

## Adoptability and comparison of commercial maize hybrids for yield and yield attributes

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### Abstract

For sustainable maize crop production, several researchers are interested to develop high yielding tolerant varieties under different agro-climatic conditions of Khyber Pakhtunkhwa (KPK), Pakistan. Keeping in view the importance of high yielding maize crop cultivars, the present study was conducted to evaluate the comparative performance of different commercial maize hybrids for grain yield and associated traits under field conditions at the Agricultural Research Farm of Gulo Dheri Swabi, Khyber Pakhtunkhwa, Pakistan during summer 2017. The experiment was carried out in a randomized complete block design with three replications to test different maize hybrids (30k08, 3025, Gorilla, Garanon, CS200 and CS220) for economic yield and its contributing components. The data was recorded on different days to germination, cob length, cob diameter, plant height and grain yield in kg ha<sup>-1</sup>. The results show that maximum days to germination were noted for CS220 (7.333) and minimum days were recorded for 3025 (6.000). Likewise, the higher grain yield was recorded for Garanon and Gorilla (1550.0kg ha<sup>-1</sup>), cob diameter for gorilla (41.100) and maximum cob length (17.750cm) and plant height by (171.01cm) Garanon. It was concluded from the study that the yield and yield components of maize hybrid varieties Garanon and Gorilla performed better than other hybrids under the agro climatic field conditions of Swabi. Furthermore, the hybrid varieties Garanon and Gorilla may also be used by the local farmers to get maximum yield as compared to other local varieties.

**Keywords:** Maize hybrids, Grain yield, Field conditions, Comparative performance

### 1. Introduction

Maize (*Zea mays* L.) belongs to kingdom Plantae, order Poales, family Poaceae, genus *Zea*, and species *Zea mays*. It is one of the most important food and feed crops of the world. It ranks second in the world after wheat in its total production. It has become a staple food in many countries of the world with total production higher than rice or wheat. In Pakistan, maize is grown on an area of 1168.5 thousand hectares with production of 4944.2 thousand tons (PBS, 2014). It is cultivated on about 65% irrigated land, while the remaining is cultivated under rain fed conditions. Maize is highly susceptible to drought; therefore, it needs intermittently irrigations for prosperous vegetative and reproductive growth (Rashid and Rasool, 2011). Early domestication of several food crops, including maize in GuilaNaquit Cave in Oaxaca, Mexico. So, Maize or Corn was first grown by indigenous people in South America from Mexico about 10,000 years ago. Maize is also called corn in some countries and in Pakistan it is now the third most important cereal crop after wheat and rice. Moreover, it is one of the valuable crops of the Khyber Pakhtunkhwa (KP), where more than half of the maize or corn in the country is produced. In KP maize is often grown for producing grain and also grown for fodder purposes because it contains about 70% of starch on average, which makes it more suitable feedstock for bioethanol production (Semenčenko *et al.*, 2015). Maize/Corn seed with high nutritional value contain 70% carbohydrates, 10% protein, 4-5% oil, 3% sugar, 6% fibres and 1% ash supplying an energy of 365 Kcal/100g. Maize can be used for making breads and in industries for corn starch, corn syrup, corn flakes, paper making, textile, food industries and oil production. It is an important staple food crop and lodging is

a serious problem in local varieties. At present yield level is much lower than the potential of our existing varieties. Main constraints to enhance maize productivity are suboptimal plant density, inadequate fertilizer use, inadequate water supply, weed infestation, insect pest attack and the selection of unsuitable cultivars under a given set of environments. To control these problem, the growers must be shifted to hybrid maize cultivation which require more inputs (improved agronomic practices, fertilizers, plant protection). The growing of high quality hybrid not only improve the grain yield and it also improve the quality but also increase the income per hectare as compared to other local varieties of maize. Adoption of high yielding suitable hybrids not only improves the grain yield and its quality but also leads to higher income per hectare as compared to conventional varieties of maize (Abbas, 2001).

Modern maize hybrids have greater potential as compared with older hybrids due to livestock and poultry feeding and its industries. Modern hybrids are more resistance to diseases, insects, pest, nematodes, and especially to lodging. Since the yield potential of our existing varieties is deteriorating day by day, so the selection of good varieties with high potential and wide range of adoptability is highly essential. Besides tolerance to abiotic and biotic stresses, the likely cause for high yield in modern hybrids has been more ear bearing plants per unit land area without reduction in kernels per year. During the last decade crop yield in Pakistan has been declining despite increased inputs of fertilizer and pesticides. This is due to the sowing of synthetic or composite varieties which have less potential as compared to hybrids (Njeru, 1983). In this scenario, the present study was designed with the following objectives.

## Objectives

1. To examine the adaptability and performance of hybrid maize Varieties
2. To identify high yielding, disease and insect pest resistant (tolerant) hybrid maize varieties under local condition of district Swabi.

## 2. Materials and Methods

The experiment was conducted on comparison of different maize hybrids for yield and associated traits at the Research Station Swabi, during kharif season 2017. All the materials and technical support provided by ARS, swabi. The experiment was designed in a randomized complete block design (RCBD) with three replications having a net plot size of 5m x 5m and the total plot size was 72m<sup>2</sup> having 6 sub plots. The study was conducted to check out performance of different maize hybrids for grain yield under the local conditions of district Swabi. The crop was sown at the appropriate seed rate on 17 July 2017 having row to row distance of 75cm and plant to plant distance of 22cm. The fertilizer recommended dose was 120:90:60 kg NPK/ha while sowing was done manually with the help of labour. Six different hybrids were grown on each plot. The name of these different hybrids were 3025, 30k08 (pioneer products) CS200, CS220 (Petal seeds) Gorilla and Granon (Monsanto products). Harvesting was done manually in the month of October. Recommended land preparation operations were performed for equal irrigated water distribution. Uniform cultural practices such as weeding, hoeing, thinning was carried out for all treatment.

