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Observation of seed health of black gram (Vigna mungo L.) in relation to storage containers and treatment with three plant powders

Abstract

Vitality of seed is influenced by storage conditions. Storage conditions and containers predispose seed mycoflora on seed of pulse. Different storage containers like Gunny bag, Tin box, and Plastic bag and Glass bottle were used. Gunny bags were found to be better storage container to maintaining seed health of test pulse.

Keywords: gunny bags, black gram, nutritious pulse, wooly pyool, kharif crop, fungi

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Introduction

Black gram (*Vigna mungo* L.) is an herbaceous annual plant with spreading procumbent branches, commonly referred as 'wooly pyool' due to presence of brown hairs covering stem. Inflorescence is represented by a long stout, hairy axis bearing a group of 5–6 yellow flowers. In India it is commonly grown as a Kharif crop where rainfall is 30–35 inches. Usually cultivated in June–July and harvested within 3–4 months. Commonly cultivated in Madhya Pradesh, Uttar Pradesh, Punjab, Maharashtra, West Bengal, Andhra Pradesh and Karnataka.

Black gram is important for its high phosphoric acid content. It contains 24g protein/100g of seeds and carbohydrates 59.6g/100 g of seeds show that it is nutritious pulse. It also has good amount of phosphorus (385mg) iron (10.2mg), thiamin (0.42 mg), riboflavin (0.20 mg), niacin (2 mg) and vitamin C (3 mg).[1]

Ideal storage environment is rarely available throughout the year in nature.[2] During various processes from maturity of crop to harvesting, threshing, processing and storage, the seeds get infested with a variety of field and storage fungi in addition to a number of seed–borne pathogens.[3–6] Fungi remain active on the stored seed, leading to deterioration in seed quality and quantity.[7] Mullah et al.[8] studied effects of containers on seed of onion and reported plastic container as suitable for better storability.

Materials and methods

Collection of test pulse, plants and preparation of plant parts powder

Test pulse Black gram was collected from local farms and market places in Nanded district, Maharashtra, India. The test treatment plants; *Azadirachta indica* A. Juss., *Ocimum basilicum* L. and *Cyperus rotundus* L.; to use as bio–powders, collected from local area of Nanded district Maharashtra, India and identified from their morphological characters using 'Flora of Marathwada.[9] Plants were cut into different parts like stem, leaves, root and surface sterilized with 0.1% $HgCl_2$ and subsequently washed to remove disinfectant; with sterile distilled water. These sterilized plant parts were kept for drying in hot air oven at 60°C for 48 hours.

Application of plant part powder to seed of test pulse

The dried plant parts leaf, stem and root crushed into powder with the help of grinder. The powders thus obtained passed through sieve to get fine powder and stored in polythene bags for the study. One kilogram seed of Black gram were dusted separately with ten gram of leaf powder of *Azadirachta indica* A. Juss, *Ocimum basilicum* L. and rhizome powder of *Cyperus rotundus* L. These treated seeds of the pulse were stored in different containers like gunny bag, plastic bag, tin box and glass bottle. After storing seeds of each pulse in different containers for one year, the seeds of each pulse were incubated on moist blotters for ten days at room temperature. On eleventh day seed health in terms of seed mycoflora, seed germination, root and shoot length was measured. Seeds without dusting with any plant part powder served as control.

Results and discussion

The results in the Table 1 show that, treated seeds showed reduced seed mycoflora, enhanced seed germination, shoot and root length in all the containers. Seed mycoflora was found to be reduced on treated seeds with *A. indica* than on untreated seeds stored in all containers. Untreated seeds stored in gunny bag showed minimum incidence of seed mycoflora (60%) and maximum was found in the seeds stored in plastic bag (70%). The treated seeds stored in gunny bag showed least seed mycoflora (42%) followed by tin box (50%), where as maximum was reported in the seeds stored in plastic bag (66%). Seed germination was more in the treated seeds compared to the untreated ones in all the containers. In untreated seeds maximum seed germination was observed in gunny bag (80%) and minimum in seeds stored in plastic bag (62%). Treated seeds stored in gunny bag had maximum seed germination (100%), followed by seeds stored in tin box (93%) and least in seeds stored in plastic bag (68%). Shoot and root lengths were more in the treated seeds than untreated seeds, in all the containers. Root length in untreated and treated seeds was slightly

more in seeds stored in tin box and shoot length was slightly more in untreated and treated seeds stored in gunny bag.

Table 1 Effect of storage containers on seed germination (%), seed mycoflora (%), Shoot and Root length (cm) of Black gram seed treated with different plant powders. UT, Untreated; T, Treated

Plant part powders	Storage container	Seed germination		Seed mycoflora		Shoot length		Root length	
		UT	T	UT	T	UT	T	UT	T
Azadirachta indica	Gunny bag	80	100	60	42	25	28	36	38
	Tin box	78	96	62	50	22	25	37	38
	Plastic bag	63	69	70	67	19	22	37	38
	Glass bottle	78	90	66	56	20	23	36	37
Ocimum basilicum	Gunny bag	83	99	52	18	29	31	35	36
	Tin box	80	92	58	28	26	27	33	36
	Plastic bag	66	70	67	68	24	27	28	30
	Glass bottle	70	100	62	24	24	26	35	34
Cyperus rotundus	Gunny bag	78	96	50	29	28	35	35	38
	Tin box	69	91	56	30	30	32	32	37
	Plastic bag	57	84	58	39	29	30	36	37
	Glass bottle	66	87	58	38	30	33	35	37

