

Original Research Article

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Influence of Seed Treatments and Packaging Materials on Seed Quality Parameters during Storage in Buck Wheat (*Fagopyrum esculentum* L.)

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ABSTRACT

Keywords

Buckwheat, Neem oil, Carbendazim, Polythene bag, Cloth bag

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A storage experiment was conducted to understand the effect of seed treatments and packaging materials on seed quality parameters of Buckwheat genotypes during storage at Seed Testing Laboratory, Department of Genetics and plant Breeding, SHUATS, Prayagraj, U.P during 2019-2020. The Experiment. Consists of five genotypes viz, IC-13140(G1), IC-13143(G2), IC-13144(G3), IC-13191(G4) –IC-13412(G5). Seeds were treated with Neem oil at 5 ml/kg (T₁) and carbendazim at 2 g/kg (T₂) and seed alone with control (untreated T₀) and packed in polythene bag (C₁) and cloth bag (C₂) and maintained for 9 months under ambient conditions. The results clearly revealed that seeds of IC-13143 (G2) treated with neem oil which were stored in polythene bag were found high germination percent (82.75 %), root length (12.25 cm), shoot length (9.97 cm), seedling length (22.22 cm), fresh weight (0.8 g), dry weight (0.07 g), vigour index-I (1839.2), vigour index-II (5.38) and viability (70).

Introduction

Buckwheat (*Fagopyrum esculentum* L) is an annual crop, it is a pseudo cereal but its grains belong to cereals because of their similar use and chemical composition (Campbell, 1997). It is a multipurpose crop. The tender shoots are used as leafy vegetables. Buckwheat grains are an important source of microelements, such as: Zn, Cu, Mn, Se (Stibilj *et al.*, 2004), and macro elements: K, Na, Ca, Mg (Wei *et al.*, 2003).

Losses in seed quality occur during field weathering, harvesting and storage due to which seeds get damaged. If seeds are

exposed to high temperature and high humidity, the incidence of microflora is mainly responsible for the degradation of protein and other food reserve resulting in reduction in viability, vigour and germination. To combat these factors, it is better to store the seeds in moisture impervious containers like polythene bag and some are moisture pervious container like cloth bag to maintain the quality for longer period. Indiscriminate use of Chemical and their residual toxicity adversely affect the seed quality. Many of synthetic chemicals look effective but they are not readily degradable physically or biologically which yield more toxic residues. Hence, the feasible approach is the treatment

of seeds with botanicals which are safe, economical, eco-friendly, cheap, easily locally available and non-harmful to seeds, animals and human beings. It will be of immense use to the farming community. Therefore, the present investigation was taken up to study the effect of seed treatments on seed quality characters of buckwheat genotypes during storage.

Materials and Methods

The experiment was laid down in CRD with four replications. The Buckwheat seeds IC-13140 (G₁), IC-13143 (G₂), IC-13144 (G₃), IC-13191 (G₄) and IC-13412 (G₅) were dried to bring down the moisture content to 10-12 % before proceeding for storage. Seed was treated with Neem oil at 5 ml/kg (T₁), Carbendazim at 2 g/kg (T₂) with local control (T₀) stored for 9 months at ambient room temperature in the seed testing Laboratory of department of Genetics and Plant Breeding, Naini Agricultural Institute, SHUATS, Allahabad with packed in packaging materials viz polythene bag, cloth bag.

Results and Discussion

Germination percent

The significant differences with respect to treatments were observed in Table 1. The seeds of IC-13143 (G₂) genotype treated with biocide (Neem oil at 5 ml/kg) stored in polythene bag recorded maximum germination percent (82.75%) followed by seeds of IC-13140 (G₁) (82.70%) treated with biocide (Neem oil at 5 ml/kg). Now a day's botanicals are widely used in place of fungicides and pesticides for seed treatment to protect seeds against pests and diseases during storage. The present results are in close agreement with the reports of Hanegave (2009) in wheat.

