Plant Archives Vol. 21, Supplement 1, 2021 pp. 2360-2362 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
doi link : https://doi.org/10.51470/PLANTARCHIVES.2021.v21.S1.386

EFFECT OF STORAGE CONTAINERS AND SEED TREATMENTS ON SEED GERMINATION AND VIGOUR OF BLACK GRAM (*VIGNA MUNGO* (L.) HEPPER)

J.Johnny subakar ivin, Y.Anbuselvam* and M.Surendhar J.R. Jerish
Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai Nagar- 608002, India
Corresponding author: yanbuselvam@gmail.com

ABSTRACT

One of the most important basic needs for higher agricultural production is quality seed, characterized by high viability and vigour. Maintenance of seed viability and vigour from Harvest till the next growing season is of the utmost importance in a seed production programme. During seed storage, qualitative and quantitative losses of up to 20% have been reported in India. The poor seed quality may also be due to the poor storability which is very often being decided by the internal and external factors. In pulses, the major cause for seed deterioration during storage is bruchid damage. In this context, evolving an improved storage strategy to prolong the shelf life of seeds under ambient storage conditions with easily available cost-effective resources was carried out. The experiment was conducted at the Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai nagar. Freshly harvested seeds of black gram cv. ADT 3 were cleaned and graded using BSS, 8x8 wire mesh sieve. Then seeds were dried under sunlight to bring the moisture content to required level (8.5%). The seeds were treated with Thiram @ 2g kg^{-1}, Neem oil @ 10ml kg^{-1} and Malathion dust @ 200 mg kg^{-1}. Two hundred and fifty grams of seeds from all treatments along with control were packed in two containers *viz.* cloth bag and polythene bag (700 gauges) with three replication and stored in at ambient temperature ($30^{o}c$ – $35^{o}c$) and relative humidity of 52-80%. Seed samples were drawn from each replication at monthly interval for assessing the viability and vigour. Germination test was conducted in between paper method and seedlings were evaluated on seventh day for vigour index bruchid infestation. The untreated seeds recorded lower germination per cent and vigour index after seven months of storage. There was no bruchid damage on seeds treated with neem oil @ 10ml kg^{-1} and thiram @ 2g kg^{-1}. It was concluded that the shelf life of black gram seeds could be increased by treating the seeds with neem oil and stored either by polythene bag (700 gauges) or cloth bag.

***Keywords*:** Neem Oil, Thiram, Malathion Dust, Cloth Bag, Vigor, Polythene Bag

Introduction

Black gram (*Vigna mungo* (L.) Hepper) is an important pulse crop of our country. In India it is grown in the states of Madhya Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh and Rajasthan. (Ramu et al, 2018). This crop has a wide range of economic value; it is boiled and even eaten whole after splitting into dhal. It is also extensively used in various culinary preparations like idly, curries and papad. (Maphosa and Jideani, 2017). The green pods are eaten as vegetables. The hulls or the outer covering of gram and straw are used as cattle feed. In Tamil Nadu, black gram is grown in an area of about 3.41 lakh hectares with a production of 1.21 lakh metric tons and productivity of 354.84 kg/ha. (Season and crop report, 2018-2019). This being a pulse crop, highly infected by bruchids during storage and the post-harvest losses is very severe. (Kumar and Kalita, 2017) Maintenance of seed viability and vigour from harvest till the next growing season is of the utmost importance in a seed production programme. The poor seed quality may also reduce to the poor storability which is very often being decided by the internal and external factors. In pulses, the major cause for seed deterioration during storage is bruchid damage. (Raghavendra and Loganathan, 2017) Among different species of bruchids, *Callosobruchus chinensis* (*L.*) is considered to be the most destructive in India and causing severe damage to the storage seed to the extent of 93.33% in different pulse crop (Ahmed *et al.,* 2019). The seed deterioration is also hastened by adverse storage environment, seed moisture content and the containers used for seed storage besides its susceptibility to insect infestation. In this context, evolving an improved storage strategy to prolong the shelf life of seeds under ambient storage conditions with easily available cost-effective resources was carried out.

