Original Research Article

Effect of Halopriming along with Hydropriming on Germination of Wheat (*Triticum aestivum* L.) Seeds.

Abstract

Biotic and abiotic stress effects the crop yield badly every year. In the abiotic factors the drought, heat and salinity are the major stress for crops in Pakistan. Cultivated area are decreasing rapidly because the construction of new buildings, towns and population food demand increasing. There is only one way to fulfill the requirements of population by development stress tolerance genotypes. Two different varieties of wheat (*Triticum aestivum* L. with AABBDD genome and 6x= 42) i.e. Faisalabad 2008 and Galaxy 2013 were used to evaluate the effect of halopriming along with hydropriming to observe germination parameters and early growth stages. The experiment was conducted in factorial structured treatments design with three replications at Department of Seed Science and Technology, University of Agriculture Faisalabad. For halopriming seeds were soaked in 0.5% KCL, 1% KCL, 1.5% KCL and in distilled water for hydropriming for time period of 6-8 hours. The results showed that final emergence percentage of priming seeds with 1% KCL of Faisalabad 2008 had higher percentage than others. However, for time to start germination there was no any difference among KCL priming and hydropriming for both varieties. For mean germination time priming seeds with 1.5% KCL of Faisalabad 2008 showed maximum time. Seeds priming with 1% KCL of Galaxy 2013 took maximum time to complete 50% germination (T50). Overall, Faisalabad 2008 priming with KCL proved best in most of parameters.

Keywords: Wheat; Halopriming; Hydropriming; Mean germination time; Time to complete 50% germination.

1.Introduction

Wheat (*Triticum aestivum* L.) is top ranked crop among cereal crops in whole world. Moreover, it is a staple food for most of countries including Pakistan. Wheat is a rich source of carbohydrates and its raw material can be used for human beings as well as for animals [1]. Most of crops have to face many biotic and abiotic stresses which limits their growth and yield attributes, wheat has to face drought, fluctuation in temperature and salinity etc. which retards its germination [2]. In world 20% of cultivated land belongs to saline and about half land belongs to saline of total irrigated land. Salinity has adverse effects on crops which limits quality of crops and their germination parameters like time to start germination, final emergence percentage and mean germination time [3]. Salinity can be overcome by halopriming, priming of seeds before germination into salt solution for certain period of time [4]. Salinity can be overcome by many techniques which include halopriming and hydropriming and it should be reduce because of its effects which changes patterns of growth, nutrient imbalance and ion toxicity [5]. Hydropriming soaking of seeds into distilled water for certain period of time to soften the seed coat for more imbibition then air dry for longer storage [6]. Priming is controlled hydration process in which lag phase increases which provides metabolic repair and

enhance germination percentage [7]. Poor germination and crop stand may be due to several reasons and these can be minimized by many seed vigor enhancements techniques which improve germination and vigor [8].

priming is not much laborious, inexpensive have no high risks to adopt it, it mainly enhances germination percentage and germination rate and other parameters of growth for many cereal crops including wheat. These priming techniques including hydropriming, osmopriming and halopriming etc. [9]. Hydropriming and halopriming have positive effect on germination and early growth stages of wheat [10]. Pre farming seed treatments including seed priming makes seed enable to grow rapidly and in uniform way which improve its performance under stress conditions [11]. Seeds which become dormant due to unfavorable environmental conditions during storage, their dormancy can be break through several seed enhancements techniques like seed priming which include hydration and dehydration treatments [12]. Several seed invigoration techniques improve crop stand, early growth stages and make suboptimal conditions favorable [13]. Among seed enhancements techniques seed priming considers to be more effective technique to enhance the performance of seeds including wheat under stress conditions [14]. Halopriming induces biochemical changes which make seed to grow better with vigorously [15]. The harmful effects of great absorption of salts for plants because the osmotic retention of water and specific ionic effects on the plant cell. Water is osmotically seized in salted solutions, when the salt concentration increased water less available to the plant. At the end Poor germination and seedling develops in saline soil. It is a huge problem harmfully upset growth and development and at less agricultural production [10].

Previous work clearly indicates that hydropriming as well as halopriming greatly improve germination percentage, time to starts germination and other parameters. The aim of present study to enhance germination rate and evaluate the effect of halopriming along with hydropriming on two different wheat varieties.

