Assessment of Seedling Green Percentage, Seedling Green Rate and Seedling Emergence Index of Corn S.C704 Source Effect and Seed Size in Khuzestan

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Abstract: In order to evaluate the best seed source of corn production hybrid SC704, desirable seed size and the relationship between seed vigor and seed size on grain yield of corn, a field and experimental assessment were conducted in Agricultural Research Center of Safi Abad, Dezful in 2008 with 3 replications. In field experiment, treatments were conducted on the seed source in Khuzestan, Mooghan and Khorasan sources as the main factor and the seed size (6, 6.5 and 7 mm) was considered as subplot. The design of the field experiment was split plot in the form of complete randomized block. Results indicated that in field conditions, with the increase of seed size, the seedling green percentage, seedling green rate, seedling emergence index will increase with different seed source. In general, results showed that grain yield increases with high seed size and vigor.

Key words: Corn, Seedling green percentage, seedling green rate, seedling emergence index.

INTRODUCTION

Seed is the most important agricultural resource. The effects on the other sources like fertilizers, irrigation water and herbicides in forming and fertilizing the agricultural plants are determined by this resource. By considering that the seed is the marginal product of the plant reform programs and it could be said that the success of a program specifies the time it's seed is in the hand of farmers and is used by them, every type of abnormality in germination and its sprouting vigor affects the plant establishment and wastes away the difficulties that the reformers and producers confront (Aryannia, et al., 2011). Corn including a share equal to 65-70 percent in the poultry ration combination, the flint corn is considered as the most important energy supply source for the production. The existence of empty capacities in the poultry industry and the high conversion coefficient of the white meat have provided for the production increase. The seed size is one of the most prominent features of the seed and affects the seed growth vigor (Moujinizjah and Nakamoura, 1986). It's possible for the seed sizes of a genotype to increase in size due to the nutrition of the mother plant, the flowering condition and seed maturation. The size of the seeds which are formed on a maize is different based on the location of the constituting florets and also the filling length of each seed on the maize (Wych, 1988). Various studies have been done on the effect of the seed size on different characteristics of hybrid maize. Kurdikeri, et al (1998) observed a considerable difference between the green percentage of the field and different sizes of different maize hybrids. But Hunter and Kannenberg (1972) stated that the seed size has a marginal effect on the number of days till the emergence of 50 percent of seedlings, the sprouting speed and the extent of seedling placement, the marginal amount of the bush leaves and their performance.

The seed size has a central rule in the plant lifetime. The seed size determines the produced seed numbers (marginal product) partially, which is affected by the complex environmental factors. These factors are effective on the seed size and the effects of seed size on different stages of the plant development have a major role on more biological activities of the plant and its ecological issues (Castro, et al., 2007). Hunter, et al (1984), by an experiment on a cross single maize hybrid by (23 to 39g) variable thousand-kernel weight showed that the seed size has no effect on the product sprouting. Mazum, et al, (1994) made an experiment on the effect of the seed size and shape on the sprouting of the maize seed. In this investigation, by increasing the seed size to 7.5-8.5mm, the seedling germination has been increased and the germination fluctuations have been decreased. So, in order to improve the seedling germination, it has been suggested that the seeds become graded. Hong, et al (1982) showed that the seed size in different maize hybrids has affected the germination and the plant height hasn't any difference by the large and middle size seed treatment. No significant difference had been observed between large, small and middle size seeds on the seed yield. Wanjura and Buxton (1972) showed that the large seeds has a better germination, but the cultivation of the large seed in the soil depth impedes the germination of these seeds, though the bigger seeds outweigh the small ones. The higher or lower temperature from the optimum during flowering or maturation decreases the seed size (Abd Allah, et al, 2001). The biological cooperative interaction which decreases the plant yield, decreases the seed size (Karlsson and Orlander, 2002).
The concentration of seed production of some agricultural plants in especial regions is a convincing cause for the environmental factors to affect seed quality and its growth (Delouche, 1980).