Root length

The effect of seed treatments on root length (cm) was significant after 9 months of storage periods (Table 1). Results revealed that the seeds of IC-13143 (G₂) among all the genotypes and treated with biocide (Neem oil at 5 ml/kg) stored in polythene bag recorded maximum mean root length (12.25 cm) followed by seeds of IC-13140 (G₁) (12.05 cm) treated with biocide (Neem oil at 5 ml/kg).

The beneficial influence noticed with these botanicals may be related to their protective nature, antifungal, insecticidal property besides synergistic effect with amino acids in germinating seeds to protect the root apical meristems tissue from damage and enhance longitudinal root growth, Dileepkumar *et al.*, (2009) in cowpea; Raikar *et al.*, (2011) in Rice; Nargis and Thiagarajan (1991); Paul and Mishra (1994); Samuel *et al.*, (2008).

Shoot length

The effect of seed treatments on shoot length (cm) was significant after 9 months of storage periods (Table 1). Results revealed that the seeds of IC-13143 (G₂) among all the genotypes and treated with biocide (Neem oil at 5 ml/kg) stored in polythene bag recorded maximum mean shoot length (9.97 cm) followed by seeds of IC-13140 (G₁) (9.95 cm) treated with biocide (Neem oil at 5 ml/kg).

Similar beneficial results with other different botanicals on germination were reported by Ntonifor *et al.*, (2011) in rice.

Seedling length

The effect of seed treatments on seedling length (cm) was significant after 9 months of storage periods (Table 2).

Table.1 Effect of different treatments on Germination %, Root length and Shoot length of various genotypes of Buckwheat (*Fagopyrum esculentum* L.) stored in Polythene bags and Cloth bags

Variety	Germination %						Root Length						Shoot Length					
	3 Month		6 Month		9 Month		3 Month		6 Month		9 Month		3 Month		6 Month		9 Month	
	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂
T₀G₁	91.25	91.25	80.5	80.5	77.25	77.25	13.67	12.57	10.75	9.85	8.85	7.77	9.4	8.3	8.05	7	7.175	6.075
T₀G₂	96.75	96.5	77.25	77.25	78.25	78.25	10.17	9.07	8.15	7.1	5.75	5.5	8.85	7.75	7.95	6.9	6.95	5.9
T₀G₃	96	95	78.25	78.25	74	74	7.5	7.3	7.05	6	6.25	5.2	9.725	8.625	8.95	7.9	6.975	5.95
T₀G₄	93.5	93.25	75.25	75.25	72.5	72.5	12.95	11.9	9.25	8.15	7.55	6.5	9.5	8.4	8.4	7.3	6.9	5.8
T₀G₅	98.75	99	92.5	92.5	73.25	73	11.25	10.25	9.15	8.1	7.97	6.95	8.45	7.35	7.95	6.9	6.175	5.075
T₁G₁	97.75	97.75	88.5	87	82.70	77.25	13.94	12.9	12.55	11.45	12.05	11	11.6	10.5	10.1	9.025	9.95	8.7
T₁G₂	98.5	97.5	84.5	83	82.75	78.25	14.75	13.7	12.85	11.75	12.25	11.12	11.5	10.4	10.1	9	9.975	8.9
T₁G₃	98.25	97.25	92.5	91	80.25	74	14.82	13.8	12.17	11.07	11.97	10.95	11.95	10.9	10.12	9.025	8.95	7.9
T₁G₄	96.5	95.75	91.5	90	80.5	72.5	13.45	12.4	11.85	10.8	11.55	10.5	11.6	10.5	9.95	8.9	8.8	7.7
T₁G₅	98	97	93.25	92.25	80	73.25	13.8	12.8	11.65	10.6	11.17	10.1	10.95	9.9	10.1	9	8.95	7.9
T₂G₁	97.75	96.75	91.5	90.5	78.25	77.5	13.65	12.6	11.95	10.85	9.85	8.8	10.3	9.2	9.1	8	7.95	6.9
T₂G₂	97	96	84.5	83.75	79	77.5	13.05	12	9.15	8.05	6.85	5.75	9.95	8.9	8.95	7.9	7.6	6.5
T₂G₃	93.25	92.5	91.5	90.5	74.25	73.25	11.67	10.57	8.25	7.1	7.32	6.25	10.9	9.8	9.4	8.3	7.975	6.95
T₂G₄	98.5	97.5	75.5	74	73.5	72	13.12	12.02	10.55	9.45	8.75	7.7	10.85	8.75	9.6	8.5	7.9	6.8
T₂G₅	97.5	96.5	87.5	86.5	75	73.75	12.45	11.4	10.97	9.95	10.5	9.5	9.9	8.8	9.15	8.05	7.95	6.9
Mean	96.61	95.96	85.63	84.81	77.43	74.95	12.68	11.68	10.41	9.35	9.24	8.24	10.36	9.20	9.19	8.11	8.01	6.93
SE±	0.64	0.42	1.22	0.53	1.01	0.6	0.49	0.20	0.38	0.17	0.45	0.15	0.072	0.06	0.062	0.03	0.03	0.08
CV	1.32	0.33	2.84	1.25	2.60	1.60	7.88	3.45	7.38	3.72	9.94	3.74	1.40	1.51	1.35	0.77	0.77	2.50
CD	0.91	0.60	1.73	0.75	1.44	0.85	0.71	0.28	0.54	0.24	0.65	0.21	0.104	0.09	0.088	0.04	0.04	0.12

