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Comparison of maize hybrids effect on phenological stages

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Key words: hybrid corn, maturity and phenological stages.

Abstract

In order to determine the growing characteristics and detecting the morphological bases of yield difference, study of relations between different traits with each other and with grain yield, determining the most important effective traits on yield in hybrids of seed corn and comparison of native and foreign hybrids had been studied and classification of them had been done on the basis of morphological traits. For this purpose an experiment carried out in 2007 at Moghan agricultural research center. In this experiment, 28 hybrids of seed corn (18 foreigner hybrids and 10 native hybrids) were studied in two different experiments with using a complete randomized block designed in 4 replications. Hybrids of both groups had meaningful differences in some characteristics. In this test some of medium maturing foreigner hybrids had low yield in comparison with the early maturing native hybrids, this result showed the different reactions of these hybrids in studied test conditions ($P<0.05$). Public heritability, the yield, number of seed rows, number of seeds per row, 1000- grain weight, plant height, ear height, number of tassel branches, number of leaves, location of appearance of ear, And length of leaf in hybrids of these two groups was high.

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Introduction

Maize is an important multi-purpose crop used for food, fodder, chemicals and biofuels. According to the FAO, total world maize production reached 6.37×10^{12} tons (http://nue.okstate.edu/ Crop Information/) in 2003, higher than wheat or rice. In developing countries such as China, a huge demand for maize is expected due to the increase in animal production and biofuel requirements. Yield increase in maize is largely due to larger nitrogen (N) fertilizer inputs (Dai, 1998).

Maize (*Zea mays L.*), is a cereal with a remarkable potential for production, it is the third most important grain crop after wheat and rice and it accounts for 4.8% of the total cropped land area and 3.5% of the value of agricultural output (Ahmad *et al.,* 2011). Maize due to capabilities such as adaptation to different climatic conditions (from 58 degrees to 4 degrees south and north from sea level to an altitude of 4000 m), Resistance to drought, high performance, power, frequency of exposure, accept full mechanization and usage of several widely cultivated in many countries. Corn addition to being very good forage for livestock is also unique in terms of energy supply for livestock and poultry.

Large variation was observed for all the characters studied except days to flowering, days to maturity and protein content. Correlation and path coefficient analyses showed that biological yield and harvest index were the major direct contributors to seed yield. The 100-seed weight, plant height, days to flowering and maturity, canopy width, and protein content contributed to seed yield mainly through indirect effect via biological yield and harvest index. The 100-seed weight and seed yield were major contributors to biological yield. Major contributor to protein content was days to maturity (Sing *et al.,* 1990). Determination of importance and effectiveness of yield components is main target. Besides, relationship between yield characters and yield may change in various trials and agronomical and breeding programs. Determining and processing effective yield components and relationships between them causes significant yield increase and leads better results. Chand *et al.,* (1975), Katiyar *et al.,* (1977), İslam & Begüm (1985), Malik *et al.,* (1988), Khan *et al.,* (1989) and Gravaes & Helms (1992) reported that grain yield had positive relationship with plant height, number of branches, number of pods per plant and 100 seed mass.

The genetic diversity of crop species is the result of natural selection on the wild parents and human intervention. The extent and distribution of the genetic diversity in a crop depends on its breeding system, geographical, ecological and human factors. Conservation of genetic variability is essential for present and future human wellbeing (Tiranti 2006). Study of genetic diversity is essential for conservation, management and to identify the hybrids (Franklin 2009). The genetic diversity among and within landraces makes them a valuable resource as potential donors of genes for breeding purposes, diversification of production, developing new farming systems and new quality products (Soleri & Smith 1995, Jing *et al.* 2010). To develop crop varieties and attain significant progress in breeding programs, it is essential to know the relationship between seed yield and its component (Assady *et al.* 2005).

