EFFECT OF SEED SOAKING IN NITROGEN, PHOSPHORUS AND HERBICIDES SOLUTION ON YIELD AND OTHER CHARACTERISTICS OF WHEAT

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ABSTRACT
In order to explore the possibility of enhancing wheat productivity with limited inputs, an experiment entitled “Effect of seed soaking in nitrogen, phosphorus and herbicides solutions on yield and other characteristics of wheat” was conducted at the Agriculture Research Farm of NWFP Agricultural University Peshawar during winter-2002-03. Seeds were soaked in pure water, 0.1% and 0.5% urea solution, 0.1% and 0.5% SSP solution, 0.01% and 0.005% Buctril-M and 0.01% and 0.05% Puma super solutions. The seeds soaked in different solutions along with un-soaked control making 10 treatments were studied in the experiment. The experiment was laid out in RCB design with four replications. Seed soaking in different solutions significantly affected emergence m\(^{-2}\) seedling weight, plant height, spikem\(^{-2}\), grains spike\(^{-1}\), thousand grain weight, biological yield and grain yield (kg ha\(^{-1}\)). Maximum emergence m\(^{-2}\) (110) was noted in control while highest seedling weight (6.5 g) was recorded in plots in which seeds soaked in pure water had been sown. Tallest plants (88.10 cm) and more spikes m\(^{-2}\) (163.0) were observed in plots of seed soaked in 0.01% Buctril-M solution. More grains spike\(^{-1}\) (65.15) was noted in plots of seed soaked in 0.005% Puma super solution. Plants originating from seed soaked in 0.5% urea solution produced heaviest thousand grains weight (40.87 g). Highest grain yield (2396 kg ha\(^{-1}\)) and biological yields (16780 kg ha\(^{-1}\)) were obtained from those plots in which seed soaked in 0.1% urea solution had been sown.

INTRODUCTION
Common wheat (Triticum aestivum L.) is an annual, self-pollinated and photo periodically long day plant. It is the chief source of food for a great deal of population and is known as the king of cereals. It is the staple food for the people of Pakistan and meets the major dietary requirements, supplies about 73% of the calories and protein of the average diet (Hayene, 1987). As population growth rate of our country is over 3.1% per year, wheat production has to be increased at the same or higher rate in the country to meet the food requirements. To cope with increasing food requirements of Pakistan, it is imperative to increase the wheat production by adopting improved technology and management practice. Despite the use of adequate amount of chemical fertilizer and management the wheat yield is still 30-80% lower than its potential (Khan et al., 2001). The low wheat yield per unit area in Pakistan is due to poor agricultural practices and use of non traditional technology by the wheat growers, which includes lower use of inputs like fertilizers, pesticides, poor weed control, broadcast sowing as well as low and erratic rainfall, harsh climate for wheat low soil organic matter, limited water availability and intensive cropping etc.

There is greater need to explore every aspect of enhancing crop productivity through manipulation of crop growth and development. Starter nitrogen has been reported to enhance growth and yield. Seed soaking in nutrients solution is a sort of providing limited nitrogen for the germination seed as good starter for initiation of growth (Das and Choudhry, 1996).

Herbicides like phenoxy compounds are growth regulators and their minute quality may accelerate growth in initial stage with subsequent effect on yield (Lou et al., 1998). Therefore, the present experiment was designed to study the effect of soaking seed in nutrients and herbicides solution on yield and other characteristics of economics importance of wheat crop.

MATERIAL AND METHODS
An experiment to study the effects of seed soaking in nitrogen, phosphorus and herbicides solutions on yield and other characteristics of wheat was conducted at the Agriculture Research Farm, NWFP Agricultural University, Peshawar, during winter 2002-03. The experiment was laid out in RCB design with four replications. A plot size of 4m by 1.6m, having 6 rows four meter long and 30
cm apart was used. Overnight seed were soaked in pure water, 0.1% urea solution, 0.5% urea solution, 0.1% SSP (single super phosphate) solution, 0.5% SSP solution 0.01% Buctril-M solution, 0.005% Buctril-M solution, 0.01% Puma super solution and 0.005% Puma super solution. Sowing was done on 21st November 2002 with the help of hand hoe using Ghazanavi-98 variety. A basal dose of NPK of 120: 60: 0 kg ha$^{-1}$ was applied at the time of seed bed preparation. All other agronomic practices were uniformly applied throughout the growing season. Data were recorded on the parameters like emergence m$^{-2}$, seedling weight, plant height, spikes m$^{-2}$, grains, spike$^{-1}$, 1000 grains weight, biological and grain yields. The data for individual traits were subject to ANOVA technique and the significant means were separated by Least Significant Difference (LSD) test.

RESULTS AND DISCUSSION

Emergence m$^{-2}$
The data given in Table I showed that seed soaking in different solutions significantly affected emergence m$^{-2}$. Maximum emergence m$^{-2}$ (110.2) was observed in control plots while minimum emergence m$^{-2}$ (65.93) was observed in plots of seed soaked in 0.01% Puma super solution with the possible reason that it might have negative/toxic effect on the enzymatic activities in the seeds of wheat hence resulting in minimum emergence m$^{-2}$. These findings are in agreement with Ghosh et al. (1997) who reported increase in tillers m$^{-2}$ when seed of wheat were soaked in 100 ppm Na$_2$ PO$_4$ or dikegulac-sodium.