Materials and Methods

The experiment was conducted at the Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai Nagar during 2018-19. Freshly harvested seeds of black gram cv. ADT 3 were cleaned and graded using BSS, 8x8 wire mesh sieve. Then seeds were dried under sunlight to bring the moisture content tore quired level (8.5%). The seeds were treated with Thiram @ 2gkg^{-1}, Neem oil @ 10mlkg^{-1} and Malathion dust @ 200 mg kg^{-1}. Two hundred and fifty gram of seeds from all treatments along with control were packed in two containers *viz.* cloth bag and polythene bag (700 gauge) with three

replication and stored in at ambient temperature (30°c–35°c) and relative humidity of 52-80%. Seed samples were drawn from each replication at monthly interval for assessing the viability and vigour. Germination test was conducted in between paper method and seedlings were evaluated on seventh day (ISTA, 1999) for Vigour index bruchid infestation (Njonjo *et al*., 2019). The results were statistically analysed as per Panse and Sukhatme (1978). The effect of different containers, seed treatments and period of storage on viability of Black gram seeds were shown in Table 1.

Results and Discussion

The containers have considerable effect on germination and vigour index of seeds. There duction in germination and vigour index was higher for seeds stored in cloth bags as compared to Polythene bag (700 gauge). (Table 1). Seeds treated with neem oil @ 10ml kg-1 performed better as compared to other treatments *viz*. thiram and malathion. (Gahukar, 2017) But the untreated seeds recorded lower germination per cent and vigour index after seven months of storage. Neem oil/neem product has an antioxidant property like acetyl salicylic acid in reducing the lipid peroxidation, protein degradation and chromosomal aberrations and simultaneously controlling the deterioration process (Raja et al. 2003). There was no bruchid damage on seeds treated with neem oil @ 10ml kg^{-1} and thiram @ 2g kg^{-1} of seeds after 7 months of storage in cloth bag and is better than the seeds treated with Malathion @ 200mg kg^{-1} (Table 2). The Untreated seeds recorded higher bruchid damage. The bruchid damage increased with increase in storage period. The bitter compound *azadirachtin* present in neem seeds showed insecticidal property against a variety of storage and field crop pests. Crushed neem seed at one or two per cent protected the pulse seeds from *Callosobruchus chinensis* (Chaudhary *et al*., 2017). Seeds treated with neem seed powder reduced ovi position, egg hatching and adult emergence (Harshani *et al*., 2019).

Conclusion

Though thiram is a fungicide it effectively controlled the bruchid infestation. Thiram is metabolized to the isothiocyanate radical which in activates the sulfhydryl groups (-SH) of amino acids and enzymes within the insect cells and there by inhibits the production and function of these compound in the insect cells. It was concluded that the shelf life of black gram seeds could be increased by treating the seeds with neem oil and stored either by polythene bag (700 gauge) or cloth bag.

Table 1 : Effect of containers and seed treatments on germination and vigour index of Blackgram

Period of storage	CLOTH BAG								POLYTHENE BAG (700 gauge)							
	Control		Thiram		Neem oil		Malathion Dust		Control		Thiram		Neem oil		Malathion Dust	
	G%	VI	G%	VI	G%	VI	G%	VI	G%	VI	G%	VI	G%	VI	G%	VI
P_0	87	7365	85	7254	90	4621	91	7760	87	7342	95	8200	95	7995	89	7510
P_1	84	5540	92	6890	93	7012	87	6520	87	6847	94	7022	97	7542	91	6890
P_2	80	5670	88	6490	91	6912	87	6220	84	6147	88	6622	93	7142	89	6590
P_3	74	5340	89	6380	89	6542	85	6060	80	5814	91	6574	95	7542	81	6247
P_4	71	4575	85	5998	83	6245	83	5520	77	5047	87	6322	93	6842	86	6290
P_5	63	4540	81	5790	83	6212	77	5420	67	4347	84	6122	87	6542	84	5890
P_6	51	3245	78	5300	81	5841	75	5143	55	3514	83	5742	83	6162	79	5490
P_7	49	3140	72	5090	79	5512	73	4820	53	3347	80	5322	81	5942	71	4790
	Vigour Index								Germination							
	P	C	T	PXC	TXC	TXP	PXCXT		P	C	T	PXC	TXC	TXP	PXCXT	
	80.02	48.4	82.1	138.2	137.4	228.4	387.10		0.74	0.41	0.72	1.27	1.25	2.054	3.478	

P – Period C – Container T – Treatment

Table 2 : Effect of containers and seed treatments on bruchid damage (%) in Black gram