Plant density determines the degree of competition among plants (Ipsilandis and Vafias, 2005; Kgasago *et al.,* 2006). Fasoula and Tollenaar (2005) indicated the number of plants per unit area has been significant to assess the conduciveness of seedbed in a microenvironment. Therefore, at low densities, grain yield is limited by number of plants, whilst at higher densities decrease due to competition. An increase in plant density ensures uniform crop stand (Elliot *et al.,* 1993; Tollenaar *et al.,* 1994), and also increase grain yield and water productivity, particularly under rainfall limited regimes (Lamm *et al.,* 2009). However, in semi-arid regions, the risk of crop failure increases as density increases (Jagtap and Chan, 1999). An optimum plant density is which yields the most grain under non-limiting conditions (Modarres

et al., 1998). The objective of the present study was to determine the maize hybrids on Performance characteristics.

Materials and methods

Planting bed preparation

The research was implemented in crop year 2007 in the fields of Agriculture and Natural Resources Research Center of Ardabil Province (Parsabad Moghan) as a second crop after wheat. In terms of Climatology, Moghan is moderate and semi-arid region, with hot summers and relatively wet and mild winters with dry winds and cold, with frosts is limited.

The desired field after wheat harvest in the first half of July was deep plowing with moldboard plow and ground preparation operations based, including disk and furrow before planting was carried out.

Before conducting the experiment the physical and chemical properties of soil was determined, and texture, soil pH and the amount of fertilizer needed for corn was determined.

Calculations and statistical analysis

In this experiment, 28 hybrids of seed corn (18 foreigner hybrids and 10 native hybrids) were studied in two different experiments with using a complete randomized block designed in 4 replications.

Principal component analysis on standardized data was performed using SPSS software. For data analyzing and drawing graphs computer software MSTAT-C, SPSS-13 and EXCEL 2007 was used.

Results and discussion

Days to maturity

The mean comparison of this character showed that the hybrid (ZP684) of the medium maturity group with 138.3 days, and hybrid (BC582) with 128.3 days were the later and earliest hybrid group respectively (Table 1).

Considering that the second crop due to climate conditions and in spite of rainfall in the end season. Earliness is a desirable trait. Each hybrid has lower number of days to maturity, and yet has more yields, would be more favorable hybrid.

Number of days to pollination

The mean comparison showed that the hybrid (OH 43.1- 42 x K56) have the greatest number of days to pollination with average 57 days and the lowest pollen number hybrid 10 (Szegedi 433) with a mean of 50 days. Cross *et al.,* (1973) have suggested that increasing periods from planting to silk, increase with height and leaf area will lead to increased grain yield.

The number of days to forelock

Mean comparison using Duncan Test (5%) indicated that early hybrids (first experiment), showed the highest forelock days of hybrid (OH 43.1- 42 x K56) with an average of 61 days and the lowest related to hybrid number 10 (Szegedi 433) with a mean of 52 days.

Distance between pollination to forelock

The mean comparison of medium maturity hybrids show that the hybrid No. 10 (Ossk602) with an average of 4.5 days and hybrids, No. 5, 9 and 14 (BC678, BC682 and KSC704) with an average of 2.25 days showed the highest and lowest distance between pollination to the forelock.

Table 1. Multiple linear regression coefficients of equations grain yield based on different characteristics of regression desc.

The remaining parameters in the model	Regression coefficients
Days to maturity	-12.717**
Number of days to pollination	-1.184**
The number of days to forelock	0.297*
Distance between pollination to forelock	-0.761*
The width of origin	-2.616
Correlation coefficient	0.771

Table 2. The means of equations grain yield based on different characteristics.

hybrids	Days to maturity	Number of days to pollination	The number of days to forelock	Distance between pollination to forelock
internal	128.3[b]	60.5[a]	63[a]	2.25[b]
foreign	138.3[a]	57.59[b]	60.85[b]	4.5[a]

Conclusion

The results show that in addition to genetic factors, environmental factors are involved in determining the characteristic distance between pollination to the forelock. And the environmental factors effects are more than genetic factors.

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