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Influence of Different Micronutrient on Seed Viability and Vigour Parameters in Chilli (*Capsicum annum* L.) Under Storage Condition

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ABSTRACT

The present storage experiment was conducted at Department of Genetic and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Uttar Pradesh during 2017 - 2018 with chilli seeds (Cv. Kashi Anmol). The seeds were treated with different micronutrients and maintained untreated seeds (control) where T_0 is control, T_1 Iron sulphate @ 0.1%, T_2 Iron sulphate @ 0.5%, and T_3 Iron sulphate @ 1.0%,T_4 Copper sulphate @ 0.1%, T_5 Copper sulphate @ 0.5%, and T_6 Copper sulphate @ 1.0%, T_7 Zinc sulphate @ 0.1%, T_7 Zinc sulphate @ 0.5%, and T_7 Zinc sulphate @ 1.0%.Treated seeds were packed in polythene bag (700 gauge) and Paper bag (Factor P1 and P2) for the assessment of seed germination, seedling length, seedling dry weight, vigour indices, where data was subjected to factorial experiment laid out in Randomized block design. P_1T_2 recorded significantly higher seedling parameters (Root length, Shoot length, Seedling length, Seedling dry weight, Vigour index I, Vigour index II) except P_1T_9 recorded significantly higher seed germination.

Key words: *Chilli, Iron sulphate, Copper sulphate, Zinc sulphate, Polythene bag, Paper bag.*

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. The domestication of chilli first occurred in Central America, most likely in Mexico, with secondary centers in Guatemala and Bulgaria. Green chillies are rich source of Vitamin A and Vitamin E. It is widely used in the curry powder, curry paste, all kinds of pickles and preparing sauce, soups *etc*. For optimal growth and development, 17 essential elements are required by crop plants. Seed treatment with micronutrients solutions has the potential to meet crop micronutrient requirement and improve seedling emergence and stand establishment, yield and seed micronutrient enrichment. Seed priming was also cost effective compared with soil application with benefit: cost ratio of 8 and 360 from soil application and seed priming, respectively. Seed priming with Zn can improve crop emergence, stand establishment, and subsequent growth and yield.

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For example, priming (*Echinacea purpurea* (L.) seed with 0.05% $ZnSO_4$ solution increased germination and field emergence by 38 and 41%, respectively[4]. Seed priming with Zn significantly improved yield and related traits. In barley (*Hordeum vulgare* L.), seed priming with Zn improved germination and seedling development[1].

Chilli seed is classified as poor storer as it looses viability within a year under ambient storage conditions. Packaging materials play a major role in prolonging the shelf life of a seed during storage as they separate seeds from the surrounding environment. Some packaging materials are moisture pervious and some are impervious. Suitability of various packaging materials for safe storage of seeds for longer periods needs to be studied under various crop seeds.

MATERIAL AND METHODS

The chilli seeds cv. Kashi anmol obtained from Indian institute of vegetable research, Varanasi. Seed were treated with micronutrient viz. iron sulphate @ 0.1 %, 0.5 %, & 1.0 %, copper sulphate @ 0.1 %, 0.5 %, & 1.0 %, and zinc sulphte @ 0.1 %, 0.5 %, & 1.0 % and seed were stored in polythene bag of 700 gauge and paper bag.

Seeds were drawn at random from the bags at tri-monthly intervals for germination test. Observations on germination percentage, seedling length (cm), seedling vigour index (SVI), seedling dry weight (mg) were collected following procedure prescribed by ISTA.

RESULT AND DISCUSSION

The seed treated with micronutrient and stored in polythene bag showed significantly superiority on seed quality parameters during storage. Among the different treatments, the seeds treated with zinc sulphate @ 1.0% (T_9) recorded significantly higher germination (76.5%) compared to all the treatments and the lowest germination of (39 %) was noticed in T_0 (Uncoated seeds) at the end of 6 months of storage. The decline in germination is attributed to ageing leading to depletion of food reserves and decline in synthetic activity of embryo apart from the death of seed because of fungal invasion, insect damage and storage conditions. Similar results were also reported by Ajouri *et al*.,[1] in barley, Harris *et al*., in maize, Mirshekari., in dill seed, Martin *et al*. in okra.

Seedling length of chilli were significantly higher in seeds treated with iron sulphate @ 0.5 % (T_2) compared to all the treatments and the lowest seedling length of 2.2 cm was noticed in T_6 (copper sulphate @ 1.0 %) at the end of 6 months of storage.