Table.2 Effect of different treatments on Seedling length, Fresh weight and Dry weight of various genotypes of Buckwheat (*Fagopyrum esculentum* L.) stored in Polythene bags and Cloth bags

Variety	Seedling Length						Fresh Weight						Dry Weight					
	3 Month		6 Month		9 Month		3 Month		6 Month		9 Month		3 Month		6 Month		9 Month	
	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂
T₀G₁	23.07	20.87	18.8	16.85	16.02	13.85	0.95	0.8	0.57	0.475	0.5	0.4	0.052	0.04	0.04	0.022	0.02	0.012
T₀G₂	19.02	16.82	16.1	14	12.7	11.4	0.85	0.8	0.5	0.4	0.47	0.37	0.052	0.032	0.03	0.02	0.02	0.015
T₀G₃	17.22	15.92	16	13.9	13.22	11.15	0.55	0.4	0.35	0.25	0.3	0.2	0.055	0.045	0.04	0.03	0.02	0.012
T₀G₄	22.45	20.3	17.65	15.45	14.45	12.3	0.95	0.8	0.6	0.5	0.42	0.32	0.052	0.037	0.04	0.025	0.02	0.012
T₀G₅	19.7	17.6	17.1	15	14.15	12.02	0.6	0.47	0.4	0.3	0.35	0.25	0.065	0.055	0.04	0.027	0.03	0.015
T₁G₁	25.54	23.4	22.65	20.47	22	19.7	1.15	1	0.95	0.85	0.7	0.6	0.085	0.082	0.07	0.057	0.06	0.045
T₁G₂	26.25	24.1	22.95	20.75	22.22	20.02	1.15	1.05	0.98	0.87	0.8	0.7	0.085	0.08	0.07	0.057	0.07	0.05
T₁G₃	26.77	24.7	22.3	20.1	20.92	18.85	1.05	1	0.9	0.8	0.67	0.57	0.085	0.077	0.07	0.057	0.06	0.043
T₁G₄	25.05	22.9	21.8	19.7	20.35	18.2	0.99	0.87	0.8	0.7	0.65	0.55	0.09	0.082	0.08	0.07	0.05	0.035
T₁G₅	24.75	22.7	21.75	19.6	20.12	18	0.98	0.85	0.75	0.65	0.65	0.57	0.085	0.075	0.07	0.05	0.05	0.035
T₂G₁	23.95	21.8	21.05	18.85	17.8	15.7	0.99	0.87	0.65	0.55	0.55	0.45	0.054	0.042	0.04	0.032	0.03	0.017
T₂G₂	23	20.9	18.1	15.95	14.45	12.25	0.87	0.75	0.55	0.45	0.5	0.4	0.048	0.04	0.03	0.02	0.02	0.021
T₂G₃	22.57	20.37	17.65	15.4	15.3	13.2	0.57	0.45	0.4	0.3	0.35	0.25	0.057	0.05	0.04	0.03	0.03	0.022
T₂G₄	23.97	20.77	20.15	17.95	16.65	14.5	0.99	0.87	0.7	0.6	0.5	0.4	0.05	0.04	0.04	0.025	0.02	0.022
T₂G₅	22.35	20.2	20.12	18	18.45	16.4	0.65	0.5	0.45	0.35	0.4	0.3	0.067	0.06	0.04	0.027	0.03	0.015
Mean	23.04	20.89	19.61	17.46	17.25	15.17	0.88	0.76	0.63	0.53	0.52	0.42	0.065	0.056	0.05	0.036	0.03	0.024
SE±	0.51	0.20	0.39	0.26	0.45	0.17	0.05	0.06	0.05	0.04	0.05	0.05	0.0035	0.003	0.004	0.004	0.005	0.005
CV	4.43	1.98	4.04	3.02	5.24	2.36	12.7	15.89	16.08	16.93	19.88	24.69	10.55	14.02	17.21	24.50	33.11	44.64
CD	0.72	0.29	0.56	0.37	0.64	0.25	0.08	0.08	0.073	0.06	0.07	0.07	0.005	0.005	0.006	0.006	0.007	0.007

