YIELD AND YIELD COMPONENTS OF MAIZE (ZEA MAYS) CULTIVARS UNDER RAINFED CONDITIONS

BY

MUHAMMAD HUSSAIN, MUZAMMIL HUSSAIN SIDDIQUI, *ABDUL GAFOOR MAGSI, MUHAMMAD JAMIL ABDUL KHALIQ, AND SARDAR ALI
University of Azad Jammu and Kashmir, Faculty of Agriculture, Rawalakot, Pakistan
*Z.A. Bhutto Agricultural College, Dokri, Pakistan Email: f_oad@hotmail.com

ABSTRACT
A field experiment for yield performance of various promising maize cultivars under rain-fed conditions was conducted at Agronomic Research Area, Faculty of Agriculture, Rawalakot, Azad Jammu and Kashmir, Pakistan. The results revealed that maize cultivar Swan-3 had significantly the highest grain weight cob⁻¹ (173.15 g), 1000-seed weight (404.93 g) and harvest index (47.14%), whereas, EV-3001 had the lowest grain weight cob⁻¹ (126.41g) and 1000-seed weight (301.53 g) and Kashmir Gold had the lowest harvest index (36.91%). Agaiti-2002 was significantly at top for cob length (16.9 cm) against the lowest for EV-3001 (14.75 cm). Number of grain rows cob⁻¹ was significantly maximum in Kashmir Gold (13.87) and minimum in EV-3001 (12.16). The cultivars had non-significant variations for plant density, cob diameter, grain yield, biological yield, number of grains row⁻¹ and number of grains cob⁻¹.

Keywords: Maize, Varieties, Harvest, Index, Grains, Cobs, Yield

INTRODUCTION
Maize (Zea mays L.) ranks third most important food crop next to wheat and rice all over the world. Being C₄ plant, it is one of the most physiologically efficient crops in terms of food nutrients and production. It is a miracle crop called as queen of cereals having the high yield potential. It is staple food of the rural population especially in the northern areas of Pakistan and the state of Azad Jammu and Kashmir. Maize seed is a raw material for a number of products viz., starch, glucose, textile, paper, edible oil. The ear shanks are used in the manufacture of chip board, fuel, insulation material etc. In spite of such importance, it has not been paid proper attention for increase in per unit area yield. Among other factors of cultivation, varieties are the most important factor for low yield per unit area. Arif et al. (2001) reported significant variations among three varieties of maize for cob length, number of grains cob⁻¹, cobs plant⁻¹, biological yield, grain yield and grain weight cob⁻¹. Bavec and Bavec (2002) found that cultivars of maize were significantly different for growth and yield parameters. Widdicombe and Thelen (2002) reported significant variation in plant height, seed test weight and grain yield. Alias et al., (2003) recorded significant variation between maize cultivars for plant height, number of grains cob⁻¹, 1000-grain weight, grain yield, stover yield and harvest index. Aslam and Tahir (2003) reported significant variation in grain yield plant⁻¹ among ten lines of maize. Hussain et al. (2003); Shah et al., (2003); Ayub et al. (2004); Rasheed et al. (2004); Sener et al. (2004); Ihsan et al. (2005) also observed great variation among hybrids and local maize genotypes for tasseling, silking, and other maize characters. Looking the previous studies, an attempt was made to explore high yielding varieties for rainfed conditions.

MATERIAL AND METHODS
The experiment was conducted to evaluate promising maize varieties under rain-fed conditions at Agronomic Research Area, Faculty of Agriculture, Rawalakot, Azad Jammu and Kashmir, Pakistan, during
2004.
Four varieties of maize (Kashmir Gold, Agaiti-2002, EV.3001 and Swan-3) were collected from National Agricultural Research Center, Islamabad for evaluation. The experiment was laid out in Randomized Complete Block Design. Nitrogen and phosphorus @ 200 and 100 kg ha⁻¹ as urea and single supper phosphate were incorporated into finely prepared seedbed before the sowing of the experiment. The experiment was sown manually with the help of single row hand drill keeping 70 cm inter-row distance in plots measuring 3.5 m x 2.75 m by using the seed @ 25 kg ha⁻¹. The plots were thinned to maintain the optimum plant population. The plots were kept weed free manually and all the cultural practices were kept normal and at par for all the experimental plots. The data were collected and tabulated at the harvest of the trial. The statistical program “MSTATC” (Freed and Eisensmith, 1986) was used for the analysis of the data.

