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Assessment of Seed Priming Methods for Seed Quality Parameters in Chilli (*Capsicum annuum* L.) Seeds

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A B S T R A C T

An experiment was conducted on priming was conducted in Post Graduate Laboratory, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences, SHUATS, Allahabad, Uttar Pradesh during 2017-2018 on Chilli Kashi Anmol variety. The seeds are treated with different chemicals like Distilled water, (PEG 20%), (KCl 1%), ($CaCl_2$ 1%), (Neem Leaf Extract 5%) and (Eucalyptus Leaf Extract 5%). The treated seeds are soaked for 12hr for seed germination percentage, speed of germination, shoot length, root length, seedling length, seedling fresh weight and dry weight, seedling vigour index I and seedling vigour index II, Halopriming with KCl 1% and $CaCl_2$1% soaked to 12hrs. KCl 1% primed seed recorded higher germination percent (88.75%), speed of germination (16.77), root length (3.42cm), shoot length (5.36cm), seedling length (8.78cm), seedling fresh weight (2.17 g), seedling dry weight (0.025 g), seed vigour index I (779.80) and seed vigour II (2.17) the seed treated with KCl 1% followed by $CaCl_2$ 1% recorded numerical higher value compared to control. It was found that all priming treatment showed significance difference with the control.

Introduction

Chilli (*Capsicum annuum* L.) belongs to the family *Solanaceae* having diploid species with mostly 2n = 2x = 24 chromosomes, but wild species with 2n = 2x = 26 chromosomes have been reported (Pickersgill, 1991). The domestication of chilli first occurred in Central America, most likely in Mexico, with secondary centers in Guatemala and Bulgaria (Salvador, 2002). India, Mexico, Japan, Ethiopia, Uganda, Nigeria, Thailand, Turkey, Indonesia, China and Pakistan are the major chilli growing countries. To some extent, it is also grown in Italy, Spain and the United States.

Broadly, the chillies can be categorized into hot and mild types based on pungency. In the world, it is cultivated on an area of 1.98 million hectares with an annual production of 31.132 million tonnes and having the productivity of 1576.34 kg ha^{-1}. The important chilli producing countries in the world are India, China, Indonesia, Korea, Pakistan, Turkey and Srilanka. The 'mild' Chilli is

known as paprika and it is produced in Hungary, Spain, Romania, Bulgaria and Slovak Republic countries.

In India, Chilli is grown all over the country under varying agro-climatic zones but area of riped dry chilli is concentrated in southern states. In India, the area under this crop is 287 thousand hectares with an annual production of 3406 thousand MT with productivity of 2.1 kg ha^{-1}(National Horticulture board 2017). India alone contributes about 50 per cent of world production, out of which 90 per cent is used for domestic consumption and only six per cent is exported to other countries like USA, Bangladesh, Nepal and Mexico.

Chilli (*Capsicum annuum* L.) is vernacularly known as "Mirchi". It occupies an important place in daily diet and can be used in a variety of ways. Chilli fruits are used as pickles, sauces, ketchup, essence, oleoresins and are an inevitable ingredient in Indian dishes. Chilli is a good source of capsicin, vitamin A, vitamin C, riboflavin and thiamine. It contains about) carbohydrates, (5.3 g) sugar, (1.9 g) protein and (534 micro g) beta carotene per 100 g chill (Panda *et al.*, 2010).

The Chilli fruits are used for imparting pungency both at green stage as well as after maturity. The fruit varies in size from 1-20 cm in length from thin, long to conical and thick fleshed blocky 39 shapes. The popularity of chilli is due to its wide range of shape, size and sensory attributes such as colour, pungency and piquancy that make generally insipid bulk nutritive flesh, cereal and vegetable foods more appetizing (Govindarajan *et al.*, 1987).

High quality seed is the key to successful agriculture. Modern agriculture with its bias for technology and precision, demands that each and every seed should germinate and produce a vigorous seedling ensuring high yield. Apart from increased productivity, the seeds should also have better storability to produce good crop during the next season. To accomplish these characters the seed technologists have developed seed invigoration techniques such as seed priming which has significant impact on seed quality. Seed priming is a commercially viable technique for improving seed germination and vigour. It involves imbibition of seeds in water under controlled conditions to initiate early events of germination, followed by drying the seed back to its initial moisture content (Dolly pan and Basu, 1985).

Priming in its traditional sense, soaking of seeds in water before sowing, has been the experience of farmers in India in an attempt to improve crop stand establishment but the practice was without the knowledge of the safe limit of soaking duration (Harris *et al.*, 1999).

The main objectives include, to evaluate the effect of different priming method on seedling parameters in chilli. And also to identify best priming method for chilli seeds.

Materials and Methods

The present study entitled "Assessment of Seed Priming Methods for Seed Quality Parameters in Chilli(*Capsicum annuum* L.) Seeds" under Post graduate laboratory of Seed Science and Technology was conducted in the Department of Genetics and Plant breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad during 2017-2018. The lab experiment was analyzed by using C.R.D. (Complete Randomized Design) with 4 replications and 7 treatments under laboratory condition. Seed Treated with Control (untreated), Distilled water, Polyethylene glycol (PEG 20%), Potassium chloride (KCl1%), Calcium chloride ($CaCl_2$1%), Neem Leaf Extract (5%) and Eucalyptus Leaf Extract (5%) soaking for 12

hrs. Afterward, primed seeds were allowed to dry back to their original moisture content under shade to assess the parameters.

