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Influence of Priming on Seed Quality of China Aster (*Callistephus chinensis L. Nees)*

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ABSTRACT: *Seeds of china aster (*Callistephus chinensis L.Nees*) were primed by different methods to study the physiological changes occuring during ageing on storage. Among the different methods used, halopriming with KNO_3 (0.5%) resulted in higher germination percentage (64.37 per cent) with increase in speed of germination, which lead to increase of seedling vigour index. Moisture content of the primed seed increased upto 8.29 percent and thereafter it decreased.*

Keywords: *Haloriming, germination percentage, speed of germination, seed infestation*

INTRODUCTION

China aster (*Callistephus chinensis L.Nees*) is an important common flowering annual, grown in many parts of the world. It is used as loose and cut flower besides also used for various purposes like keeping in vase, flower decoration, preparation of bouquets etc., mostly propagated by seed.

Seed deterioration is an inseparable aspect of ageing. The climatic conditions greatly accelerate seed deterioration under ambient storage environment causing the loss of viability of seeds. Though the arrest of seed deterioration during storage is impossible, it can be reduced or slowed down or maintained through simple technique of conditioning (Priming). Availability of viable seed is hindering its cultivation, as the china aster seeds loose viability very quickly and exploring various techniques to overcome the lacuna is utmost important for its commercial exploitation.

Priming of seed offers a unique advantage in increasing the germination percentage, under a wide range of environmental conditions (Basra, 2005). Seed priming has presented surprising results for different flower crops including china aster (Badek *et al.* 2006; 2007). However information on the effectiveness of using different priming methods on aged seeds of china aster is scanty. Therefore to generate scientific evidences on these aspects the work has been formulated and documented.

MATERIALS AND METHODS

The experiment was laid out in factorial randomized block design comprising two factors viz., age of the seed and other as different priming methods. Entire treatments were replicated four times.

The seeds subjected to different priming methods as illustrated below were air dried till they achieve original moisture content prior to soaking. Then the seeds were packed in polyethelene bags and stored at ambient conditions for six months and the effect of priming on seed physiology was investigated.

Hydro Priming

China aster seeds were soaked (primed) in water for 24 hr at ambient condition.

Osmo Priming

The cleaned seeds were soaked in the solution of Poly Ethylene Glycol (PEG-6000) @ -1.25MPa (6.75g per 100 ml of water) for 24 hrs at room temperature followed by drying the seed to original moisture and storage in polythene bags at room temperature.

Halo Priming

The cleaned seeds were soaked in the solution of KNO_3 @ 0.5% (0.5 g per 100 ml of water) for 24 hrs at room temperature.

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RESLTS AND DISCUSSION

Moisture Content (%)

The moisture content of china aster primed seed, in comparison, six months old seed (S_2) for the first month of storage recorded highest moisture content (8.29 per cent) which subsequently decreased with progress in storage period. Although similar trends of reduction in moisture content was noticed for one year old seed (S_1). The percentage of decrease was significantly higher to that of six months old seed.

With regard to the influence of priming treatments, the moisture content of seed was significantly enhanced with all the priming treatments. However, a gradual decrease in the moisture content was noticed with advancement in storage of seed. This variation in moisture content of seed during storage might be due to inherent nature of genotypes where in potential for water holding decrease during storage with advancement in age. This phenomenon of low moisture retention with seed ageing significantly lowered the germination percentage of one year old seed (S_1).