2. MATERIAL AND METHODS

2.1 Seed source: Seeds of two varieties of wheat (*Triticum aestivum* L.*),* Faisalabad 2008 and Galaxy 2013 were obtained from Ayyub Agriculture Research Institute Faisalabad, Pakistan. Seeds were surface sterilized with 1% Sodium Hypochlorite solution for three min, then air dried to keep moisture content at optimum level.

2.2 EXPERIMENTAL DESIGN: The experiment was conducted in controlled conditions at Seed Science and Technology department, University of Agriculture Faisalabad Pakistan. Experiment was performed in Completely Randomized Design (CRD) with three replications and two factors which are given below

- **FACTOR 1.** For priming of seeds four different concentrations KCL salt were applied.

I. 0.5% KCL Solution
II. 1% KCL Solution
III. 1.5% KCL Solution
IV. Control (KCL 0%)

- **FACTOR 2.** To check the effects of KCL on wheat seeds two varieties were taken

i. Faisalabad 2008
ii. Galaxy 2013

This experiment was conducted to find the effect of KCL on different parameters of seeds of two varieties of wheat which included, time to start germination (TSG), final emergence percentage (FEP), mean germination time (MGT).

$$\text{MGT (D)} = \sum(DN)/\sum N$$

Where D is the number of days from the start of germination test and N is the number of seeds germinating on days N.

And to calculate time to complete 50% germination (T50)

$$T50 = ti + [(N/2 - ni)(ti - tj)] / ni - nj$$

Where N is the final number of emergence and ni and nj cumulative respectively when ni < N/2 < nj.

Four hundred seeds of each variety were taken for the germination test. Three solutions of 200 ml were prepared in beakers by using KCL and distilled water having concentrations 0.5% KCL, 1% KCL, 1.5 % KCL. One beaker contained distilled water for the purpose of hydropriming. One hundred seeds of wheat variety FAISALBAD 2008 were soaked in each beaker for a time period of 6-8 hours and the beakers were carefully covered to avoid contamination. The same process was repeated for wheat variety Galaxy 2013. After 6-8 hours priming seeds were collected from beakers and sown in petri dishes. For this purpose, 24 petri dishes were taken, washed and dried to avoid contamination. Afterwards, filter papers were placed in each petri dish, wetted slightly with distilled water. Ten seeds were sown in each petri dish. The experiment was conducted in CRD with three replications. Experiment was observed on daily basis and data were collected. To determine significance of variance ($P<0.05$) factorial structured treatments design used.