The observation on the characters *viz.*, Germination percent (ISTA 2004), Speed of germination, Root length (cm), Shoot length (cm), Seedling length (cm), Seedling fresh weight (g), Seedling dry weight (g), Seedling vigour index I and Seedling vigour index II(Baki and Anderson, 1973) were recorded. The experimental data recorded were subjected to statistical analysis for calculating analysis of variance, range, and mean, critical Difference and coefficient of variation (Fisher, 1936).

Results and Discussion

According to the results, all studied traits were affected by the treatments and there was completely significant difference between control (unprimed seeds) and primed seeds (Table 1). All seedling characters were affected by KCl - 1% and it was followed by T_3–$CaCl_2$ with 653.37 and T_1–Distilled water are significantly recorded maximum (Table 2). The results are conformity with findings of (Kalyanrao *et al.*, 2017). Significantly higher germination percent (88.75) reported in treatment T_3 - KCl- 1% followed by T_4 - $CaCl_2$1% (87.25) and T_2 - PEG(20%) (85.00). Higher Speed of Germination reported in T_3 - KCl-1% (16.77) followed by T_4–$CaCl_2$ (15.22) and T_1–Distilled water (14.70). Maximum root length (3.42cm) was recorded by T_3 and it was followed by $T_4$with (3.14cm) and $T_1$with (2.91cm). Maximum shoot length (5.36cm) was recorded by T_3 and it was followed by T_4(4.36cm) and T_1(4.11cm). The results are conformity with findings of (Nasher 2008).

Maximum seedling length (8.78 cm) found in T_3 and it was followed by T_4(7.50 cm) and T_1(6.98 cm) and minimum seedling length in T_0(5.94). Maximum Fresh weight (2.17gm) was recorded by $T_3$with treatment of KCl-1%. Maximum dry weight (0.025gm) was recorded by $T_3$with treatment of KCl- 1%. Maximum vigour index - I (779.80) was recorded by KCl - 1% and it was followed by $CaCl_2$ 1% with 653.37 and Distilled water with 590.50. Maximum vigour index – II (2.17) was recorded by T_3 and it was followed by T_4(1.63) and T_1(1.56). Minimum seedling characters were observed in control (T_0) and (T_6) 400C.

Table.1 Analysis of variance for vigour characters in chilli (*capsicum annuum* L.)

Sl. No.	Characters	Mean sum of squares	
		Treatment (d.f. =6)	**Error (d.f.=21)**
1	Germination percentage	74.583*	4.786
2	Speed of germination	7.943*	1.580
3	Root length (cm)	0.354*	0.281
4	Shoot length (cm)	2.166*	0.192
5	Seedling length (cm)	4.118*	0.514
6	Seedling fresh weight (g)	0.105*	0.074
7	Seedling dry weight (g)	0.138*	0.116
8	Seedling Vigour index I	48461.998*	3455.013
9	Seedling Vigour index II	0.469*	0.022

*Significant at 5% level

Table.2 Mean performance of chilli for 9 seedling characters

Treatments	Germination percentage	Speed of germination	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling fresh weight (g)	Seedling dry weight (g)	Seedling Vigour index I	Seedling Vigour index II
T_0	75.25	12.52	2.59	3.39	5.94	1.65	0.014	447.20	1.03
T_1	84.75	14.70	2.91	4.11	6.98	1.86	0.019	590.50	1.56
T_2	85.00	14.20	2.64	3.47	6.12	1.82	0.018	520.43	1.48
T_3	88.75	16.77	3.42	5.36	8.78	2.17	0.025	779.80	2.17
T_4	87.25	15.22	3.14	4.36	7.50	1.87	0.019	653.37	1.63
T_5	83.75	14.10	2.81	3.43	6.24	1.82	0.018	522.68	1.46
T_6	83.25	13.02	2.70	3.44	6.32	1.74	0.017	526.47	1.37
Grand mean	**84**	**14.36**	**2.88**	**3.94**	**6.84**	**1.85**	**0.018**	**577.20**	**1.53**
C.D @5%	3.23	1.86	0.62	0.64	1.06	0.08	0.003	87.01	0.22
S.E.M	1.09	0.62	0.26	0.21	0.35	0.03	0.001	29.39	0.07
C.V.	2.60	8.75	18.35	11.12	10.47	3.26	10.24	10.18	9.75
Max.	88.75	16.77	3.42	5.36	8.78	2.17	0.025	779.8	2.17
Min.	75.25	12.52	2.59	3.39	5.94	1.65	0.014	447.20	1.03

On the basis of results obtained from the present experiment following conclusions are drawn.

The different priming treatments showed significant Halopriming increases the germinability and vigour of chilli seeds, significantly in lab condition. Potassium Chloride KCl (1%), significantly increased the germination and vigour of chillis. Halopriming of the chilli seeds for 12 hrs. enhanced germinability, vigour of chilli seeds. These conclusions are based on the results of three months investigation and therefore further investigation is needed to arrive at valid recommendations.

Soaking of seed with Distilled water is advantageous to obtain healthy seedlings. The second best option for priming is soaking of seeds with Calcium Chloride $CaCl_2$ (1%).

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