Original Research Article

Potential of Zinc glycinate and Calcium chloride on morphological and yield characters of Wheat *(Triticum aestivum*L*)*

Abstract

Thepresentstudyentitled**"Potential of Zinc glycinate and Calcium chloride on morphological and yield characters of Wheat *(Triticum aestivum*L*)"***was carried out to assess the effectofseedtreatmentsduring2022 tofindthesuitableseedtreatmentforwheat.Thirteen treatments alongwithcontrol consists of Calcium chloride, Zinc glycinate and Calcium chloride&Zinc Glycinate in different concentrations, individually and combination as well.A Randomized Block Design(RBD) was used for statistical analysis. The main objectives of this experiment wasto evaluate the influence of different concentrations of Zinc glycinate and Calcium chloride on morphological and yield parameters of Wheat and to determine the effective treatment for wheat.The results indicated thatalltreatmentsrecordedsignificantvariationforpre-harvestandpost-harvestparametersthatwerestudied.ThetreatmentT_{12} (Calcium chloride + Zinc glycinate-7%+7%) significantlyrecorded the higher values inField emergence(95.55%), Plant height(93.13 cm), Number of tillers per plant(5.73),Spike length(15.18 cm),Seedyieldperplant(16.37g)andHarvestIndex(40.09%),incomparision withothertreatments andlowestrecordedinT0(control).Thisstudyhelpstofindthebestsuitableseedtreatment for wheat.

***Keywords*:**Seed treatment, Zinc glycinate, $CaCl_2$, Field emergenceand Harvestindex.

INTRODUCTION:

Common wheat or Bread wheat(*Triticum aestivum* L) is most widely grown type wheat in India. It is a good source of carbohydrates, dietary fiber and essential nutrients such as

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Vitamin B and minerals like Iron and Magnesium but relatively low in certain amino acids such as Lysine and Protein sources. Wheat is used as a primary ingredient in a wide range of floods. It can be ground into flour to make products like Bread, Pastries, Cakes and Pasta. Wheat is best adapted to temperate regions with rainfall 30 cm to 90 cm. In 2022, world wheat production was 761 million tonnes, led by China, India, and Russia collectively providing 38% of the world total**(International wheat production statistics, 2022).**As per Second Advance Estimates for the agriculture year 2022-23, the wheat production in India is estimated at 112.18 million tons which is higher by 4.44 million tonnes than the production achieved during 2021-22.The total sown area under the wheat crop was 34.3 million hectares as of 2023.Wheat production in Uttar Pradesh is estimated at 9590.00 ha for the year 2022-23. (**Ministry of Agriculture and Farmers Welfare, 2022-23).**It has a good nutritional profile with 13% proteins, 40% Wet gluten content, 7% Yellow pigment content, 7% pentosans, 1.8% lipids. 1.8% ash. 20% reducing sugars and provides 314 Kcal/100g of food. Besides it also contains Calcium (37 mg/100 g), Nicotinic acid (5.4 mg/100 mg), Iron (4.1 mg/100 g), Thiamine (0.45 mg/100 g) and Riboflavin(**Fernando, 2014).**

Pre-sowing seed treatment refers to that treatments that are applied to seeds before they are planted in order to enhance their germination, growth and overall health to improve the crop establishment and yield potential. Some of that treatments are Zinc glycinate and Calcium chloride.Zinc glycinate is a chelated form of zinc, where zinc is bound to the amino acid glycine. In plants, zinc is an essential micronutrient that plays a vital role in various physiological processes and is required for proper growth, development, and overall health.Calcium chloride ($CaCl_2$) is a salt of calcium and chlorine and is widely used in various agricultural and horticultural practices as a source of calcium and as a means to manage specific plant responses. Calcium is one of the essential secondary nutrients required by plants.Through the pre-sowing treatment in the seed, one can enhance the quality of seeds. The seed can protect the stress which is caused by the abiotic stress and also produce equal germination, thus overall crop yields might be greatly enhanced. It is also reported that seed hardening can be useful to develop the rapid and uniform germination and emergence of the seeds and it also increases the seeds tolerance to adverse environmental conditions**(Ananthi2017).**

MATERIALS AND METHODS:

Theexperiment wascarried outtostudythe“**Potential of Zinc glycinate and Calcium chloride**

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on morphological and yield characters of Wheat *(Triticum aestivum*L*)*in the field experiment centre of Seed Science and Technology, at the Department of Genetics and PlantBreeding, Sam Higginbottom University of Agriculture, Technology AndSciences, Prayagraj,Uttar Pradesh, India, during 2022.