Germination Percentage (%)

Six months old seed (S_2) recorded significantly maximum germination (64.37 per cent) and minimum (47.00 per cent) in first and six months of storage respectively, was illustrated in Table 1. In one year old seed (S_1) also similar trend of decreasing germination per cent was noticed, but the percentage of germination initially and at subsequent months of storage was drastically ceased, reduction in germination percentage is attributed to cytoplasmic or physiological changes in sub cellular system (membrane, mitochondria, protein synthesis, ribosomes and DNA) and enzyme machinery during storage with preceding age of the seed resulting in

Table 1
Effect of Priming Treatments on Moisture Content and Germination Percentage of China Aster Seed

Treatments	*Storage months*											
	Moisture content						*Germination percentage*					
	October	*November*	*December*	*January*	*February*	*March*	*October*	*November*	*December*	*January*	*February*	*March*
						Age of the seed (S)						
S_1	7.69	7.67	7.64	7.55	7.48	7.26	17.87	18.50	16.37	14.56	12.87	11.43
S_2	8.29	8.26	8.23	8.20	8.16	7.95	64.37	60.81	58.62	56.56	52.19	47.00
SEm ±	0.011	0.0076	0.0084	0.0079	0.0119	0.024	0.82	0.44	0.29	0.64	0.68	0.46
CD (0.05)	0.031	0.022	0.0244	0.0230	0.0347	0.069	2.38	1.83	0.86	1.86	2.00	1.34
						Priming treatments (T)						
T_1	8.02	8.01	7.99	7.93	7.87	7.74	41.50	42.87	40.62	37.37	33.50	31.50
T_2	7.96	7.95	7.93	7.89	7.85	7.67	44.50	39.62	36.50	35.37	31.37	28.37
T_3	8.06	8.01	7.99	7.96	7.93	7.77	44.25	44.50	42.87	40.87	38.12	34.00
T_4	7.90	7.89	7.82	7.72	7.625	7.24	34.25	31.62	30.00	28.62	27.12	23.00
SEm ±	0.015	0.0108	0.0118	0.0111	0.0168	0.034	0.80	0.63	0.42	0.90	0.97	0.65
CD (0.05)	0.443	0.0314	0.0345	0.0325	0.0491	0.098	2.33	1.83	1.22	2.63	2.83	1.90
						Interactions (S×T)						
S_1T_1	7.72	7.70	7.68	7.60	7.50	7.38	16.00	20.75	18.50	14.50	12.50	12.25
S_1T_2	7.69	7.68	7.64	7.50	7.52	7.35	21.50	18.75	16.00	14.00	11.75	10.00
S_1T_3	7.74	7.70	7.67	7.62	7.60	7.42	19.50	22.50	20.50	19.75	17.25	15.25
S_1T_4	7.60	7.60	7.55	7.40	7.30	6.90	14.50	12.00	10.50	10.00	10.00	8.25
S_2T_1	8.33	8.32	8.30	8.26	8.24	8.10	67.00	65.00	62.75	60.25	54.50	50.75
S_2T_2	8.24	8.23	8.22	8.20	8.18	8.00	67.50	60.50	57.00	56.75	51.00	46.75
S_2T_3	8.38	8.34	8.31	8.30	8.26	8.12	69.00	66.50	65.25	62.00	59.00	52.75
S_2T_4	8.20	8.19	8.10	8.05	7.95	7.58	54.00	51.25	49.25	47.25	44.25	37.75
SEm ±	0.022	0.015	0.017	0.016	0.024	0.047	1.60	0.88	0.59	1.27	1.37	0.92
CD (0.05)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	4.67	2.585	1.72	3.72	4.00	2.68

S_1T_1: One year old seed primed with distilled water
S_1T_2: One year old seed primed with PEG
S_1T_3: One year old seed primed with KNO_3
S_1T_4: Unprimed one year old seed (Control)
S_2T_1: Half year old seed primed with distilled water
S_2T_2: Half year old seed primed with PEG
S_2T_3: Half year old seed primed with KNO_3
S_2T_4: Unprimed half year old seed (Control)

slow germinaton rate of embryo, which intended to continue its ontogenic effect on the developing seedling (Heydecker, 1972 and Chauhan *et al.,* 1984)

Among the priming methods, seeds primed with KNO_3 (T_3) performed well and followed by hydro priming (T_1).The possible effect of KNO_3 might be due to its role in influencing the turgidity of membranes, lead to activation of enzymes involved in protein synthesis and carbohydrate metabolism (Perece and Read, 1993). Besides, the nutrient potassium has a positive effect on keeping quality.