Among the different treatments, the seeds treated with iron sulphate @ 0.5 % (T_2) recorded significantly higher seedling dry weight (0.035 gm) compared to all the treatments and the lowest seedling dry weight of 0.012 gram was noticed in T_3 (iron sulphate @ 1.0 %) at the end of 6 months of storage.

The seeds treated with iron sulphate @ 0.5 % (T_2) recorded significantly higher vigour index I (534.4) and vigour index II (2.455) compared to all the treatments and the lowest Vigour Index I of (161.45) & II (0.872) was noticed in T_3 (iron sulphate @ 1.0 %) at the end of 6 months of storage.

Packaging materials showed significant influence on seed quality parameters, the seed stored in polythene bag maintained numerically better seed quality parameters with less qualitative losses in comparison to those seeds stored in paper bag throughout the storage period.

Interaction effect due to seed treatments and packaging materials showed significant influence on seed quality parameters at the end of 6 month of storage. In the interaction effect of seed treated with micronutrient and packaging materials, P_1T_2 (iron sulphate @ 0.5 % and stored in polythene bag) was maintained higher seed quality parameters throughout the storage period.

Table 1: Effect of different micronutrient and packaging materials on Germination % in chilli during storage

Period of seed storage							
Treatment	Initial	3 MAS		Mean	6 MAS		Mean
		P1	P2		P1	P2	
T_0	75.000	60	73	66.500	36	42	39.000
T_1	86.000	85	85	85.000	79	70	74.500
T_2	87.000	72	82	77.000	75	65	72.000
T_3	69.000	75	81	78.000	76	64	70.000
T_4	86.000	85	79	82.000	78	67	72.500
T_5	83.000	84	83	83.500	77	66	71.500
T_6	88.000	83	79	81.000	78	68	73.000
T_7	87.000	90	88	89.000	74	70	72.000
T_8	91.000	76	84	80.000	58	70	64.000
T_9	93.000	92	89	90.500	80	73	76.500
MEAN	84.5	80.2	82.3	81.25	71.1	65.5	68.5
		T	P	TxP	T	P	TxP
SEm±		0.91	0.40	1.28	1.86	0.83	2.63
CD at 5%		2.91	7.31	4.11	5.95	14.95	8.42
Significance		S	S	S	S	S	S

Table 2: Effect of different micronutrient and packaging materials on Seedling length (cm) in chilli during storage

Period of seed storage							
Treatment	Initial	3 MAS		Mean	6 MAS		Mean
		P1	P2		P1	P2	
T_0	4.25	4.45	2.6	3.525	4.8	5.5	5.15
T_1	5	5.5	4.65	5.075	6.15	5.75	5.95
T_2	5.7	6.6	5.4	6	7.8	7.4	7.6
T_3	5.25	4.9	4.55	4.725	6.05	2.7	4.375
T_4	3	2.85	3.35	3.1	4.6	2.15	3.375
T_5	2.7	3	2.85	2.925	2.25	2.4	2.325
T_6	3.2	3.15	2.7	2.925	2.1	2.35	2.225
T_7	5.65	4.6	4.7	4.65	6.25	5.85	6.05
T_8	5	5.35	4.55	4.95	6	5.6	5.8
T_9	3.75	4.75	4	4.375	4.75	2.6	3.675
GRAND MEAN	4.35	4.515	3.935	4.225	5.075	4.23	4.6525
		T	P	TxP	T	P	TxP
SEm±		0.14	0.066	0.21	0.20	0.093	0.29
CD at 5 %		0.47	1.19	0.67	0.67	1.68	0.94

Table 3: Effect of different micronutrient and packaging materials on Seedling Dry weight (g) in chilli during storage

Period of seed storage							
Treatment	Initial	3 Months		Mean	6 Months		Mean
		P1	P2		P1	P2	
T_0	0.045	0.015	0.015	0.015	0.025	0.02	0.0225
T_1	0.03	0.02	0.015	0.0175	0.02	0.025	0.0225
T_2	0.065	0.035	0.025	0.03	0.035	0.035	0.035
T_3	0.025	0.025	0.02	0.0225	0.01	0.015	0.0125
T_4	0.03	0.025	0.015	0.02	0.02	0.02	0.02
T_5	0.025	0.025	0.015	0.02	0.025	0.015	0.02
T_6	0.025	0.02	0.025	0.0225	0.025	0.015	0.02
T_7	0.02	0.025	0.015	0.02	0.02	0.02	0.02
T_8	0.04	0.025	0.02	0.0225	0.025	0.01	0.0175
T_9	0.02	0.025	0.015	0.02	0.025	0.025	0.025
GRAND MEAN	0.0325	0.024	0.018	0.021	0.023	0.02	0.0215
		T	P	TxP	T	P	TxP
S Em		0.002	0.001	0.0031	0.0033	0.0015	0.0047
CD at 5 %		0.007	0.018	0.0101	0.0107	0.027	0.0152
Significance		S	S	NS	S	NS	NS

