INFLUENCE OF POLYMER SEED COATING, BIOCIDES AND PACKAGING MATERIALS ON STORABILITY OF LENTIL (*LENS CULINARIS* L.)

Prashant Kumar Rai■ and P. K. Mishra♦

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ABSTRACT

The present investigation was carried out under Post Graduate Laboratory of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology And Sciences, Allahabad, Uttar Pradesh, India during 2012-2013. The first seed lot was treated with polymer (@6 ml/kg seed) second lot treated with polymer (@8 ml/kg seed), third seed lot treated with the Neem fruit powder @ 10 gm/kg seeds and fourth seed lot treated with Black Pepper powder @10 gm/kg seeds and fifth seed lot is control. After that the treated seed samples were stored in different types of packaging materials viz. jute bag, vacuum plastic bags, cloth bags, plastic bags (non vacuum), jute + plastic bags and stored under ambient condition for 2, 4 and 6 months with 10% seed moisture content. At the end of 6th months of storage period under ambient condition seeds treated with Neem fruit powder (@ 10 gm/kg seeds) was proved to be superior as it enhanced the seed quality characters i.e. germination percentage, root length, shoot length, and seed vigour index, germination rate and seed viability. Seed stored in vacuum plastic bag was found better than other containers.

Key words: *lentil, polymer, biocide, seed quality characters, packaging materials.*

INTRODUCTION

Lentil (*Lens culinaris Medikus* L.) is one of the major Rabi pulse grown in India since time immemorial. It contributes significantly to food, feed and sustainable farming systems and contains high amount of digestible protein (upto 35%), macro- and micronutrients, particularly Iron and Zinc and Vitamins, thus providing nutritional security to consumers. Lentil occupies 13.8 lakh hectares of area with the total production of 9.5 lakh tons. The crop can be grown on a variety of soils (light loams, alluvial and black cotton soils) and is mostly cultivated under rainfed condition **(ICARDA, 2012)**.

The seeds are stored after harvest till the next sowing or until further use **(Nagaveni, 2005)**. Proper seed treatment is needed to maintain the seed quality during storage. Seed storage condition plays an important role in seed production system. Good storage condition can reduce deterioration of seed. Seed moisture content, relative humidity and temperature during storage are responsible for the main effect on seed quality **(Baki and Anderson, 1973)**. The Polymer film coat provides protection from the stress imposed by accelerated ageing, which includes fungal invasion.

The coat is thin (8 µm), simple to apply, diffuses rapidly and nontoxic to the seedling during germination. **(Struve and Hopper 1996)**. The use of chemicals for control of storage pests and disease is known to be costly, and environmentally hazardous even to man, hence research on use of locally available plant material such as Black pepper powder (*Piper guinensis*), Neem fruit powder (*Azadiracter indica*) for storage of seed have been very successful **(Dudu,1996)**.

Among botanicals, using the castor, neem powder and neem oils are proved to be effective protectants against storage insects, they can reduce infestation and maintain the quality of the seed in terms of viability and vigour for longer period in storage **(Kulkarni *et al.*, 1988)**.

To combat these factors effectively storing the seeds in vapour proof containers like polythene bag, aluminium foils, tins or any sealed containers is found to be more useful in maintaining the desired quality of seeds for longer period **(Gurmithsingh and Harisingh 1992)**. Keeping all these factors in view present investigation was carried out with the following objectives i.e. to study the effect of polymer seed coating and biocide treatments on vigour and viability of Lentil seeds and to identify the suitable packaging material for storage of Lentil seeds.

MATERIALS AND METHODS

The present investigation was conducted under the Post Graduate laboratory of the Department of Genetics of Plant Breeding, Faculty of Agriculture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, (U. P.). The experiment was laid down in a Factorial Completely Randomized Design (F.C.R.D.) with four replications. After cleaning and grading the seeds were well dried at10% moisture content before storage. After that the lentil seeds divided in five parts first part of seeds is untreated (T_0), second part of seeds were treated with polymer cistrocoat @ 6 ml per kg seed (T_1), third part of seeds were treated with polymer cistrocoat @ 8ml/ kg of seed (T_2) and fourth part of seeds were treated with Neem fruit powder @ 8 ml/ kg seed (T_3) and fifth part of seeds were treated with Black Pepper powder @ 10 g/kg seed (T_4). These seeds were stored for 2, 4 and 6 months respectively. It was packed in jute bags (P_0), vacuum plastic bags (P_1), non vacuum polythene bags (P_2), cloth bags (P_3) and jute + plastic bags (P_4). Germination test was conducted with four replications of 100 seeds each by adopting between paper method as described by ISTA **(Anonymous, 1996)**.

