The Investigation of the seedling characters of New Hybrid seeds of corn in laboratory conditions Using cold Test

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ABSTRACT

Cold test is considered one of the oldest and commonest tests in determining corn seed vigor in unpleasant conditions (humidity and cold) and is used as standard test for determining corn seed vigor. Corn seedling vigor is usually determined by using cold test on occasions when corn seed is planted in an unfavorable cultivation bed; therefore, there is a high correlation between the results from this test and the degree of the emergence of corn seedling in field. This experiment was performed in agricultural (physiology) laboratory of Islamic Azad University, Shushtar branch, in 2001. In this experiment, treatments were new hybrid seeds of corn at 10 levels from V1 to V10 and hybrid SC704 as control hybrid (V0). In this study, complete randomized design of four replications was used. Evaluated characteristics included seedling vigor index, primary root length, and seedling length. The obtained data entered into the tables of computer programs like Excel spread Sheet after summarization and classification. Variance analysis of row data was performed by SAS statistical programs and mean analysis was done by LSD test. Statistical analysis made it clear that all the characters evaluated in laboratory were affected by hybrid type. The comparison of means showed that hybrids were different in terms of all the characters evaluated in this experiment. Moreover, the results clarified that some of the studied hybrids were, in terms of evaluated indices, superior to hybrid SC 704 which was the prevalent hybrid in the region so that, as to the characteristic of seedling vigor index, hybrid PL 711 with a mean of 4801 had the most seedling vigor index, whereas hybrid PL710 with an average of 2177.7 had the least. Hybrid PL711 with mean 13.20 mm and hybrid 07-107 with average 7.30 mm were the most and the least respectively in terms of their primary root lengths. The most seedling length belonged to hybrid PL 706 with an average of 34.70 mm and the least seedling length was allocated to hybrid PL710 with average 17mm. Since in most cases the results obtained in laboratory conditions can predict and suggest the results obtained in field conditions, it is expected that these hybrids can also preserve their superiority in field conditions in the region.

Key words: seedling vigor index, primary root length, seedling length.

Introduction

Corn is one of the valuable agricultural plants which its diversity, high adaptability and great nutritional value make it one of the most important agricultural plants in the world, so that it is in the third rank after wheat and rice [11]. Since the use of grain corn inside our country is about 4 million tons and domestic production is just about 2.6 million tons per year [1]. So development and spread of this strategic product is very important. Because of restrictions of soil and water resources, development of under-planting area is facing so many problems. Therefore, the best acceptable solution for achieving self-sufficiency in corn production and subsequently achieving economic self-sufficiency is increasing yield per surface unit.

The cold test is one of the most common tests which determine the corn seedling vigor index under undesirable regional conditions [18,14]. In the cold test, it is tried to simulate the spring cultivation especially in Europe which has had the humid and cool soil [2]. Nigensten in 1985 stated that the cooling test is one of the major available methods in
have observed significant differences between the laboratories for the corn seed vigor test in USA and cooling performance test which were specialists and the international seed testing council performance by the council of the full time seed regarding the standard method of cold test laboratories are performed by minor differences of the performance of cold test by different control its performance method. Also the different methods papers were proposed by making some corrections in [1981], the seed cultivation method in the tubular test of the international council of the seed vigor test and the germination paper alternatively. Almost at the seed cultivation over the trays of seed cultivation method over the tubular germination paper and also specialists of the council suggested the use of the performance of seed vigor test of the full time has been completed and suggested by (ISTA) and been extended significantly and it's related standards extensively, but its performance methods haven't America and Europe [12]. Although this test is used corn seed masses which annually are sold in northern production centers in order to test the vigor of all vigor which is used in reproduction and corn seed production centers in order to test the vigor of all corn seed masses which annually are sold in northern America and Europe [12]. Although this test is used extensively, but its performance methods haven't been extended significantly and it's related standards have been completed and suggested by (ISTA) and (AOSA) many years ago. In 1983, the guide of the performance of seed vigor test of the full time specialists of the council suggested the use of the special vessels for cultivation and the cultivation method over the tubular germination paper and also the seed cultivation over the trays of seed cultivation and the germination paper alternatively. Almost at the time by issuing the guidance of the seed vigor test of the international council of the seed vigor test [1981], the seed cultivation method in the tubular papers were proposed by making some corrections in its performance method. Also the different methods of the performance of cold test by different control laboratories are performed by minor differences regarding the standard method of cold test performance by the council of the full time seed specialists and the international seed testing council [17].

Bouris and Navratil [2] compared the different methods of cooling performance test which were compared by 9 control and evidence seed laboratories for the corn seed vigor test in USA and have observed significant differences between the cooling test method for a seed mass in different laboratories. They have observed the minimum change coefficient regarding the seed cultivation test on the tray and the germination paper by a thin coverage of the soils on the seeds. Tekeroni [20] observed many differences in the results obtained from the cold test in order to determine the seed vigor in different control laboratories and seed evidence which used the cultivation method in special boxes. However, more trusted and replicable results of this test were reported by means of the seed cultivation method in the tubular germination paper and the method of seed cultivation on germination paper over the tray.