Period of storage	CLOTH BAG				POLYTHENE BAG (700 gauge)			
	Control	Thiram	Neem oil	Malathion Dust	Control	Thiram	Neem oil	Malathion Dust
P_0	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)
P_1	1.98 (1.38)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)	2.00 (5.87)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)
P_2	1.00 (3.25)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)	6.00 (2.92)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)
P_3	18.00 (4.46)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)	13.00 (3.94)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)
P_4	28.00 (5.41)	0.00 (0.72)	0.00 (0.72)	0.00 (0.72)	2.00 (1.42)	23.00 (4.81)	0.00 (0.72)	0.00 (0.72)
P_5	30.00 (5.48)	0.00 (0.72)	0.00 (0.72)	3.00 (1.84)	24.00 (4.91)	0.00 (0.72)	0.00 (0.72)	2.00 (1.42)
P_6	36.00 (6.10)	0.00 (0.72)	0.00 (0.72)	5.00 (2.32)	28.00 (5.41)	0.00 (0.72)	0.00 (0.72)	3.00 (1.84)
P_7	40.00 (6.45)	0.00 (0.72)	0.00 (0.72)	6.00 (2.56)	36.00 (6.10)	0.00 (0.72)	0.00 (0.72)	3.00 (1.84)

	Vigour index							Germination						
	P	C	T	PXC	TXC	TXP	PXCXT	P	C	T	PXC	TXC	TXP	PXCXT
CD (P=0.05)	80.02	48.45	82.15	138.21	137.46	228.47	387.10	0.74	0.41	0.72	1.27	1.25	2.05	3.47

(Figures in parentheses are arc sign values)

P – Period C – Container T – Treatment

Acknowledgement

Authors are thankful to the department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Tamil Nadu, India for providing the laboratory facilities for the conduct of present study.

References

Ahmed, S.; Haque, A.; Mahmud, H. and Khalequzzaman, K.M. (2019). Egg deposition and weight loss of seeds by pulse beetle, *Callosobruchus chinensis* L. on different genotypes of pulses. Bangladesh Journal of Agricultural Research, 44(3): 513-524.

Chaudhary, S.; Kanwar, R.K.; Sehgal, A.; Cahill, D.M.; Barrow, C.J.; Sehgal, R. and Kanwar, J.R. (2017). Progress on *Azadirachta indica* based biopesticides in replacing synthetic toxic pesticides. Frontiers in plant science, 8:610.

Devaramane, R. and Loganathan, M. (2017). Effect of Pulse Beetle (*Callosobruchus maculates* L.) Infestation on Quality of Pigeon pea Seed. 5(6): 976-980

Gahukar, R.T. (2017). Withdrawn: pest and disease management in important medicinal plantsin India: A review.

Harshani, H.S. and Karunaratne, S. (2019). Chemical composition and insecticidal effect of fruit peel powders of two citrus species against *Callosobruchus maculatus* (F.)(*Coleoptera: Bruchidae*) in stored cowpea (*Vigna unguiculata*). International Journal of Pest Management, pp.1-8.

ISTA. (1999). International rules for seed testing. Seed Sci. and Technol., Supplement Rules, 27: 25-30.

Kumar, D. and Kalita, P. (2017). Reducing postharvest losses during storage of grain crops to strengthen food security in developing countries. Foods, 6(1), p.8.

Maphosa, Y. and Jideani, V.A. (2017). The role of legumes in human nutrition. Functional Food-Improve Health through Adequate Food, 1, p.13.

Njonjo, M.W.; Muthomi, J.W. and Mwang'ombe, A.W. (2019). Production Practices, Postharvest Handling, and Quality of Cowpea Seed Used by Farmers in Makueni and Taita Taveta Counties in Kenya. International Journal of Agronomy.

Panse, V.G. and Sukhatme, P.V. (1978). Statistical methods for agricultural workers. ICAR, Pub., New Delhi.

Parsai, S.K.; Rawat, R.R. and Choudhary, P.K. (1989). Ovi positional behaviour and preference of the bean beetle, Callosobruchusphaseoli, its extent of damage in stored seeds of different varieties of field bean. Bull. Grain Technol. **27:** 103-106.

Raja, K.; Bharathi, A. and Karivaradaraaju, T.V. (2003). Effect of storage containers and seed treatments on seed viability and vigour of greengram (*Vigna radiata* (L.) Wilczek) cv. CO 6 (No. RESEARCH).

Ramu, P.S.; Swathi, K. and Rao, S.G. (2018). A review on seasonal incidence and insecticidal management of spotted pod borer [*Maruca vitrata* (Geyer)] with special reference to urdbean (*Vigna mungo* L.) In India. Journal of Entomology and Zoology Studies, 6(4): 926-931.

Season and crop report. (2018-2019). Department of Economics and Statistics, Government of Tamilnadu, India.