The centrality of some especial regions for the production of some products is a convincing reason for the effect of the environment on the growth and quality of the seed (Mati, et al., 1989). Studying and investigating the effect of cultivation date on the quality of soybean seed, Green, et al (1966) found that the soybeans produced because of the early cultivation, due to placement in a hot and dry weather, produced seeds with low growth vigor. Also, Perry and Harrison (1973) in their investigations found that exposing the mother plants to high temperatures during maturation and desiccation of premature seeds in high temperatures is the principal factor for physiological differences in the seeds. The emergence of this physiological disorder has been related to the delay in germination, decrease in the growth of seedling and plant, low green level, and low yield of the plant in field conditions. The effective factors on the seed quality could be issues like temperature, humidity, soil fertility, nutrition of mother plant, pathogenic factors and the environmental factors after maturation and before harvesting, the drying and storage method of seed. In spite of the technological developments and the agricultural management of the seed, the optimal germination and placement of the produced seedlings have a key rule in agriculture, so that the success or failure in the production is dependent on the full and fast seed germination and the production of vigorous seedlings. The most seedling establishment is achieved when the seed could overcome the undesirable environmental conditions and shows a proper reaction from itself. Certainly this reaction is variable according to the genotype and environment.

The environmental conditions of the seedbed usually will cause the seed to confront various tensions like dryness, low temperature, soil or water salinity and many live and dead stresses (Hall, et al, 1990). This idea which is the source and the place for hybrid seed production could have an effect on the next yield. In the recent years, it has been proposed in scientific forums that in spite of the need for more investigation, unfortunately there isn't enough sources in this case. This research seeks a proper response to determine the best source of the corn hybrid seed for the consumption in Khuzeistan province and has also the most suitable size in order to increase the yield of the fields in the province according to the obtained results.

**MATERIALS AND METHODS**

This research was carried out in the summer of 2008 in farm research station of safi-abad (Institute of seed control and certification). This center is located in 120km north of Ahvaz with 82 height from sea level and 32 geology wide and 24 north minutes and 48 length and 24 east minutes. Generally all of south country coast lands that their height is less than 100 meter, including desert climate. So whole of khuzestan plain to loorestan's mountain slope have this climate figures. Heat in all of this area is severe (stable maximum temperature in this area is 53 and related to Ahvaz) rain mean annually in this area is of low amount and doesn't in order now.

Almost all of raining is in winter and 7 months of year doesn't have raining (Kochakee et al, 2005). To determine physical and chemical soil characteristics after choosing the place of test operation from testing soil before any land preparing operations by oger sampling from 0-30 cm land depth from 10point randomly, the sampling was performed. Obtained results of soil deposition in soil laboratory are expressed in table 1.

| Table 1: Physicochemical traits of soil of field that used in the experimen. |
|------------------------|---------------|---------|---------|-------|
| EC (m mho/cm)          | pH            | Total N (mg/kg) | K (mg/kg) | OC (%) |
| 1.2                    | 7.6           | 3.32      | 10.6    | 120   | 0.82 |
|                        |               |           |         |       | Clay Loam |

In this survey, S.C 704 cultivar was investigated by three different seed production sources in Khorasan, Mooghan and Khuzestan. In order to classify the seeds regarding their sizes, especial sieves were used that the diameter of their pores were 6, 6.5 & 7. The experiment was done by testing the split-plots in the form of complete random blocks by three iterations in a field by (46.5×18 m) dimensions. Before the testing season, the field was used for wheat cultivation. In this experiment, the seed sizes have been investigated in three levels including the produced seeds of Khorasan, Mooghan and Khuzestan as the main factor and the seed size as the minor factor in three levels which were alternatively 6, 6.5 & 7. In order to determine the statues of field sprouting, the seeds were noted by different sizes and sources in the field regarding the date of the first irrigation as the cultivation time of the number of emerging seedlings within 7 days after the emergence of the first seedling in the field. In the beginning of seedling formation, in order to determine the germination percentage, the germination rate and evaluating the seed vigor and the way of seedling establishment. All the data were registered and maintained for statistical analysis. The obtained data were entered into the tables of computer programs like Excel Spread Sheet after summarization and classification. The variance analysis of row data was made by SAS statistical programs and the mean analysis was done by LSD test.
RESULTS AND DISCUSSION

The Seedling Green Percentage:

The results of variance analysis (table 2) show that the seedling green percentage hasn't become significant under the effect of seed source and the cooperative interaction of the seed size and source, but the effect of the seed size on the characteristics of seedling sprouting percentage has become significant in 1 percent probability level. Figure 1 shows that 7 mm seed size by the mean (89.5) had the maximum sprouting percentage of the seedling and 6 mm seed size by the mean (76.8) had the minimum sprouting percentage of the seedling. The results of this experiment are consistent with the results obtained by Grawn (1990), Galsis (1993), Kurdikri, et al (1998) and Shirin, et al (2008a), but are in contrast with the results obtained by Hunter and Kunberg (1972).

Table 2: Analysis of variance (mean squares) green percent, seedling green rate and seedling emergence index.