Subsequently, a decline in per cent germination was observed in all the priming treatments with advance in storage period, which may be attributed to the phenomenon of ageing and due to depletion of food reserves, decline in synthetic activity as reported by Chandrasenan Nair (1966) and Joeraj Hopper (2000).

Speed of Germination and Seedling Vigour Index

Highest speed of germination and seedling vigour index was noticed in six months old seed (S_2) during first month of storage which decreased with increase in storage period (Table 2). Similar trend was observed in one year old seed (S_1). The probable reason for early germination of primed seed may be the completion of pre-germinative metabolic activities making seed ready for radical protrusion (Basra *et al.* 2005).

KNO_3 primed seed recorded highest speed of germination and seedling vigour index, which gradually decreased with advancement in the storage period. It was found that seed primed with KNO_3 greatly influenced the plant growth as nitrogen is an indispensable elementary constituent of numerous organic compounds such as amino acids, proteins, and nucleic acids and potassium is a major essential element required for physiological mechanism of plant growth (Aisha *et al.*, 2007). N and K are most important for plant growth and nitrogen metabolism (El-Bassiony, 2006).

Seed Infection/ Infestation

As the age of the seed increases, seed infection was severed. In both one year (S_1) and six months old seed

Table 2
Effect of Priming Treatments on Seed Infestation of China Aster Seed

Treatments	*Storage months*					
	October	*November*	*December*	*January*	*February*	*March*
Age of the seed (S)						
S_1	70.37	80.50	83.62	84.31	86.75	88.56
S_2	30.75	38.00	41.37	42.75	48.00	53.00
SEm ±	0.72	0.60	0.30	0.76	0.64	0.46
CD (0.05)	2.10	1.76	0.90	2.23	1.86	1.34
Priming treatments (T)						
T_1	50.75	54.00	59.37	61.37	66.25	68.50
T_2	53.62	59.62	63.50	62.25	68.62	71.62
T_3	48.75	54.50	57.12	59.12	61.62	66.00
T_4	65.12	68.87	70.00	71.37	72.62	77.00
SEm ±	1.01	0.85	0.42	1.08	0.90	0.65
CD (0.05)	2.96	2.49	1.22	3.15	2.63	1.89
Interactions (S×T)						
S_1T_1	75.75	77.75	81.50	85.50	87.00	87.75
S_1T_2	77.00	79.75	84.00	81.50	88.25	90.00
S_1T_3	74.25	75.50	79.50	80.25	82.25	84.75
S_1 T_4	86.50	89.00	89.50	90.00	89.50	91.75
S_2T_1	25.75	30.25	37.25	37.25	46.25	49.25
S_2T_2	30.25	39.50	43.00	43.00	49.00	53.25
S_2T_3	23.25	33.50	34.75	38.00	41.00	47.25
S_2T_4	43.75	48.75	50.50	52.75	55.75	62.25
SEm ±	1.43	1.21	0.59	1.52	1.28	0.92
CD (0.05)	4.20	3.53	1.72	4.46	3.72	2.69

S_1T_1: One year old seed primed with distilled water **S_2T_1**: Half year old seed primed with distilled water
S_1T_2: One year old seed primed with PEG **S_2T_2**: Half year old seed primed with PEG
S_1T_3: One year old seed primed with KNO_3 **S_2T_3**: Half year old seed primed with KNO_3
S_1 T_4: Unprimed one year old seed (Control) **S_2T_4**: Unprimed half year old seed (Control)

(S_2) there was an increase in the seed infestation by prolonging the period of storage. Among the priming treatments KNO_3 primed seed recorded less seed infection, but the severity of infestation increased from the first and last months of storage (48.75 to 66.00 per cent respectively), it might be due to loss of membrane integrity, lipid peroxidation and invasion of fungi, leaching of seed exudates can stimulate microbial activity, it contribute to increase of fungal proliferation. Similar trend was observed in one year old seed, but the severity of infection was high.

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