tr>
<tr>
<td>Root weight per plant (g)</td>
<td>0.59 ± 0.1053</td>
<td>17.85</td>
</tr>
<tr>
<td>Root weight per plant (g)</td>
<td>0.15 ± 0.1071</td>
<td>19.47</td>
</tr>
<tr>
<td>Root weight per plant (g)</td>
<td>39.31 ± 11.35</td>
<td>12.16</td>
</tr>
</tbody>
</table>

Table 1: Correlation coefficients for indicated seedling traits among five hundred S1 maize families.

<table>
<thead>
<tr>
<th>Trait</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoot length</td>
<td>0.377*</td>
<td>0.463**</td>
<td>0.191**</td>
<td>0.039*</td>
<td>0.125</td>
</tr>
<tr>
<td>Shoot weight</td>
<td>0.463**</td>
<td>0.222**</td>
<td>0.312*</td>
<td>0.730,*</td>
<td>0.266*</td>
</tr>
<tr>
<td>Root weight</td>
<td>0.191**</td>
<td>0.312*</td>
<td>0.474*</td>
<td>0.423*</td>
<td>0.446*</td>
</tr>
<tr>
<td>Percentage</td>
<td>0.039*</td>
<td>0.109*</td>
<td>0.474*</td>
<td>0.423*</td>
<td>0.847**</td>
</tr>
</tbody>
</table>

*ns = Significant at 5 and 1 per cent level, respectively.

Shoot weight was positively and significantly correlated with fresh shoot length, fresh root length, fresh weight, dry shoot weight and dry root weight. There was positive and significant linear correlation for dry shoot weight with fresh root length and dry root weight. Fresh root weight was positively and significantly correlated with dry shoot weight, dry root weight, fresh shoot and root length. Fresh shoot length was also positively and significantly correlated with fresh root length. But, Li (1993) reported that emergence percentage has been extensively used as an indicator for seedling vigour. Similarly, Fakorede and Ayoola (1980) used emergence percentage, emergence index, dry matter accumulation growth rate and relative growth rate as an indicator for seedling vigour during the first 30 days of growth.

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References


