Priming on the yield and seed yield component of dry farming wheat

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ABSTRACT: Wheat is one of the strategic productions playing the important role in the country food security. One of its problems in province is lack of acceptable yield in some of kinds for high bakery quality. The current study with aim of the priming effect on the yield and growth way of wheat kinds was carried with seeds (prime) treats with urea, water and lack of priming into factorial in a randomized complete block design on the dry farming kinds (sardary and Azar 2) for three times in Imam Qais region of Chaharmahal va Bakhtiari Province in 91-92.

In this study, the yield component such as number of grains per spike, number of spikes per unit area, grain weight, grain yield, biological yield and harvest index were evaluated. The result showed that the priming has significant increase in the number of raceme per unit of area and seed yield. Also, the priming effect has significant increase in the number of seed per spike and seed yield in Azar 2 and it has significant increase in weight of 1000 seed in Sardary too. Totally as a result, the Azar2 and hydropriming in dry farming cultivation of Imam Qais region showed best results rather than of other compounds in this study.

Keywords: Priming, Seed yield, Biological yield, Harvest index, Wheat

INTRODUCTION

Wheat is one of the winter grains having a special place in the world in term of feeding. The importance of wheat is for chemical and physical properties that make its grain. The country’s food provision including attention to dry farming cultivation causes independence and self-sufficiency in food production of country (Khodabande, 2003).

Some ways help to plant growth or increasing of root expansion. however , most of production are limited for bushes unfavorable aggregation , low soil fertility , plant diseases , improper planting time , water remaining , weeds and etc. however , water scarcity is a major factor for production limiting in dry farming conditions (Ovis and Hachum 2003). Also the investigations in the dry farming research station of Maragheh on the irrigation of Azar2 wheat in three time showed that one irrigation at planting ( first planting date) increase the more yield of Azar2 rather than Sardary kind (Tavakoli, 2000) .

The seeds priming is a technology that the seeds gain the preparation of germination before settling in its bed and facing with ecological conditions in term of physiological and biological manner. This makes the biological and physiological demonstrations in primed seeds and its resulted plants. These items can be observed in germination manner, early crop deployment, utilization of environmental factor, prematurity, increasing the quality and quantity of product (Pill and Necker, 2001, Savaj, 2004).

The seeds during planting consume significant time for water absorbing and can increase the germination rapid and the existing of gemma from soil with reducing this time. In the other words, in priming the water absorbing level controls that the necessity metabolic activities occur for germination but the roots can be prevented from leaving.
This technique is used to improve germination and seedling deployment and yield (Ackermann, 1992). Priming stimulates the synthesis and activation of hydrolytic and amylase enzymes. These enzymes provide the required energy for germination and seedling emersion by oxidation of stored food in the seed (Vary, 2010). The required time for 50% germination, relative time of germination, rate and uniformity of germination in primed seeds such as canola, wheat, soybean, alfalfa, corn, sorghum and rice improved significantly which represent the acceleration of germination and seed vigor enhancement by using of treat seeds before planting (Dauman, 2006). This experiment was carried in order to the effect of seed priming on the performance and yield of Azar2 and sardary wheat.

MATERIALS AND METHODS

The project implemented in Imam Qais area in the Borjjen city in 1390. The area located in 21-51 east longitude, 31-44 north latitude, with altitude 2460 m, humidity 49% and the average of total annual rainfall is 698.5 mm that the rainfalls in this region is mostly in winter and spring.

This study with aim of the priming effect on the yield and growth way of wheat kinds was carried with seeds coverage treats with urea, salt, water and lack of priming into factorial in a randomized complete block design on the dry farming kinds (Sardary and Azar2) in three times.

After selecting the land, the soil degradation characteristics were studied in the agrology laboratory (table 1). After land preparation, seeds of each line include six lines with a length of 4 meters and a distance of 20 cm were planted by hand. During harvest, we used of a half in half box manually. Attributes that were examined in this study were number of grains per spike, number of spikes per unit of area, seeds weight and seed yield respectively.

Static calculation:
Data were analyzed by using the Minitab (ver16) software and compared by using Duncan’s multiple range test at the level 1 and 5 percent and graphs were plotted using excel software.