RESULTS AND DISCUSSION

Plant density
The plant density remained at par among all the entries which ranged from 4.40 to 4.82 plants m⁻². This was due to the maintenance of the optimum plant population for fair competition among the varieties. These results are in line with those of Shah et al. (2003) who recorded the similar plant density among maize cultivars.

Days taken to 50% tassel
The number of days taken to 50% tassel showed significant variation among all the varieties. Agaiti-2002 took the minimum number of days (59.13) to 50% tassel and maximum number of days (74.07) was taken to 50% tassel by EV-3001. These results are supported by Hussain et al. (2003); Sener et al. (2004) and Ihsan et al. (2005) who also noted significant variation among maize varieties for number of days taken to 50% tassel.

Days taken to 50% silk
Analysis of variance depicted significant variation among all the cultivars regarding number of days taken to 50% silk. The least number of days (62.87) was attained by Agaiti-2002 as compared to Swan-3 (64.07 days), EV-3001(77.40 days) and Kashmir Gold (76.4 days). These results are consistent with those of Hussain et al. (2003); Shah et al. (2003) and Ihsan et al. (2005) all reported significant variation for days to 50% silk in various varieties of maize.

Plant height
The maximum plant height (2.13 m) was attained by EV-3001 whereas the minimum plant height (1.58 m) was recorded in Agaiti-2002 followed by Kashmir Gold (1.98 m) and Swan-3 (1.82 m). These results are similar to those of Widdicombe and Thelen (2002 and Ihsan et al. (2005) that plant height is influenced by genotype which is different for maize varieties.

Cob diameter
All the maize varieties for cob diameter showed statistically significant differences. Swan-3 had the highest cob diameter (4.81cm). EV-3001 recorded 4.20 cm, Agaiti-2002 showed 4.48cm and Kashmir Gold exhibited 4.67 cm cob diameter. Sener et al. (2004) also reported that cob diameter depends on the genetical material.

Cob length
The significant variation among maize varieties for cob length was noted, being the maximum (17 cm) in Agaiti-2002 followed by 15.97 cm in Swan-3, whereas, Kashmir Gold and EV-3001 were statistically minimum for cob lengths (14.33 cm and 15 cm cob) respectively. These results are in harmony with those of Sener et al. (2004) and Ihsan et al. (2005) all were in the view that in rain-fed condition the cob length varies in different maize varieties.

Number of grain rows Cob⁻¹
Data concerning number of grain rows cob⁻¹ showed significant variations ranging from 12.97 in Agaiti-2002 to 13.90 in Kashmir Gold. Swan-3 (13.10) was followed by EV-3001 (13.83). These findings are supported by those of Bavec and Bavec (2002) and Shah et al., (2003) who found significant variation among maize cultivars for number of grain rows cob⁻¹.
Number of grains row$^{-1}$
The grains row$^{-1}$ exhibited significant variation among all the maize varieties. Kashmir Gold (35.07) and EV-3001 (33.83) statistically varied with Swan-3 (36.00) and Agaiti-2002 (38.90) which were statistically different. These results confirm the findings of Bavec and Bavec (2002) who reported significant variation among maize varieties for number of grains row$^{-1}$ of maize cob.

Grain yield plant$^{-1}$
The grain yield plant$^{-1}$ was statistically similar in Agaiti-2002 (177.94 g) and Swan-3 (172.37 g) and was significantly different from Kashmir Gold (150.67 g) and EV-3001 (142.64 g). These finding are in line with those of Aslam and Tahir (2003).

1000 grain weight (g)
Grain weight is an important yield component and has strong positive correlation with grain yield in maize. The maize varieties under evaluation varied significantly for 1000 seed weight. Swan-3 had the maximum weight for 1000 seeds (406.09g) and the minimum 1000 seed weight (331.57g) was recorded in EV-3001, whereas, Kashmir Gold and Agaiti-2002 had 344.04g and 391.98.6g 1000 seed weight, respectively. Bavec and Bavec (2002); Winddicombe and Thelen (2002); Alias et al. (2003); Shah et al. (2003); Rasheed et al. (2004) and Ihsan et al. (2005) also reported the similar results for maize varieties for 1000 seed weight.