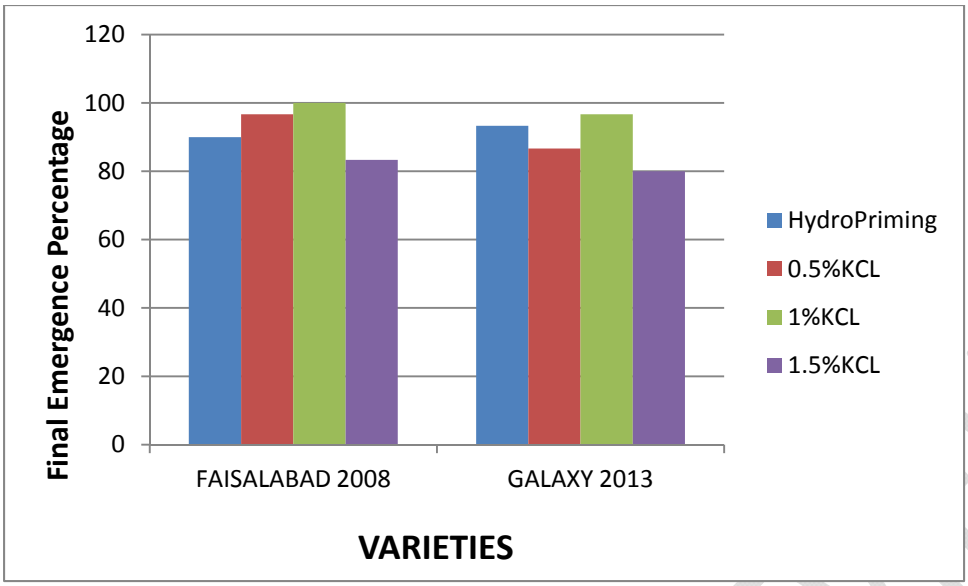
3. Results and Discussion

To check significance, the analysis of variance was done. Significant differences observed among varieties and priming levels. For interaction the F_{cal} = 0.76, 1.11 and 2.76 for FEP, MGT and T50 respectively which are less than F_{tab} =3.24. So interaction (V×P) is non-significant indicating thereby that main effect has meanings. For priming levels F_{cal}=4.85, 0.70 and 4.81 for FEP, MGT and T50 respectively. So for FEP and T50 they are significant because, F_{tab} =3.24 and for MGT is non-significant. For varieties F_{cal} =1.14, 0.53 and 0.12 which are non-significant as F_{tab}=224.58. For treatments T50 is significant, FEP and MGT are non-significant as F_{tab}=2.91. Moreover, for time to start germination there is significant ($p<0.05$) difference for time to start germination.

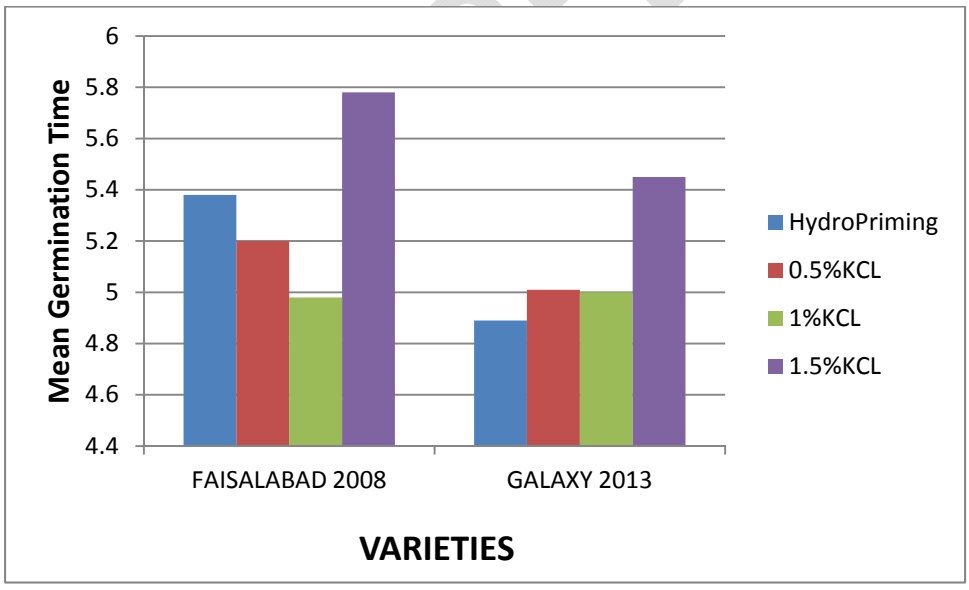
Table 1: Analysis of various

SOV	DF	MSS			F_{cal}		
		FEP	MGT	T50	FEP	MGT	T50
Treatments	7	150	1.77	1.24	2.57	2.69	3.26*
V	1	66.67	0.35	0.046	1.14	0.53	0.12
P	3	283.34	0.46	1.83	4.85*	0.70	4.81*
V×P	3	44.44	0.7273	1.05	0.76	1.11	2.76
Error	16	58.33	0.6564	0.38			
Total	23						

3.1 Final Emergence Percentage. Following graph shows that seeds priming with 1%KCL of Faisalabad 2008 variety have higher final emergence percentage of about 100% following by seeds primed with 1%KCL of Galaxy 2013 variety. The minimum final emergence percentage are showed by seeds primed with 1.5%KCL of Galaxy 2013 variety about 80% following by 83% of Faisalabad 2008 variety primed with 1.5%KCL.