RESULTS AND DISCUSSION

Number of grain per spike
The table examination of test data variance (table 2) showed that the use of different varieties of wheat in term of number of grain per spike in Azar2 showed the greater increase rather than Sardary kind. Also, high positive correlation with the yield of grain per spike, number of spikelets per spike and the number of spikes per unit of area indicated. In addition, the number of grains dependent to plant genotype and be affected by environmental conditions.

Reduction in number of grains per spike in Sardary kind due to facing with growth sensitive phase such as blooming, pollination and seed production with improper conditions in last of season and high sensivity of Sardary kind than other kind to grain rust disease, decumbency and also high temperature was less than Azar2.

Number of spikelet per spike:
The data showed that use of different kind had significant effect on the number of spikelet per spike (p<0.01), so that the investigation of average comparison showed that the number of spikelets per spike in Azar2 has been increased from 8.8 to 11 significantly (table 2).

The number of spikelet per spikes is increased by increasing the pedicel length. The modification of wheat kind for producing of limited claws and fertile can increase the length of pedicel and length of spike.

The increasing of synthesize matter storage in pedicels and the increasing of claw length period to end of pedicel causes storage of high synthesizing matter in pedicel and raceme length increase (Najafi 1387). Wheat seed priming increases the yield and yield component. The number of spikelets per spike had significant correlation with grain yield and the number of raceme per unit of area. Richard found similar results.
Table 1. Soil chemical properties of the test

<table>
<thead>
<tr>
<th></th>
<th>N (%)</th>
<th>K (mg/kg)</th>
<th>P (mg/kg)</th>
<th>T.N.C (%)</th>
<th>O.C (%)</th>
<th>Ec (ds/m)</th>
<th>depth (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>64</td>
<td>296</td>
<td>10/1</td>
<td>27/5</td>
<td>7/22</td>
<td>7/39</td>
<td>950</td>
</tr>
</tbody>
</table>

Table 2. The variance analysis of the effect of priming on the characteristics

<table>
<thead>
<tr>
<th>Mean-square</th>
<th>Harvest index</th>
<th>Biological yield</th>
<th>Grain yield</th>
<th>The weight of 1000 grain</th>
<th>Number of raceme per unit of area</th>
<th>Number of spikelet of per spike</th>
<th>Number of fertile claw per unit of area</th>
<th>Degree of freedom</th>
<th>Changes resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/867ns</td>
<td>2323889ns</td>
<td>195687ns</td>
<td>28/202ns</td>
<td>426ns</td>
<td>2/9105ns</td>
<td>0/901ns</td>
<td>2</td>
<td>repeat</td>
<td></td>
</tr>
<tr>
<td>5/41ns</td>
<td>54617ns</td>
<td>2708**</td>
<td>42/499**</td>
<td>6161**</td>
<td>308508</td>
<td>193/092**</td>
<td>1</td>
<td>kind</td>
<td></td>
</tr>
<tr>
<td>123/11**</td>
<td>1650751**</td>
<td>3076882**</td>
<td>7/422ns</td>
<td>37334**</td>
<td>2/4085ns</td>
<td>5/235ns</td>
<td>3</td>
<td>priming</td>
<td></td>
</tr>
<tr>
<td>32/55**</td>
<td>1568581ns</td>
<td>144680**</td>
<td>9/084ns</td>
<td>2198ns</td>
<td>5/7486ns</td>
<td>4/365ns</td>
<td>3</td>
<td>kind*priming</td>
<td></td>
</tr>
<tr>
<td>5/253</td>
<td>645112</td>
<td>101894</td>
<td>3/901</td>
<td>597</td>
<td>0/8699</td>
<td>8.633</td>
<td>14</td>
<td>error</td>
<td></td>
</tr>
</tbody>
</table>

The symbols ** and * are probability levels 5 and 1 significantly and ns is non-significant.

The number of raceme per unit of area

One of the investigating factors was the number of raceme per unit of area. The results showed that (table 2) the number of raceme per unit of area increase in Azar2 than Sardary to 9% and from 4, 23 grains per raceme in Sardary reached to 1,254 grains in Azar2.