<table>
<thead>
<tr>
<th>S. O. V</th>
<th>df</th>
<th>seedling green percent</th>
<th>seedling green rate</th>
<th>seedling emergence index</th>
</tr>
</thead>
<tbody>
<tr>
<td>block</td>
<td>2</td>
<td>16.86 ns</td>
<td>0.69 ns</td>
<td>0.002 ns</td>
</tr>
<tr>
<td>Seed source</td>
<td>2</td>
<td>24.11 ns</td>
<td>0.9 ns</td>
<td>0.001 ns</td>
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<td>Main error</td>
<td>4</td>
<td>11.72</td>
<td>0.55</td>
<td>0.002</td>
</tr>
<tr>
<td>Seed size</td>
<td>2</td>
<td>377.19**</td>
<td>24.47**</td>
<td>0.04**</td>
</tr>
<tr>
<td>source× Seed size (A×B)</td>
<td>4</td>
<td>10.55 ns</td>
<td>0.45 ns</td>
<td>0.001 ns</td>
</tr>
<tr>
<td>Sub error</td>
<td>12</td>
<td>10.47</td>
<td>0.81</td>
<td>0.002 ns</td>
</tr>
<tr>
<td>CV (%)</td>
<td></td>
<td>3.9</td>
<td>8.1</td>
<td>5.4</td>
</tr>
</tbody>
</table>

ns: non significant, *, **: respectively significant (p≤0.05) and highly significant  (p≤0.01).

Fig. 1: Effects seed size on seedling green percent.

The Seedling Green Rate in the Field:

From the results of variance analysis, the green rate has been offered in table 2. From this table, it is concluded that the treatments of the seed source hadn't any significant difference regarding the sprouting rate. But the maximum sprouting rate by the mean (11.4 seedling per day) relates to Khuzestan seed source and the minimum sprouting rate by the mean (10.8 seedlings per day) has been related to Mooghan source. The sizes of the seed which was under investigation had a significant statistic difference regarding the sprouting rate in 1 percent probability level, so that the seed size (7 mm) by the mean sprouting rate (12.8 seedlings per day) had the maximum sprouting percentage and 6 mm seed size by the mean (9.6 seedlings per day) had the minimum sprouting rate (figure 2). Also the cooperative interaction of the seed sources which were under investigation and the seed sizes hadn't any significant statistic difference (table 2). The results obtained by Tekerony and Agli (1991) and Hmidi et al, (2005) have verified the results of this research and in contrast with the results obtained by Hunter and Kunberg (1972 and 1994).

Fig. 2: Effects seed size on seedling green rate.
The Index of Seedling Emergence:

The treatments of the seed source regarding the index of seedling emergence hadn't any significant statistic difference with each other (table 2). But the source of Khuzestan and Mooghan seed by the mean (0.87), had the maximum index and the source of Khorasan seed by the mean (0.85) had the minimum index of the seedling emergence. The treatments of the investigated seed size regarding the index of seedling emergence showed a significant statistic difference in 1 percent probability level (table 2). 7mm seed size by the mean (0.93) and 6mm seed size by the mean (0.80) had the maximum and minimum seedling emergence index alternatively (figure 3). Totally, the seed sizes were statistically located in 1 percent probability level in three different levels. According to table (2), variance analysis, the cooperative interaction of the seed sizes which were under investigation and the seed sizes hadn't shown any significant statistic difference. The results obtained by Kouchaki, et al (2005) also verify this experiment.

Fig. 3: Effects seed size on the index of seedling emergence.

Conclusion:

Summarizing the results obtained from the data analysis of this experiment showed that in summary, by increasing the seed size, the economical yield increases and the seeds with higher vigor produce more vigorous seedlings and increase the establishment of the seedling and creates a better green cover in the field which finally results into producing more vigorous plants. So, the seeds with higher vigor increase the seed yield by the abovementioned mechanism. The results of this research showed that by increasing the seed size, the seedling green percentage, the seedling green rate and the index of seedling emergence increased in different origins.

ACKNOWLEDGEMENT

This investigation is a cooperative work of Ramin Agricultural and Natural Resources University. The control center and the seed license center of Dezful agricultural researches, Iran registration, control and seed license institute and Shoushtar Islamic Azad university, so we give thanks to those who helped us in this research, especially, the experts of the control center and seed license center of Dezful Agricultural researches, Dr. Aryannia, Dr. Hamidi, Engineer Farshidi, and Engineer Ch'ab.

REFERENCE


Delouche, J.C., 1980. Environmental effects on Seed development and seed quality. Horticulture science. 15: 775-780.