In case of seed treated with *O. basilicum* maximum seed mycoflora in untreated seeds was noticed on seeds stored in plastic bag (65%) and minimum in seeds stored in gunny bag (52%), followed by tin box (57%). Treated seeds stored in gunny bag showed minimum seed mycoflora (15%), followed by glass bottle (24%) and maximum in plastic bag (38%). Increased seed germination was reported in treated seeds than in untreated seeds stored in all containers. Untreated seeds stored in plastic bag showed least germination (66%) and maximum was in gunny bag (82%), followed by tin box (80%). Treated seeds stored in glass bottle showed maximum seed germination (100%), followed by seeds stored in gunny bag (98%). Shoot and root lengths were more in treated seeds than in untreated ones stored in all containers. Shoot and root length in treated seeds were more or less similar in seeds stored in all containers.

Seed mycoflora on untreated seeds was much more than on the seeds treated with *C. rotundus* stored in all containers. Untreated seeds stored in plastic bag showed more seed mycoflora (58%) and least was reported in gunny bag (50%). Seed mycoflora in treated seeds was minimum in gunny bag (28%), followed by seeds stored in tin box (32%) and maximum was in the seeds stored in plastic bag (38%). Untreated seeds showed very less seed germination than treated seeds stored in all containers. Seed germination in treated seeds was maximum in gunny bag (98%), followed by glass bottle (85%), whereas least was in plastic bag (83%). Regarding shoot and root lengths, treated seeds stored in all containers were with higher values of lengths compared to untreated seeds. Both untreated and treated seeds showed slightly more lengths in the seeds stored in gunny bag followed by tin box.

Similar finding were reported in safflower by Singh et al.[10] they found difference in fungal flora under different storage periods, four months stored seeds nurtured *Chaetomium globosum*, *C. spirata*, *Rhizopus arrhizus* and *Penicillium* spp. and eight month stored seeds nurtured mainly *Aspergillus fumigatus*, *A. sydowii*, *A. flavus* and *A. niger*. Chandra et al.[11] while studying mycoflora of mustard, linseed, sunflower, safflower, soybean, sesame and groundnut recorded that, the fungi like *Alternaria*, *Cladosporium*, *Curvularia*, *Fusarium* and *Helminthosporium* decreased gradually during storage period and disappeared after three years and were succeeded by storage fungi like *Aspergillus* spp. *Penicillium* spp. and *Rhizopus* spp. Bhattacharya et al.[12] studied fungal infection, moisture content, germinability and deterioration of seeds of maize, groundnut and soybean in storage at the locality of Santiniketan, West Bengal, India under natural condition for one year. Dominant fungi recorded from stored seeds were *Aspergillus candidus*, *A. flavus*, *A. niger*, *A. terreus*, *A. ruber*, *Rhizopus* spp. *Penicillium* spp., *Curvularia* spp., *Fusarium* spp. *Alternaria* spp. etc. Carbohydrates and protein content of the test seeds were found to be declined. Zeljko et al.[13] studied changes in fungi and mycotoxins in pearl millet under controlled storage conditions; they reported that, predominant fungi showed fluctuation in their incidence with changes in storage temperature, moisture and humidity. Abdulaziz et al.[14] found that storage of *Ephedra alta* seeds in cotton cloth bags favorably maintained seed moisture content below critical level resulting in minimum seed deterioration compared with other seed storage containers. Khatun et al.[15] used botanicals, such as whole leaf powder of neem *(A.indica)*, Dholkalmi *(Ipomoea sepiara)*, and Bishkatali *(Polygonum hydropiper)* at a dose of 5% w/w (25 g botanical per 500 g of lentil seeds), *A. indica*. In addition, *P. hydropiper* were effective in preserving seed germination and seed vigor of lentil. Gopinath et.al.[16] found that storage fungi depleted total fat (1.94–1.75g), triglycerides (1.46–1.07g), where as phospholipids (0.06–0.21g), free fatty acids (0.002–0.01 g) and peroxide values increased. The fatty acid content of palmitic, steric, linoleic acid decreased, but oleic acid content increased in Red Gram and Black gram during storage periods. Khalequzzman et al.[17] reported moisture content, seed weight, abnormal seedlings, seed rot, and fungal association of French bean increased, but germination and normal seedlings growth decreased with increase in storage period. Kakade et al.[18] reported negative nutritional and fatty oil alteration in soybean and safflower due to storage fungi; like *Alternaria, Fusarium, Macrophomina* sp., *Curvularia* sp., *Rhizopus* Sp., *Penicillium* sp. etc. Sethumadhav et.al.[19] found that storage fungi like *Aspergillus flavus*, *A. niger, A. fumigatus, Cladosporium cladosporiodes* etc found to reduce carbohydrates, amino acids and phenols in the vegetables, increased storage period abnormally increased phenols and amount of reducing sugar. Lambat et al.[20] reported polyethylene bag provided much protection.

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Conflict of interest

Author declares there is no conflict of interest.

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