Preparation of treatmentswith Zinc glycinate: Seedsweresoaked in fourconcentrationsof Zinc Glycinate; 1%solutionwas preparedbydissolving 1gram in 100 mlofdistilled water. 2%, 5% and 7% solutions were prepared by dissolving 2 grams, 5grams and 7 grams in 100 ml of distilled water respectively.The seeds were soaked for 3 hours and then it is allowed to dried under shade condition for a period of 3 hours and finally it dried under sun condition which bring back to its original moisture condition.

Preparation of treatmentswithCalcium chloride: Seedsweresoaked in fourconcentrationsofCalcium chloride; 1%solutionwas preparedbydissolving 1gram in 100 mlofdistilled water. 2%, 5% and 7% solutions were prepared by dissolving 2 grams, 5grams and 7 grams in 100 ml of distilled water respectively.The seeds were soaked for 3 hours and then it is allowed to dried under shade condition for a period of 3 hours and finally it dried under sun condition which bring back to its original moisture condition.

The following are the treatments:

T_0-Control

T_1-Calcium chloride(1%)-3 hours

T_2-Calcium chloride(2%)-3 hours

T_3-Calcium chloride(5%)-3 hours

T_4-Calcium chloride(7%)-3 hours

T_5-Zinc glycinate(1%)-3 hours

T_6-Zinc glycinate(2%)-3 hours

T_7-Zinc glycinate(5%)-3 hours

T_8-Zinc glycinate(7%)-3 hours

T_9-Calciumchloride+Zinc glycinate(1% + 1%)-3 hours

T_{10}-Calciumchloride+Zinc glycinate (2% + 2%)-3 hours

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T_{11}-Calciumchloride+Zinc glycinate(5% + 5%)-3 hours

T_{12}-Calciumchloride+Zinc glycinate(7% + 7%)-3 hours

In the present study, data of the following pre-harvest and post- harvest parameters data is recorded:

1. Field Emergence (%).

2. Plant height(cm).

3. Number of tillers per plant.

4. Days to 50% flowering.

5.Spike length(cm).

6.Days to Maturity.

7. Seed yield per plant(g).

8. Harvest index (%).

RESULTS AND DISCUSSION

Results from the experiment revealed that different concentrations of pre-sowing seed treatment influenced the growth and yield parameters. The present study revealed that treatment T_{12}-Calciumchloride(7 %) along with Zinc glycinate(7%) showed that maximum growth and yield attributing traits in Wheat. The mean values, standard error mean, standard error of difference, the critical difference at 5 % level of significance and coefficient of variation with 13 treatments along with 8 parameterswhere represented in Table-1, which revealed a wide range of variation for all the traits studied. The mean performances of different priming treatments with respect to different attributes is described as under:

Morphological attributes: As per the data mentioned in the Table-1. the maximum field emergence was found in treatment T_{12}-Calcium chloride 7% and Zinc glycinate7% with mean value of 95.55% which is followed by treatment T_{11}-Calcium chloride 5% and Zinc glycinate 5% with mean value of 94.44% and minimum was observed in control treatment with mean value of 84.44%.Calcium and Zinc treated seedswithstand the stress which is caused by the abiotic stress and also produce equal germination,useful to develop the rapid and uniform germination and emergence of the seedlings**(Ananthi2017).**Maximum plant

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height after 90 days in wheat was observed in the treatment T_{12}-Calcium chloride 7% and Zinc glycinate 7% with mean value of 93.13 cm which is followed by T_{11}-Calcium chloride 5% and Zinc glycinate 5% with mean value of 92.34 cm and minimum was observed in control treatment with mean value of 85.04 cm. Calcium chloride ($CaCl_2$) plays a crucial role in maintaining plant cell structure and its function. It is an integral component of the middle lamella, which holds plant cell walls together, providing strength and rigidity to the plant's tissues that increases the plant height rapidly**(Ananthi2017).**Maximum number of tillers were found in treatment T_{12}- Calcium chloride 7% and Zinc glycinate 7% with mean value of 5.73 which is followed by T_{11}-Calcium chloride 5% and Zinc glycinate 5% with mean value of 5.46 and minimum was observed in control treatment with mean value of 4.As per the data shown in the Table-1 minimum days required for 50 % flowering were observed in treatment T_{12}-Calcium chloride 7% and Zinc glycinate 7% with mean value of 65 days which is followed by T_{11}-Calcium chloride 5% and Zinc glycinate 5% with mean value of 67 days but control treatments takes 75 days for 50 % flowering which is highest when compared with other treatments.Zinc is an essential micronutrient that plays a vital role in various physiological processes and is required for proper growth and causes for early flowering in wheat. Maximum spike length was observed in treatment T_{12}-Calcium chloride 7% and Zinc glycinate 7% with mean value of 15.18 cm which is followed by T_{11}-Calcium chloride 5% and Zinc glycinate 5% with mean value of 14.76 cm and minimum was observed in control treatment with mean value of 11.27 cm.As per the data shown in the Table-1 minimum days required for maturity of wheat crop were observed in treatment T_{12}-Calcium chloride 7% and Zinc glycinate 7% with mean value of 110.6 days which is followed by T_{11}-Calcium chloride 5% and Zinc glycinate 5% with mean value of 111.60 days but control treatment takes 121.06 days for maturity which is highest when compared with other treatments.Zinc is a crucial component that enhances various enzymes which play essential roles in various metabolic processes likeAuxin (plant growth hormone) synthesis and Carbon metabolism which reduces the maturity time for wheat.