Table.3 Effect of different treatments on Vigour Index-I, Vigour Index-II and Viability of various genotypes of Buckwheat (*Fagopyrum esculentum* L.) stored in Polythene bags and Cloth bags

Variety	Vigour Index-I						Vigour Index-II						Viability					
	3 Month		6 Month		9 Month		3 Month		6 Month		9 Month		3 Month		6 Month		9 Month	
	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂	C ₁	C ₂
T ₀ G ₁	2103.85	1904.7	1512.4	1356.42	1238.62	1069.7	4.79	3.64	3.435	1.81	1.82	0.96	82	70	62	50	46	34
T ₀ G ₂	1840.5	1623.57	1244.5	1081.85	993.65	892.35	5.07	3.12	2.32	1.54	1.74	1.17	84	72	64	52	48	36
T ₀ G ₃	1653.75	1512.87	1252.0	1087.67	978.2	825.02	5.27	4.27	3.32	2.34	1.29	0.92	86	74	62	50	50	38
T ₀ G ₄	2099.1	1893.1	1327.1	1162.65	1048.65	891.75	4.91	3.49	3.192	1.88	1.63	0.90	88	76	62	50	52	40
T ₀ G ₅	1944.9	1742.32	1580.6	1387.52	1036.15	877.95	6.41	5.44	3.69	2.545	1.84	1.09	82	70	64	52	45	32
T ₁ G ₁	2497.73	2287.32	2005.7	1781.35	1820	1537.97	8.3	8.06	5.96	5.002	4.55	3.47	92	80	74	62	70	57
T ₁ G ₂	2585.25	2349.97	1939.6	1722.05	1839.2	1551.37	8.36	7.79	6.12	4.772	5.38	3.91	88	76	76	64	70	58
T ₁ G ₃	2631.3	2402.07	2063.2	1828.75	1678.52	1394.95	8.35	7.53	6.70	5.225	4.40	3.14	92	80	72	60	68	56
T ₁ G ₄	2417.67	2192.57	1994.8	1773	1637.52	1319.8	8.68	7.9	7.09	6.305	3.99	2.53	94	82	76	65	68	56
T ₁ G ₅	2424.42	2201.92	2028.1	1808.72	1610.12	1318.52	8.33	7.27	6.04	4.62	3.62	2.56	92	80	72	60	64	52
T ₂ G ₁	2341.2	2109.15	1926.3	1705.9	1393.35	1216.82	5.35	4.11	3.88	2.942	1.94	1.36	88	76	68	56	52	40
T ₂ G ₂	2231.025	2006.67	1529.9	1335.67	1141	949.37	4.70	3.83	2.75	1.672	1.58	1.66	90	78	70	58	56	44
T ₂ G ₃	2104.7	1884.77	1615.0	1393.37	1135.57	966.75	5.36	4.62	3.89	2.712	1.23	1.65	88	76	68	56	58	46
T ₂ G ₄	2361.47	2025.65	1521.9	1328.32	1222.57	1044.02	4.93	3.89	3.20	1.867	1.66	1.61	90	78	72	60	60	48
T ₂ G ₅	2179.15	1949.15	1759.8	1556.75	1383.52	1209.27	6.58	5.78	3.71	2.3	1.87	1.10	92	78	70	58	54	42
Mean	2227.7	2005.72	1686.75	1487.33	1343.77	1137.71	6.36	5.38	3.35	3.17	2.64	1.87	88.53	76.4	68.8	56.8	57.4	45.2
SE±	49.42	22.64	40.88	23.29	34.73	18.70	0.32	0.37	0.37	0.39	0.43	0.47	0.52	0.46	0.46	0.35	0.39	0.41
CV	4.43	2.25	4.84	3.13	5.16	3.28	10.35	13.84	16.98	24.69	33.16	44.74	1.19	1.22	1.34	1.24	1.37	1.84
CD	70.52	32.3	58.34	33.23	49.56	26.69	0.47	0.53	0.52	0.55	0.62	0.59	0.75	0.66	0.66	0.50	0.56	0.59