Seedling Weight
The data given in Table I showed that seed soaking in different solutions significantly affected seedling weight. Maximum seedling weight (6.50 g) was observed in plots of seed soaked in pure water and 0.1% SSP solutions with the possible reason that phosphorus encourages vigorous root growth hence increasing seedling dry weight or it may be due to that in water and 0.1% SSP solution seedling uptake of nutrient from endosperm was maximum resulting in vigorous seedling while minimum seedling weight (3.25 g) was observed in plots of seed soaked in 0.01 Puma super solution which might have negative effect on the translocation of stored food in endosperm to radical and the growing plunule thus resulted in slightest seedling weight.

Plant Height
Data on plant height as affected by soaking seed in fertilizers and herbicides solution are given in Table I. The statistical analysis of the data showed that seed soaking in fertilizers and herbicides solutions significantly affected plant height. Maximum plant height (88.10 cm) was noted in seed soaked in 0.01% Buctril-M solution with the possible reason that broad leaf weeds were suppressed by Buctril-M solution soaked seeds of wheat hence resulting in maximum plant height while, minimum plant height (79.33 cm) was observed in plot when seeds soaked in pure water. It might be due to non-toxic effect of water on weeds hence the plants of plots in which water soaked seeds were applied resulted in dwarf plants of wheat due to weed plants competition. These results are in confirmation with those of Chhipa et al. (1993) that presoaking wheat seeds with IAA, IBA or sodium Sulphate increased plant height in wheat.

Spikes m$^{-2}$
Data on spikes m$^{-2}$ as affected by seed soaking in fertilizer and herbicides solution are given in Table I. The statistical analysis of the data showed that seed soaking fertilizers and herbicides solutions significantly affected spikes m$^{-2}$. Maximum spikes m$^{-2}$ (163) were observed in plot of seed soaked in 0.01% Buctril-M solution. Buctril-M being a growth promoter might have been absorbed by seed at soaking encouraged shoot development initially and later on might have resulted in the highest number of spikes m$^{-2}$ while minimum spikes m$^{-2}$ (67) were recorded in plot of seed soaked in 0.01% Puma super solution. Buctril-M being a growth promoter might have been absorbed by seed at soaking encouraged shoot development initially and later on might have resulted in the highest number of spikes m$^{-2}$ while minimum spikes m$^{-2}$ (67) were recorded in plot of seed soaked in 0.01% Puma super solution. Buctril-M being a growth promoter might have been absorbed by seed at soaking encouraged shoot development initially and later on might have resulted in the highest number of spikes m$^{-2}$ while minimum spikes m$^{-2}$ (67) were recorded in plot of seed soaked in 0.01% Puma super solution. Buctril-M being a growth promoter might have been absorbed by seed at soaking encouraged shoot development initially and later on might have resulted in the highest number of spikes m$^{-2}$ while minimum spikes m$^{-2}$ (67) were recorded in plot of seed soaked in 0.01% Puma super solution.

Grains Spike$^{-1}$
The results of grains spike$^{-1}$ after statistical analysis indicated that the various seed soaking in fertilizes and herbicides solutions significantly.
affected grains spike\(^{-1}\) (Table I). More number of grains spike\(^{-1}\) (65.15) were found with 0.005% Puma super solution with the possible reason that larger spikes resulted in more grains spike\(^{-1}\) whereas less number of grains spike\(^{-1}\) (48.42) were observed in control plot. These results are in agreement with those of Ghosh et al. (1997) they reported maximum number of grain spike\(^{-1}\) in wheat when seeds were soaked in 100 ppm Na\(_2\)HPO\(_4\) or dikegulac-sodium solution.

**Thousand Grain Weight**

Data on thousand grains weight as affected by seed soaking in fertilizers and herbicides solutions are given in Table I. The statistical analysis of the data showed that seed soaking in fertilizers and herbicides solutions significantly affected thousand grain weight. Heaviest thousand grain weight (40.78 g) was noted in plot of seed soaked in 0.5% urea solution with the possible reason that it might have improved the nutrient status of the grains and hence resulted in heavier grains. While lightest thousand grain weight (34.56 g) was observed in plots of seed soaked in 0.005% Puma super solution. This decrease in weight with Puma super might be due to adverse effect on grain constituents. These results are in close conformity with those of Ghosh et al. (1997) they reported increased 1000 grain weight in wheat when seeds were soaked in Na\(_2\)HPO\(_4\) or dikegulac-sodium solution.

**Biological Yield**

Significantly different results were found for biological yield (Table I). Analysis of the data showed that maximum biological yield (16780 kg ha\(^{-1}\)) was recorded in plots of seed soaked in 0.1% urea solution which might caused stress on plant growth and resulted in less and weak plants of wheat and hence decreased biological yield. These results are in similarity with the findings of Chhipa et al. (1993) they reported 34% increase of straw yield of seed soaked in IAA.

