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Comparison of maize hybrids effect on seed traits

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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. Orthogonal comparison showed that the yield of foreign hybrids were higher than native one and it was arised from the 1000- grain weight, deep of seed, plant height, length of tassel, number of leaves on the top of the ear, number of days to pollen shedding, number of days to silking and number of days to physiological ripping in foreign hybrids.

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Introduction

Maize (*Zea mays L.*) is the only member of the genus Zea of tribe maydeae under the family gramineae. It is a C4 plant and has high production potential for high photosynthetic capacity (Goldsworthy, 1984). Maize uses nutrients more efficiently due to its deep rooting system and it is more tolerant to drought than rice and wheat.

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.

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.

A number of studies have evaluated the relationship between grain yield and yield components (Love and Wentz 1917; Guo *et al.,* 2008; Peng *et al.,* 2011). Bekavac *et al.,* (2008) found significant correlations between maize inbred per se and testcross performance for stay green, anthesis-silking interval, stalk water content and grain moisture. Rafiq *et al.,* (2010) evaluated 10 maize inbred lines in testcross combinations and as lines per se. Based on genotypic correlation coefficients; they found a significant correlation between 100-kernel weight and grain yield. Ross *et al.,* (2006) examined phenotypic correlations among yield components in Iowa Long-Ear Synthetic. In that study, ear length correlated positively with grain yield on a plant basis and kernel weight. Although studies of inbred lines for traits such as cob diameter, ear length, 100-kernel weight, kernel row number, and grain yield exist in the literature, there is a lack of published research on the sizing of the seed obtained from seed parents in a commercial hybrid seed field. In the seed industry, sizing refers to the process where harvested seed is separated into different seed lots based on the width, thickness and length of the kernel (Wych, 1988). Sizing involves passing seed through a series of screens of varying sizes to separate a seed lot into fractions with similar kernel morphology. The objective of sizing is to produce a seed lot with acceptable uniformity. Uniformity of the seed lot plays a role in the packaging and acceptability of the seed for sale to producers for planting. Seed lots with variable seed sizes can introduce stand establishment issues upon planting which can lead to yield loss if the variability is great enough (Nielsen, 1996).

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 seed traits.

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

Grain yield

The mean comparison of this character showed that the hybrids (MV502, Maxima and Szegedi) have maximum Grain yield with 11 980, 11 660 and 11 060 kg per hectare respectively and the Hybrid (ZP599) showed lowest Grain yield with 5720 kg per hectare.

1000-seed weight

According to the comparison results, the distribution of traits in hybrids between the two levels, max 373.8 gram in Hybrid (Maxima) and at least 257 grams of hybrid (KSC 302) ranged.

Given the high heritability of this trait can be concluded, the grain weight is more influenced by genetic factors. And environment effect is low. And can be used in breeding programs to increase the grain yield.

Seed depth

Comparison of the average extent of the variation for this attribute indicates showed that the hybrid (KSC 500) have maximum depth (1.252 cm) and in the hybrid (KE 75016/32-12 x K 1264/5-1) with 1.097 have lowest depth.

Hectolitre weight

Analysis of variance indicated that there were significant differences between hybrids for Hectolitre weight. The mean comparison of Hectolitre weight show that the hybrid (KSC 260) showed highest Hectolitre weight with 67.13 gr., and hybrid (MV502) with a 62.22 gram showed the lowest Hectolitre weight.

Table 1. Mean squares of seed traits.

Sources changes	DF	Grain yield	1000-seed weight	Seed depth	Hectolitre weight
Block	3	0.785^{ns}	776.976^{*}	0.007^{ns}	4.475^{ns}
Hybrid	13	4.950^{**}	4599.456^{**}	0.010^{*}	18.53^{*}
Error	39	0.556	247.489	0.004	9.165
Coefficient of Variation		7.49	5.11	5.56	4.80

Table 2. The means of seed traits.

hybrids	Grain yield	1000-seed weight	Seed depth	Hectolitre weight
internal	5.72^{b}	373.8^{a}	1.097^{b}	62.22^{b}
foreign	11.98^{a}	257^{b}	1.252^{a}	67.13^{a}

Conclusion

The results show that in addition to genetic factors, environmental factors are involved in seed factors. And the environmental factors effects are lower than genetic factors.

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