Also, hydropriming made the significant increasing in the number of raceme per unit of area than other treats (figure 1). In the investigations the number of spike and the number of fertile claw per unit of area affected by genetic factor and environmental factors have low effect.

The results of the investigation by Ghanbari (1391) on the some agronomic characteristics and grain yield of winter wheat showed that the number of raceme per unit of area of Sardary in the earlier varieties of planting dates is greater than Azar2 significantly. This researches statement that claw production potential was high that the delay at planting date and the encountering with cold weather reduce the number of fertile claw of Sardary kind significantly. There was a high positive correlation between number of grains in raceme per unit of area and raceme with yield.

The weight of 1000 grains

The analysis of the variance indicate (table2) that the using of different kinds have significant effect on the weight of 1000 grains (p<0.01). The comparison of average showed that using of Sardary than Azar2 increased seed weight to 15% and was reached from 31.9 to 36.9. These results indicate that in Sardary due to heavy raceme during grain filling and senility of this kind to grain rust disease causes increasing of pedicel decumbency and consequently reduced weight of 1000 grains.

In the grain filling period in Sardary kind and Azar2 was more opportunity time for grain filling and subsequently increased the number of grains and spike length and can increase the grain weight in appropriate environmental conditions. There is negative and significant correlation between the weights of 1000 grains with number of spikelets and grains per spike. Also, Ghanbari (1391) and Ziluei (1392) were reached to similar results.
The grain yield
Evaluation of test data (table 2) showed that the grain yield is affected by kind, priming and interaction of priming at one percent probability level (p<0.01). also, the hydropriiming had significant effect on the yield per unit of area than urea and salt and enhanced it 100. also, the use of Azar2 than Sardary had significant increasing in grain yield. The interaction of kind in priming on this attribute was significant.
The results of studies by Abdolrahmani (1390) showed that the treated seeds had better use by germination and rapid deployment of existing resources and in these plants the dry matter accumulation; crop growth rapid and relative growth rapid and finally grain yield were height than the control plants from seeds.
In this study, the performance increasing due to the hydropriiming can show the rapid and more desirable deployment of plants and their more using of environmental conditions (such as nutrients, moisture, solar radiation). The yield and positive and high correlation with number of raceme per unit of area, the number of grain per spike and grain yield. Also Jamieson (1995) refers to similar results in this case.

![Figure 2. effect of interaction of kind and priming on seed function](image)

**BIOLOGICAL YIELD**
The variance analysis examination of data showed that the using of hydropriiming increased the biological yield significantly (p<0.01). Hydropriiming than priming with salt and urea increased the biological yield to 69%. It seems that the treated seeds used better of available resources by germination and rapid deployment.
In a study that was done by Ziluei, they found that there is positive and significant correlation between grain yield and biological yield in kinds. On the other hands, several factors such as sensivity to decumbency, disease and grain falling can cause yield loss, thus, the yield reduces.

![Figure 3. effect of priming of on the biologic function](image)

The harvest index
Analysis of variance (table 2) showed that the hydropriiming use and nonuse of priming increased harvest index significantly (figure 4). Priming with urea (figure 5) reduced the harvest index in Azar2 than Sardary and nonuse of priming in Azar2 increased the harvest index than Sardary.
In this study, there was positive correlation between harvest index and the gain yield. If the carbohydrate matter send to grain from green part the harvest index increases. Donald (1976) in a study showed that in the flowering time, the maximizing material transfer take place and the grain reaches to its maximum weight. The better spikes with high competition power in some kind’s increases the yield and harvest index (fisher 2011).

![Figure 4. effect of priming on the harvest index](image)

**The effect of priming on the harvest index**

![Figure 5. The interaction of kinds and priming on the harvest index](image)

**The interaction of kinds and priming on the harvest index**

**CONCLUSION**

The conclusion showed that the grain yield increases by hydropriming and the investigating kinds have different yield potential and interaction of priming treats and kinds had significant effect on the function. Thus, it can be conducted that use of Azar2 and hydropriming in Imam Qais had high yield and yield component than Sardary and other treats.

The number of raceme per unit of area is important component of performance, so that these 3 factors have correlation to each other and can compensate each other. Most kinds with growth period of pedicel and grain filling have heist ranking of grain yield.
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