■Assistant Professor, ♦Student
Department of Genetics and Plant Breeding, Allahabad School of Agriculture
Sam Higginbottom University of Agriculture, Technology And Sciences, Allahabad-211007, Uttar Pradesh, India

Five normal seedlings were selected for measuring shoot and root length, The vigour index was calculated by adopting the method suggested by **(Baki and Anderson 1973)**, the germination rate was calculated by aopting the method suggested by **(Maguire, 1962)** Rate of germination = *G1/D1+G2/D2+G3/D3+ ....+Gx/Dx* and the seed viability test was determined by Tetrazolium method the seeds kept in Tetrazolium solution for four hours. After that the seeds that sowed bright red colour were viable and discoloured seeds were non-viable.

RESULTS AND DISCUSSION

The experimental data recorded on various aspects of seed quality parameters during storage were subjected to the appropriate analysis of mean and variance. Complete analysis of the experimental data presented in *Table 1* and *Table 2* revealed the results as discussed here separately for each character, studied in the present investigation. Seed germination (%) The percentage of seed germination % after 6 months of storage as influenced by the seed treatments showed that, T_1 (Neem fruit powder @ 10 gm per kg seed) 82.80 % was significantly superior than other treatments. The packaging material, vacuum Plastic bags (P_1) 83 % was found to be significantly superior in case of seed germination (%) than jute bag (P_0) 81.15 %, non vacuum plastic bag (P_2) 83.25 %, cloth bag (P_3) 82.70 %, plastic bag + jute bag (P_4) 83.20 % packaging material after 6 months of storage. Similar findings were reported by **Barua *et al.* (2009)**. Among the interaction effect of seed treatments and packaging materials the combination (T_1P_1) 86.00 % was found to be significantly superior in case of seed germination percentage.

The root length after 6 months of storage showed that the treatment (Neem fruit powder @ 10 gm per kg seed) 13.91 cm significantly superior than T_3 (polymer @ 6 ml per kg seed) 13.58 cm. With reference to the packaging material, the vacuum plastic bags (P_1) 13.14 cm were found to be significantly superior than jute bag (P_0) 12.05 cm, non vacuum plastic bag (P_2) 12.72 cm, cloth bags (P_3) 12.45 cm, and jute+ plastic bag (P_4) 12.66 cm after 6 months of storage in securing the root length. These results are in conformity with findings by **Rahman *et al.* (2009)** in Rice. The treatment combination (T_1P_1) 13.66 cm recorded superior value of root length after 6 months of storage.

The shoot length after 6 months of storage showed that the treatment (Neem fruit powder @ 10 gm per kg seed) 7.84 cm significantly superior than T_3 (polymer @ 6 ml per kg seed) 7.57 cm. With reference to the packaging material, the vacuum plastic bags (P_1) 8.30 cm were found to be significantly superior than jute bag (P_0) 7.04 cm, non vacuum plastic bag (P_2) 7.25 cm, cloth bags (P_3) 7.11 cm, after 6 months of storage in securing the shoot length. Similar finding were also reported by **Barua *et al.* (2009)**.

The combination (T_1P_1) (7.70 cm) was found to be significantly superior in case of shoot length than other combination after 6 months of storage.

The seedling vigour index after 6 months of storage as influenced by the seed treatments showed that, T_1 (Neem fruit powder @ 10 gm per kg seed) 1807.53 was significantly superior than other treatments. The packaging material, vacuum Plastic bags (P_1) 1944.84 was found to be significantly superior in case of seedling vigour index than jute bag (P_0) 15.75.29, non vacuum plastic bag (P_2) 1693.35, cloth bag (P_3) 1610.06, plastic bag + jute bag (P_4) 1612.05 after 6 months of storage in securing the seed vigour index.These results are in conformity with findings **Hunje *et al.* (2008)** the treatment combination (T_1P_1) (1844.75) recorded superior values of seed vigour index after 6 months of storage.

The germination rate as influenced by seed treatment T_1 (Neem fruit powder @ 10 gm per kg seed) 13.47 was significantly superior than other treatments. The packaging material, vacuum Plastic bags (P_1) 12.61 was found to be significantly superior in

Table: 1 : Effect of different treatment and packaging material in seed germination (%), Root length (cm), Shoot length (cm), Seedling vigour index (VI),germination rate and seed viability (%) of lentil seeds at the end of 6th month of period storage.

Treatments (T)	Seed germination (%)	Root length (cm)	Shoot length (cm)	Seedling vigour index (VI)	Germination rate	Seed viability (%)
T_0 Control	77.40	12.63	6.55	1481.53	11.69	85.93
T_1 Neem fruit powder @ 10 gm/kg	82.80	13.91	7.84	1807.20	13.47	90.07
T_2 Black pepper powder @ 10 gm/kg	81.50	13.41	7.35	1688.75	13.03	88.15
T_3 Polymer @ 6 ml/kg	82.20	13.58	7.57	1736.02	13.53	89.08
T_4 Polymer @ 8 ml/kg	82.20	13.50	7.49	1722.08	13.33	88.62
F-test	S	S	S	S	S	S
S. Em. (±)	0.312	0.128	0.054	10.054	0.234	0.687
C.D. at 5%	0.638	0.263	0.110	20.590	0.480	1.407
Packaging materials (P)						
P_0 Jute bag	79.90	12.02	7.04	1575.29	11.58	81.15
P_1 Plastic bag (vaccum)	83.00	13.14	8.30	1944.84	12.61	84.50
P_2 Plastic bag (Non Vacuum)	81.40	12.72	7.25	1693.35	12.47	83.25
P_3 Cloth bag	80.60	12.45	7.11	1610.06	12.21	82.70
P_4 plastic bag + Jute bag	81.20	12.66	7.11	1612.05	12.46	83.20
F-test	S	S	S	S	S	S
S. Em. (±)	0.312	0.128	0.054	10.054	0.234	0.687
C.D. at 5%	0.638	0.263	0.110	20.590	0.480	1.407