Results revealed that the seeds of IC-13143 (G₂) among all the genotypes and treated with biocide (Neem oil at 5 ml/kg) stored in polythene bag recorded maximum mean seedling length (22.22 cm) followed by seeds of IC-13140 (G₁) (22.0 cm) treated with biocide (Neem oil at 5 ml/kg).

Fresh Weight

The effect of seed treatments on Fresh weight (g) was significant after 9 months of storage periods (Table 2). Results revealed that the seeds of IC-13143 (G₂) among all the genotypes and treated with biocide (Neem oil at 5 ml/kg) stored in polythene bag recorded maximum mean fresh weight (0.8 g) followed by seeds of IC-13140 (G₁) (0.7 g) treated with biocide (Neem oil at 5 ml/kg).

Dry weight

The effect of seed treatments on dry weight (cm) was significant after 9 months of storage periods (Table 2). Results revealed that the seeds of IC-13143 (G₂) among all the genotypes and treated with biocide (Neem oil at 5 ml/kg) stored in polythene bag recorded maximum mean dry weight (0.07 g) followed by seeds of IC-13140 (G₁) (0.06 g) and IC-13144 (G₃) (0.06 g) treated with biocide (Neem oil at 5 ml/kg).

Vigour Index- I

The effect of seed treatments on Vigour Index- I was significant after 9 months of storage periods (Table 3). Results revealed that the seeds of IC-13143 (G₂) among all the genotypes and treated with biocide (Neem oil at 5 ml/kg) stored in polythene bag recorded maximum mean Vigour Index- I (1839.2) followed by seeds of IC-13140 (G₁) (1820) treated with biocide (Neem oil at 5 ml/kg). The results are similar to the findings of seedling of Asawalam *et al.*, (2008). Seed

quality is judged by seedling vigour parameters like root and shoot length, vigour index and seedling dry weight. Generally, higher the seedling length, vigour index and seedling dry weight, higher is the seed quality.

Vigour Index- II

The effect of seed treatments on Vigour Index- II was significant after 9 months of storage periods (Table 3). Results revealed that the seeds of IC-13143 (G₂) among all the genotypes and treated with biocide (Neem oil at 5 ml/kg) stored in polythene bag recorded maximum mean Vigour Index- II (5.38) followed by seeds of IC-13140 (G₁) (4.55) treated with biocide (Neem oil at 5 ml/kg).

Viability

The effect of seed treatments on Viability was significant after 9 months of storage periods (Table 3). Results revealed that the seeds of IC-13143 (G₂) and IC-13140 (G₁) among all the genotypes and treated with biocide (Neem oil at 5 ml/kg) stored in polythene bag recorded maximum mean Viability (70.00) followed by seeds of IC-13144 (G₃) (68) and treated with biocide (Neem oil at 5 ml/kg).

It is concluded that from the present investigation in buckwheat of all treated seeds, seeds of IC-13143 (G₂) treated with neem oil stored in polythene bag recorded significantly higher seed quality parameters. Seed treatments have a major role in protecting the seed during storage and can also play an important role in achieving uniform seedling emergence under certain conditions.

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