Table 4: Effect of different micronutrient and packaging materials on Vigour index I in chilli during storage

Period of seed storage							
Treatment	Initial	3 Months		Mean	6 Months		Mean
		P1	P2		P1	P2	
T_0	318.6	265.6	189.3	227.45	168	231.8	199.9
T_1	430.6	467.4	394.5	430.95	486	401.6	443.8
T_2	495.9	476	442.8	459.4	585.1	483.7	534.4
T_3	361.8	368.7	368.4	368.55	460.1	170	315.05
T_4	258	242.1	264.6	253.35	369.2	143.5	256.35
T_5	224.2	251.4	228.4	239.9	173.3	158	165.65
T_6	281.6	262.8	213.6	238.2	163.4	159.5	161.45
T_7	483.7	412.8	413.6	413.2	462.2	412.3	437.25
T_8	445.3	406.6	382.7	394.65	344	391.2	367.6
T_9	347.5	437	352.1	394.55	381.3	190.2	285.75
GRAND MEAN	364.72	359.04	325	342.02	359.26	274.18	316.72
		T	P	TxP	T	P	TxP
S Em		12.87	5.75	18.20	19.41	8.68	27.45
CD at 5 %		41.18	103.44	58.24	62.09	155.98	87.81
Significance		S	S	NS	S	S	S

Table 5: Effect of different micronutrient and packaging materials on Vigour index II in chilli during storage

Period of seed storage							
Treatment	Initial	3 Months		Mean	6 Months		Mean
		P1	P2		P1	P2	
T_0	3.36	0.92	1.09	1.005	0.96	0.84	0.9
T_1	2.64	1.7	1.29	1.495	1.58	1.74	1.66
T_2	5.55	2.54	2.05	2.295	2.62	2.29	2.455
T_3	1.71	1.89	1.62	1.755	0.765	0.98	0.8725
T_4	2.68	2.14	1.235	1.6875	1.685	1.34	1.5125
T_5	2.08	2.035	1.25	1.6425	1.93	1	1.465
T_6	2.2	1.66	1.925	1.7925	1.94	1.075	1.5075
T_7	1.74	2.24	1.32	1.78	1.49	1.32	1.405
T_8	3.67	1.9	1.68	1.79	1.5	0.71	1.105
T_9	1.86	2.3	1.33	1.815	1.99	1.83	1.91
GRAND MEAN	2.749	1.9325	1.479	1.70575	1.646	1.3125	1.47925
		T	P	TxP	T	P	TxP
S Em		0.15	0.068	0.21	0.17	0.079	0.25
CD at 5 %		0.49	1.23	0.69	0.56	1.43	0.80
Significance		S	S	S	S	S	NS

Table 6: Interaction effect between micronutrient and packaging materials on Seedling length (cm) in chilli during storage

Treatment details	**Period of storage**	
	3 MAS	**6MAS**
P_1T_0	4.8	4.45
P_1T_1	6.15	5.5
P_1T_2	7.8	6.6
P_1T_3	6.05	4.9
P_1T_4	4.6	2.85
P_1T_5	2.25	3
P_1T_6	2.1	3.15
P_1T_7	6.25	4.6
P_1T_8	6	5.35
P_1T_9	4.75	4.75
P_2T_0	5.5	2.6
P_2T_1	5.75	4.65
P_2T_2	7.4	5.4
P_2T_3	2.7	4.55
P_2T_4	2.15	3.35
P_2T_5	2.4	2.85
P_2T_6	2.35	2.7
P_2T_7	5.85	4.7
P_2T_8	5.6	4.55
P_2T_9	2.6	4
GRAND MEAN	4.6525	4.225
F TEST	S	S
S Em ±	0.21	0.29
CD at 5 %	0.67	0.94

CONCLUSSION

It is concluded from the present investigation that chilli seeds treated with the combination of micronutrient Iron sulphate @ 0.5 % (T_2) recorded significantly higher seedling parameters (Root length (cm), Shoot length (cm), Seedling length (cm), Seedling dry weight (g), Vigour index I, Vigour index II) except Zinc sulphate @ 1.0% (T_9) recorded significantly higher seed germination. These two seed treatments were found effective in improving the shelf life of seed. It is more beneficial to the farmers. chilli seeds packed in polythene bag were found very effective for extending the seed longevity and maintaining the storability.

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