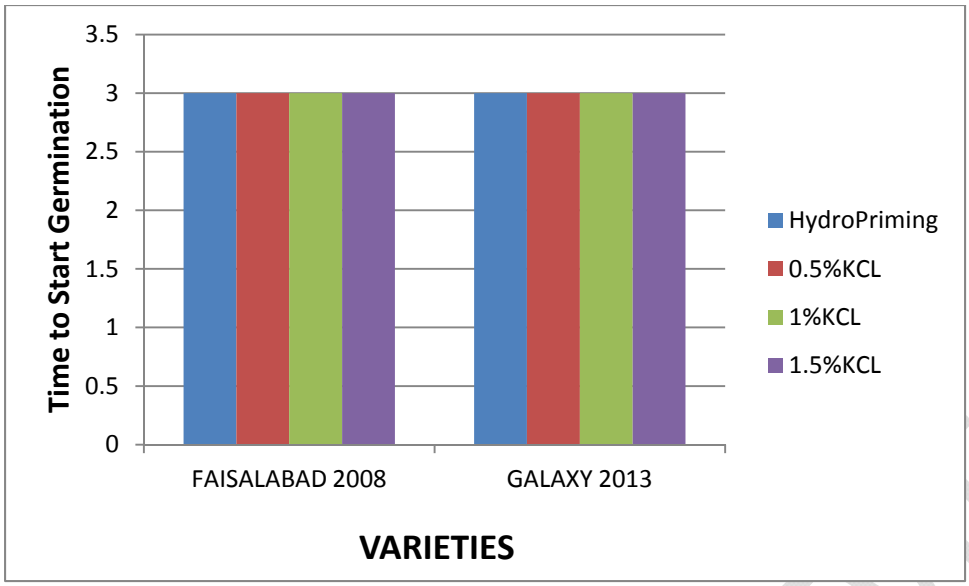


3.2 Mean Germination Time. The graph illustrates that seeds primed with 1.5%KCL of Faisalabad 2008 variety showed higher Mean Germination Time about six days following by seeds primed with 1.5%KCL of Galaxy 2013 variety about five days. The minimum mean germination time showed by seeds priming with Galaxy 2013 seeds treated with hydropriming about less than four days and followed by Faisalabad 2008 seeds treated with hydropriming about just four days.

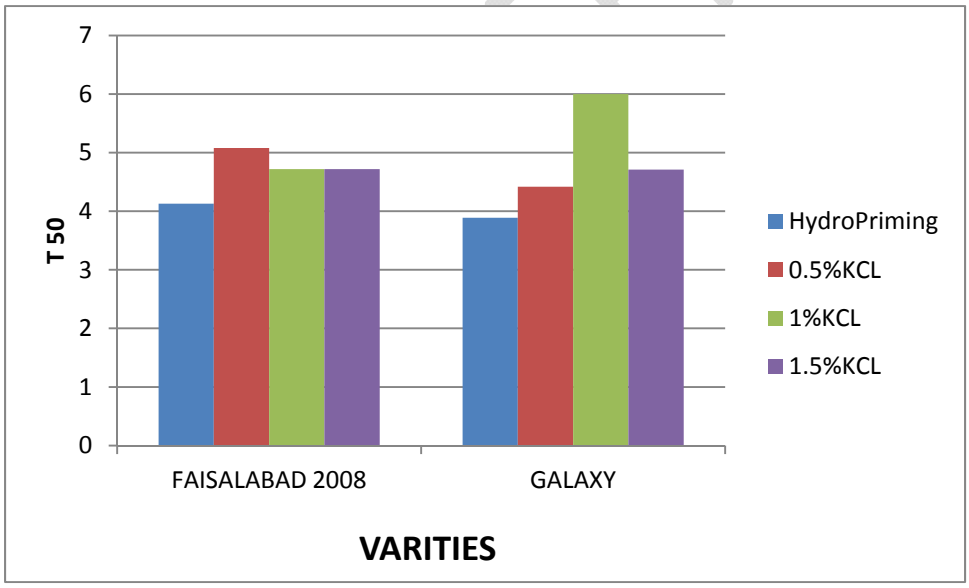


3.3 Time to Start Germination

There is no variation among both varieties which are primed with different concentrations of KCL along with hydropriming. Both varieties showed about three days to start germination.



3.4 Time to Complete 50% Germination. Seeds primed with 1% KCL of Galaxy 2013 variety took maximum days to complete 50% germination about six days following by seeds primed with 0.5% KCL of Faisalabad 2008 variety about five days.



The minimum time taken by seeds of Galaxy primed with hydropriming about less than four days followed by seeds primed with hydropriming of Faisalabad 2008 about just more than four days.

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