Biological yield (t ha$^{-1}$)
The cultivars were statistically similar for total plant dry matter. This may be attributed to plant density and plant height. These results are not in agreement with those of Arif et al. (2001) who reported significant variation for biological yield in maize varieties.

Grain yield (t ha$^{-1}$)
Grain yield is combined output of genetic potential and environmental interaction. Data regarding the performance of various maize varieties for grain yield evinced that Agaiti-2002 was significantly superior (7.82 t ha$^{-1}$) followed by EV-3001 (6.87 t ha$^{-1}$). Kashmir Gold (7.21 t ha$^{-1}$) and Swan-3 (7.64 t ha$^{-1}$) were statistically similar. These results are in conformity with those of Bavec and Bavec (2002); Hussain et al. (2003) and Sener et al. (2004) that grain yield parameter is associated with tested genetic material.

Harvest index (%)
The harvest indices for various varieties showed that Swan-3 (42.96%) and Agaiti-2002 (44.43%) statistically were significantly different from EV-2001 (36.54%) and Kashmir Gold (38.43%). These results are consistent with those of Alias et al., (2003).

CONCLUSIONS
It was concluded that Swan-3 was superior in grain weight cob$^{-1}$, 1000-seed weight and harvest index. Agaiti-2002 was significantly at the top for cob length. Kashmir Gold attained more number of grain rows cob$^{-1}$. The cultivars had non-significant variations for plant density, cob diameter, grain yield, biological yield, number of grains row$^{-1}$ and number of grains.

Table 1: Plant parameters of various maize cultivars

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Kashmir Gold</th>
<th>Agaiti-2002</th>
<th>EV-3001</th>
<th>Swan-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant density (m$^{-2}$)</td>
<td>4.78 ns</td>
<td>4.40 ns</td>
<td>4.82 ns</td>
<td>4.43 ns</td>
</tr>
<tr>
<td>Number of days taken to 50% tassel</td>
<td>64.40 b</td>
<td>59.13 d</td>
<td>74.07 a</td>
<td>61.40 c</td>
</tr>
<tr>
<td>Number of days taken to 50% silk</td>
<td>67.40 b</td>
<td>62.87 c</td>
<td>77.40 a</td>
<td>64.07 c</td>
</tr>
<tr>
<td>Cob diameter (cm)</td>
<td>4.67 b</td>
<td>4.48 c</td>
<td>4.20 d</td>
<td>4.81 a</td>
</tr>
<tr>
<td>Cob length (cm)</td>
<td>15.00 c</td>
<td>17.00 a</td>
<td>14.33 c</td>
<td>15.97 b</td>
</tr>
<tr>
<td>Plant height at maturity (m)</td>
<td>1.98 b</td>
<td>1.58 d</td>
<td>2.13 a</td>
<td>1.82 c</td>
</tr>
<tr>
<td>Grain yield plant$^{-1}$(g)</td>
<td>150.67 b</td>
<td>177.94 a</td>
<td>142.64 b</td>
<td>172.37 a</td>
</tr>
<tr>
<td>Number of grain rows cob$^{-1}$</td>
<td>13.90 a</td>
<td>12.97 c</td>
<td>13.83 ab</td>
<td>13.10bc</td>
</tr>
<tr>
<td>Number of grains row$^{-1}$</td>
<td>35.07 c</td>
<td>38.90 a</td>
<td>33.83 c</td>
<td>36.00 a</td>
</tr>
<tr>
<td>1000-grain weight (g)</td>
<td>344.04 c</td>
<td>391.98 b</td>
<td>331.57 d</td>
<td>406.09 a</td>
</tr>
<tr>
<td>Biological yield (t ha$^{-1}$)</td>
<td>18.76 ns</td>
<td>17.60 ns</td>
<td>18.79 ns</td>
<td>17.78 ns</td>
</tr>
<tr>
<td>Grain yield (t ha$^{-1}$)</td>
<td>7.21 ab</td>
<td>7.82 a</td>
<td>6.87 b</td>
<td>7.64 ab</td>
</tr>
<tr>
<td>Harvest index (%)</td>
<td>38.43 b</td>
<td>44.43 a</td>
<td>36.54 b</td>
<td>42.96 a</td>
</tr>
</tbody>
</table>

Note: The means in rows not sharing letter differ significantly at 0.05 probability.
Hussain, et al. (2007). Performance of maize cultivars

ns= non-significant

REFERENCES