**Grain Yield**

Statistical analysis of the data showed in Table I exhibit that grain yield was significantly affected by seed soaking in different solutions. The highest grain yield (2396 kg ha\(^{-1}\)) was recorded in plots of seed soaked in 0.1% urea solution with the possible reason that it might result in fully developed grains. While the lowest grain yield (1747 kg ha\(^{-1}\)) was recorded in plots of seed soaked in 0.01% Puma super solution which might be due to smaller grains formation due to stress on plant growth and development. These results are in agreement with the findings of Gulnaz et al. (1999) who reported increased grain yield of seed soaked in 2, 4-D and to that of Ghosh et al. (1995) who reported increased grain yield of seed soaked in Na\(_2\)HPO\(_4\).

**CONCLUSION AND RECOMMENDATION**

Based on the results it is concluded that seed soaked in 0.5% urea solution produced heaviest seed weight while seed soaked in 0.1% urea solution resulted in maximum grain yield as well as biological yield. Seed soaking of wheat in various concentrations of urea is recommended to get maximum yield, reduce cost of production and increase net income of the farming community.
Table I. **Response of emergence m\(^{-2}\), seedling weight, plant height, spikes per m\(^2\), grains per spike, 1000 grains weight, biological yield and grain yield of wheat to seed soaking in nitrogen, phosphorus and herbicides solutions**

<table>
<thead>
<tr>
<th>Seed Soaking</th>
<th>Emergence m(^{-2})</th>
<th>Seedling weight (g)</th>
<th>Plant height (cm)</th>
<th>Spikes m(^{2})</th>
<th>Grains spike(^{-1})</th>
<th>1000 grains weight (g)</th>
<th>Biologic yield (kg ha(^{-1}))</th>
<th>Grain yield (kg ha(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (No soaking)</td>
<td>110.2 a</td>
<td>6.00 ab</td>
<td>84.77 bcd</td>
<td>153.9 ab</td>
<td>48.42 d</td>
<td>35.44 ef</td>
<td>15570 ab</td>
<td>2297abc</td>
</tr>
<tr>
<td>Pure Water</td>
<td>81.53 cde</td>
<td>6.50 a</td>
<td>79.33 f</td>
<td>113.3 cd</td>
<td>49.72 d</td>
<td>36.57 de</td>
<td>10850 cd</td>
<td>1965def</td>
</tr>
<tr>
<td>0.1% urea</td>
<td>84.03 cd</td>
<td>4.25 cd</td>
<td>84.13 bcd</td>
<td>129.4 c</td>
<td>53.85 c</td>
<td>37.26 cd</td>
<td>16780 a</td>
<td>2396 a</td>
</tr>
<tr>
<td>0.5% urea</td>
<td>80.69 de</td>
<td>4.75 bc</td>
<td>80.85 ef</td>
<td>99.4 d</td>
<td>56.09 c</td>
<td>40.87 a</td>
<td>10070 d</td>
<td>2035cde</td>
</tr>
<tr>
<td>0.1% SSP</td>
<td>93.18 bc</td>
<td>6.50 a</td>
<td>85.51 abc</td>
<td>113.7 cd</td>
<td>61.00 b</td>
<td>39.71 ab</td>
<td>11710 c</td>
<td>1881def</td>
</tr>
<tr>
<td>0.5% SSP</td>
<td>81.94 cde</td>
<td>4.25 cd</td>
<td>84.62 bcd</td>
<td>127.0 c</td>
<td>61.06 b</td>
<td>38.38 bc</td>
<td>10930 cd</td>
<td>1787 ef</td>
</tr>
<tr>
<td>0.1% Buctril-M</td>
<td>97.33 b</td>
<td>4.25 cd</td>
<td>88.10 a</td>
<td>163.0 a</td>
<td>55.32 c</td>
<td>34.65 f</td>
<td>10740 cd</td>
<td>2330 ab</td>
</tr>
<tr>
<td>0.005% Buctril-M solution</td>
<td>84.23 cd</td>
<td>4.75 bc</td>
<td>87.03 ab</td>
<td>129.9 bc</td>
<td>54.32 c</td>
<td>37.89 bc</td>
<td>14920 b</td>
<td>1806 ef</td>
</tr>
<tr>
<td>0.1% Puma super solution</td>
<td>65.93 f</td>
<td>3.25 d</td>
<td>83.08 cde</td>
<td>67.5 e</td>
<td>62.23 b</td>
<td>34.56 f</td>
<td>9901 d</td>
<td>2174 gef</td>
</tr>
<tr>
<td>0.005% Puma super</td>
<td>70.29 ef</td>
<td>5.75 ab</td>
<td>81.75 def</td>
<td>134.7 bc</td>
<td>65.15 a</td>
<td>36.64 de</td>
<td>11110 cd</td>
<td>2104bcd</td>
</tr>
</tbody>
</table>

LSD at P< 0.05 11.764 1.254 3.158 24.09 2.889 1.717 275.3

Means in each column followed by different letters are significantly different at P<0.05 level of probability using Least Significant Difference (LSD) test.

**REFERENCES**