Yield attributes: As per the data shown in the Table-1 maximum seed yield per plant was observed in treatment T_{12}-Calcium chloride 7% and Zinc glycinate 7% with mean value of 16.37 g which is followed by T_{11}-Calcium chloride 5% and Zinc glycinate 5% with mean value of 16.11g and minimum was observed in control treatment with mean value of 13.22g.Maximum Harvest index was observed in treatment T_{12}-Calcium chloride 7% and Zinc glycinate 7% with mean value of 40.09% which is followed by T_7-Zinc glycinate(5%)

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with mean value of 40.01% and minimum was observed in control treatment with mean value of 36.66%.

Table-1. The mean values of different pre-sowing seed treatment in wheat

***indicates significant at 5% level of significance**

S. No.	Treatments	Fieldemergence(%)	Plantheight (cm)	No.oftillers perplant	Days to50%flowering	Spikelength(cm)	Days tomaturity	Seedyieldper plant(g)	Harvestindex(%)
1	To	84.44	85.04	4.00	75.00	11.27	121.06	13.22	36.66
2	T_1	91.22	87.69	4.20	73.66	12.70	115.53	14.40	39.00
3	T_2	88.88	88.49	4.33	72.33	12.66	114.06	14.46	39.50
4	T_3	93.32	91.88	4.93	69.33	14.36	114.26	15.56	38.74
5	T_4	93.33	91.12	5.06	69.00	14.48	115.26	15.66	39.60
6	T_5	89.99	88.47	4.13	72.66	13.26	115.13	14.61	38.02
7	T_6	88.88	88.68	4.26	74.33	12.86	114.00	14.70	39.61
8	T_7	90.11	88.68	4.13	71.33	12.80	115.06	14.64	40.01
9	T_8	88.88	89.52	4.20	72.00	13.48	114.46	14.64	37.15
10	T_9	88.99	88.07	4.13	72.66	12.58	114.06	14.21	39.16
11	T_{10}	92.22	88.92	4.06	73.66	12.77	113.93	14.82	37.87
12	T_{11}	94.44	92.34	5.46	67.00	14.76	111.66	16.11	39.28
13	T_{12}	95.55	93.13	5.73	65.00	15.18	110.60	16.37	40.09
Grand Mean		90.79	89.38	4.51	1.14	13.38	114.54	14.88	38.82
SE(d)		1.74	1.36	0.23	1.74	0.28	0.83	0.31	0.68
SE(m)		1.23	0.61	0.16	1.23	0.20	0.58	0.21	0.48
C.D.*		3.59	1.78	0.48	3.60	0.59	1.71	0.64	1.41
C.V.		2.35	1.18	6.40	2.99	2.66	0.88	2.55	2.16

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CONCLUSION:

From the present investigation it is concluded that Calcium chloride and Zinc glycinate that plays a vital role in various physiological processes and is required for proper growth and causes for early flowering and early maturity in wheat. Among the various seed treatments, treatment with Calcium chloride 7% along with Zinc glycinate 7% of 3 hours duration showed significantly maximum in all attributes which is followed by Calcium chloride 5% along with Zinc glycinate 5%.Treatment T_{12} shows highest field emergence(95.55%), plant height(93.13 cm), tillers per plant(5.73), spike length(15.18 cm), seed yield per plant(16.37 g) and harvest index(40.09%) and taken very less time for 50 % flowering and maturity of crop when compared with all other treatments in this experiment. It is concluded that from this experiment Calcium chloride 7% along with Zinc glycinate 7% is better performed seed treatment.

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