The following parameters were studied during the experiment.

1. Days to germination
2. Con length(cm)
3. Cob diameter(mm)
4. Plant height(cm)
5. Grain yield( Kg/ha<sup>-1</sup>)

### Data were recorded on the following parameters

#### 3.1 Days to Germination :

Data on days to germination were recorded by using foot rod by measuring 3 randomly selected rows in each plot and counting the germinated plants.

#### 3.2 Cob length(cm)

Cob length data were recorded by using Vernier Calliper after harvesting by measuring three randomly selected plants.

#### 3.3 Cob diameter (mm)

Cob diameter data were recorded by using Vernier calliper by measuring 3 randomly selected plants.

#### 3.4 Plant height (cm)

It was recorded at physiological maturity by measuring 3 randomly selected plants in each plot from ground level to the top of plant tassels.

#### 3.5 Grain yield (kg/ha<sup>-1</sup>)

Data on grain yield was taken with the help of a weight

scale by weighting the grains obtained from each treatment after sun drying and converted into kg per hectare.

## Statistical Analysis

The collected data were analyzed with the statistical software statistix 8.1 and Least Significant Difference (LSD) test at 5% probability level was applied to compare the treatment means.

## 4. Results And Discussion

### 4.1 Days to germination

Result regarding response of germination to different hybrid maize varieties is presented in table 3.1. Upon analysis of variance it was observed that maize hybrids varieties responded Non-significantly with respect to germination. However, maximum days to germination (7.3333) were recorded for hybrid variety Cs220 and minimum Days to germination (6.6667) were observed for Cs200 and also for Granon. These results are in line with the findings of Zahra *et al.* (2012).

### 4.2 Cob length

Data on cob length of maize crop as influenced by different varieties is given in Table 3.1. Statistical analysis of the data shows a significant ( $P \leq 0.05$ ) impact of varieties on cob length of maize crop. However Highest cob length of 17.750cm was confirmed for granon and the minimum cob length (12.738cm) was observed for 3025. These results are in agreement with Markovic *et al.* (2017), who observed a significant difference for cob length among the maize cultivars.

### 4.3 Cob diameter

Data related to cob length of maize crop as influenced by different varieties is presented in Table 3.1. Statistical analysis of the data showed a significant ( $P \leq 0.05$ ) effect of varieties on cob diameter of maize crop. However, maximum cob diameter of 41.100mm was recorded for Gorilla and the minimum cob diameter (34.100mm) were noted for CS220. Our results are in line with finding of Farnia *et al.* (2015), who recorded a significant difference for cob diameter between the hybrid maize varieties.

### 4.4 Plant height

Result on the performance of plant height to different maize hybrid varieties is presented in Table 4.1. Upon analysis of variance it was observed that maize hybrids varieties responded significantly ( $P \leq 0.05$ ) with respect to plant height. However, the maximum plant height of 171.01cm was noted for Granon and minimum plant height (147.58cm) was observed for Cs200. These results are in consistency with the finding of Kinfe *et al.* (2016).

### 4.5. Grain yield

The result of grain yield to different maize varieties is presented in Table 3.1. Upon analysis of variance it was observed that maize varieties showed highly significant differences with respect to grain yield. The maximum grain yield of 1550.0kg/ha were recorded for Gorilla and Granon. Minimum grain yield (1235.0) was noted also for Cs220. These results are close to Madić *et al.* (2017) who observed significant differences for grain yield among different maize cultivars.

**Table 3.1:** Mean values for comparison of commercial maize hybrids for yield and associated traits during summer, 2017

Treatment (Hybrids)	Days to Germination	Plant height (cm)	Cob diameter (mm)	Cob length (cm)	Grain yield kg/ha
3025	6.00 a	154.9 6 b	36.500b c	12.73 8 c	1275. 0 c
30k08	7.00 a	150.4 6 b	37.000 bc	15.51 5 c	1350. 0 b
Gorilla	7.00a	151.9 2 b	41.100 a	16.70 0 ab	1550. 0 a
Granon	6.67 a	171.0 1 a	38.800 ab	17.75 0 a	1550. 0 a
Cs200	6.67a	147.5 8 b	34.650 c	16.35 0 bc	1350. 0 b
Cs220	7.33a	153.4 6 b	34.100 c	16.50 0 bc	1235. 0 c
LSD P<(0.05)	1.39	12.73 8	3.4664	1.132 5	67.25 6

## 5. Conclusions And Recommendations

### 5.1. Conclusions

The following conclusions were drawn made from the current study:

- Granon variety show better performance for days to germination stage (6.6667), Cob length (17.750cm) and plant height (171.01cm) as compared to the rest of other maize hybrids.
- Gorilla and Granon give superior performance for grain yield (1550.0kg ha<sup>-1</sup>) as compared to the rest of other maize hybrids.
- Among the different hybrids Gorilla give better performance for cob diameter (41.100mm).
- 3025 variety confirm better performance for days to germination stage (6.000) as compared to the rest of other varieties.

### 5.2 Recommendations

On the basis of current study it is recommended that: Granon and gorilla is recommended for general cultivation in Distt: Swabi, and also for surrounding areas of Khyber Pakhtunkhwa with a seed rate of 100 kg ha<sup>-1</sup> and fertilizer rate of 120:90:60 (NPK) kg ha<sup>-1</sup> respectively.

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