The council of full time seed specialists in 1990 has made a consideration in the cold performance test and using the alternate cultivation method in the tubular germination paper and the seed cultivation was proposed over the tray or special boxes. In this guidance of the seed vigor performance test, also the method of the application of the two seed cultivation has been described in the tubular germination paper and the cultivation on similar trays by the council of full time specialists. The seed vigor for germination and the emergence of seedling from the cold and wet soil, is affected by the genotype and the seed quality (physical and physiological factors), the virulent factors and the chemical factors with which the seed has been treated. Considering the fact that this experiment shows that the seeds with high germination capacity in the optimal laboratory situation for germination, they haven't enough germination in the field and the number of existing and established seedlings in the field is less due to the emergence of possible undesirable germination conditions and the less primary seedling growth. So, the seed vigor test has a considerable importance in determining the seed quality and so different experiments have been designed to evaluate the seed vigor which totally is divided into two direct and indirect methods.

The direct tests are imitations of the regional field conditions and measure the seed vigor for sprouting under the stressful field conditions and the cooling test is one of the direct tests which is used extensively in order to measure the corn seed vigor. The indirect tests also measure the physiologic characteristics which are related to the seed vigor [16, 9]. The cold test is the effective index to evaluate the seed vigor and maintenance capability of it [2, 3]. Walterz and Belansht were succeeded in prognosticating the corn seedling emergence amount in an optimal way using the cooling test. The cold test tried to measure the amount of different effects of all these factors. The cold test usually measures the maximum possible seedling emergence of a seed mass which were cultivated under optimal field conditions, while the standard germination test is the highest standard factor and seed mass which is expected and is produced under an extensive wet soil.
The Seedling Vigor Index (SVI): Vigor in this way:

been used in order to determine the germination seedling length on them. The obtained data have measurements of the primary root length and seedlings are determined randomly in order to do the normal and corrupted seeds are determined and 10

After 7 days, the number of normal seedlings, un

iterations are observed and the seed amounts which have been germinated daily are determined. After 7 days, the number of normal seedlings, un normal and corrupted seeds are determined and 10 seedlings are determined randomly in order to do the measurements of the primary root length and seedling length on them. The obtained data have been used in order to determine the germination Vigor in this way:

The Seedling Vigor Index (SVI):

SVI1 =The germination capacity × (the mean primary root length + The mean peduncle length)

SVI2=The germination capacity × The dry weight of the seedling

In the beginning of seedling formation, in order to determine the The Seedling Vigor Index (SVI), Primary root length and Seedling length 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:

The Seedling Vigor Index:

All the characters evaluated in laboratory were affected by hybrid type, as shown in table (1). Table 1 Indicates that there is statistically a meaningful difference at the 1% probability level among treatments in terms of seedling vigor index. As shown in figure (1), the most seedling vigor index with average 4801 belonged to hybrid PL711; however, it was statistically in the same category as hybrids PL 706 and PL 774. The least degree of seedling vigor index was allocated to hybrid PL710 with a mean of 2177.7 that belonged to the same category as two hybrids Mobin and 07-107. Hybrid SC704 with an average of 3964.3 was in the fifth place. These results are inconsistent with those obtained by Castro et al. [4].

Primary root length:

The results obtained from variance analysis are presented in table (1). According to the obtained results, as to the characteristic of primary root length, there was statistically a meaningful difference at the 1% probability level among treatments. As indicated in figure (2), hybrid PL711 with mean 13.20 mm had the most primary root length among treatments. Hybrid 07-107 with with an average of 7.30 mm had the least primary root length and statistically was in the same category as hybrids Mobin, PL710 and
karoon. Hybrid SC704 with average 11.02 mm had the sixth place among all treatments. These results are inconsistent with those obtained by Fallah [7].

Seedling length:

The results obtained from variance analysis are summarized in table (1). From this it can be concluded that there was statistically a meaningful difference at the 1% probability level among treatments in relation to seedling length characteristic. Figure (3) presents the comparison of treatments’ means in terms of seedling length characteristic. As it is indicated in this figure, hybrid PL704 with mean 34.70 mm had the most seedling length and statistically belonged to the same category as hybrid PL711. The least seedling length was allocated to hybrid PL710 with 17 mm which was in the same category as hybrids Mobin and 07-107. Hybrid SC704 with a mean of 30.70 mm was in the fifth place. These results are inconsistent with those obtained by Enayatgholizadeh et al., [6].

Table 1: Analysis of variance (mean squares) cold Test and seedling characters in laboratory conditions.

<table>
<thead>
<tr>
<th>S. O. V</th>
<th>df</th>
<th>Cold Test</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Seedling Vigor Index</td>
</tr>
<tr>
<td>Hybrids</td>
<td>10</td>
<td>3492549.19**</td>
</tr>
<tr>
<td>Error</td>
<td>33</td>
<td>70111.30</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>-</td>
</tr>
<tr>
<td>CV(%)</td>
<td>-</td>
<td>7.52</td>
</tr>
</tbody>
</table>

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

Conclusion:

Cold test is considered one of the oldest and commonest tests in determining corn seed vigor in unpleasant conditions (humidity and cold) and is used as standard test for determining corn test on occasions when corn seed is planted in an unfavorable cultivation bed; therefore, there is a high correlation between the results from this test and the degree of the emergence of corn seedling in field. The results obtained from this study indicated that various hybrids were different from each other in terms of evaluated characteristics. One of the most important factors that caused such difference was genetic factor. It should be noted that environment conditions of the place where the seed is produced is very important as well. The results obtained from this experiment showed that some of the hybrids were, in terms of evaluated characteristics, superior to hybrid SC704 used in this study. Thus, it can be expected that this superiority to be existed in field conditions in the region.

Fig. 1: Effect hybrids on seedling vigor index in laboratory conditions using cold test.

Fig. 2: Effect hybrids on Primary root length in laboratory conditions using cold test.
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Reference