Table: 2 : Interaction effects of different seed treatments and packaging materials on germination (%), Root length (cm), Shoot length (cm), Seedling vigour index (VI), germination rate and seed viability (%) of lentil seeds at the end of 6th month of period storage.

Treatments combination	Seed germination (%)	Root length (cm)	Shoot length (cm)	Seedling vigour index (VI)	Germination rate	Seed viability (%)
T_0P_0	75.50	11.22	5.92	1294.32	10.65	80.00
T_1P_0	80.50	12.54	6.44	1527.35	11.16	82.00
T_2P_0	79.50	12.16	6.14	1453.25	11.93	81.00
T_3P_0	81.00	12.22	6.35	1504.10	11.86	81.50
T_4P_0	83.00	12.06	6.27	1514.13	11.80	81.25
T_0P_1	78.50	12.18	6.70	1482.14	11.25	81.50
T_1P_1	86.00	13.66	7.70	1844.75	13.41	87.00
T_2P_1	83.00	13.27	7.12	1684.16	12.31	84.50
T_3P_1	84.00	13.33	7.43	1734.05	13.14	85.00
T_4P_1	83.50	13.28	7.33	1721.65	12.94	84.50
T_0P_2	78.00	12.01	6.03	1406.11	11.14	80.25
T_1P_2	83.00	13.14	7.57	1730.36	13.17	85.50
T_2P_2	81.50	12.54	7.23	1610.21	12.22	83.00
T_3P_2	82.50	12.98	7.25	1667.26	13.01	84.25
T_4P_2	82.00	12.96	7.12	1646.31	12.80	83.25
T_0P_3	77.00	11.94	6.08	1386.26	10.75	80.25
T_1P_3	82.50	12.94	7.67	1700.58	12.81	84.00
T_2P_3	80.50	12.50	7.04	1573.77	12.16	82.50
T_3P_3	81.50	12.57	7.41	1627.75	12.75	83.50
T_4P_3	81.50	12.30	7.35	1588.09	12.59	83.25
T_0P_4	78.00	12.08	6.06	1407.40	11.10	81.00
T_1P_4	82.00	13.08	7.70	1723.83	13.09	84.50
T_2P_4	83.00	12.53	7.20	1637.95	12.58	82.75
T_3P_4	82.00	12.74	7.32	1645.59	12.94	84.00
T_4P_4	81.00	12.90	7.29	1635.51	12.58	83.75
Int.(T x P) F-test	S	S	S	S	NS	NS
S. Em. (±)	0.697	0.287	0.120	22.481	0.524	1.536
C.D. at 5%	1.427	0.588	0.245	46.041	1.073	3.146

case of germination rate than jute bag (P_0) 11.58, non vacuum plastic bag (P_2) 12.47, cloth bag (P_3) 12.21, plastic bag + jute bag (P_4) 12.46 after 6 months of storage. The treatment combination (T_1P_1) 13.41 recorded non-significant superior values of germination rate after 6 months of storage.

The seed viability as influenced by seed treatment T_1 (Neem fruit powder @ 10 gm per kg seed) 90.07 was significantly superior than other treatments. The packaging material, vacuum Plastic bags (P_1) 84.50 was found to be significantly superior in case of seed viability than jute bag (P_0) 81.15, non vacuum plastic bag (P_2) 83.25, cloth bag (P_3) 82.70, plastic bag + jute bag (P_4) 83.20 after 6 months of storage in securing the seed viability. The treatment combination (T_1 P_1) 87.00 recorded non-significant superior values of seed viability after 6 months of storage.

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CONCLUSION

From the present investigation it is concluded that the treatment of Biocide (Neem fruit powder @ 10gm/kg) of seed was superior as it retained seed germination (%), shoot length, root length, seedling vigour index, germination rate and seed viability.

Seeds treatment with biocide (Neem fruit powder @ 10gm/kg of seed) and stored in vacuum plastic bag for 6 months showed significant with germination (%), seedling vigour index, root length, shoot length and non significant higher percentage of seed viability and germination rate as compared to other treated seeds were stored in vacuum plastic bag and other packaging materials.

It is also found out that vacuum plastic bag (packaging) could be the best options among plastic bag (normal), cloth bag and jute bag for seed packing in terms of maintaining the seed quality as reflected in the varied parameters of the seed quality assessment indicators.

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