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Effect of Storage Containers on Seed Mycoflora and Seed Health of Green Gram (*Vigna Radiata L.*) and its Cure with Botanicals

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Abstract

Storage containers play vital role in maintenance of seed health of crop for transitory period. Storage conditions 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.

Introduction

Green gram (*Vigna radiata L.*) is an annual plant with herbaceous bushy appearance. It attains a height of 1-3 feet, being more or less erect. The axillary raceme inflorescence is with variously yellow colored flowers in cluster. The fruit is typically a slender pod, measuring 3-4 inches long and bearing small, slightly flattened, globular seeds. The seeds are usually green in color but the cotyledons are used as dal. The plant requires 25-35 inches rainfall. It is cultivated as both a Kharif as well as Rabi crop. The Kharif crop is sown around June or July and Rabi crop in September or October. Within three months, the plant is harvested. Seeds show 24g protein, 56.7g carbohydrate/100g of edible part of the seeds, thiamin (0.47mg), riboflavin (0.27mg) and iron (7.3mg) [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 qualitatively and quantitatively [7]. Mullah et.al. [8] studied effects of containers on seed of onion and reported plastic container as suitable for better storability for it.

Materials and methods

Collection of plants and preparation of plant parts powder

The test plants 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 (Table 1).

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

Plant Part Powders of	Storage Container	Seed Germination		Seed Mycoflora		Shoot Length		Root Length	
		UT	T	UT	T	UT	T	UT	T
Azadirachta indica A.Juss	Gunny bag	77	93	50	17	30	32	30	33
	Tin box	70	80	40	19	32	33	30	32
	Plastic bag	68	90	45	20	27	29	25	27
	Glass bottle	71	80	42	19	24	27	25	27

Ocimum basilicum L.	Gunny bag	80	100	62	42	26	27	27	28
	Tin box	65	79	63	48	23	25	25	27
	Plastic bag	63	61	72	52	23	24	25	26
	Glass bottle	62	64	64	45	24	25	27	30
Cyperus rotundus L.	Gunny bag	80	100	32	20	26	27	35	36
	Tin box	77	79	32	27	25	27	34	35
	Plastic bag	60	68	42	23	24	25	32	34
	Glass bottle	60	67	48	30	23	24	30	32

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 seeds Green 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 studied. Seeds without dusting with any plant part powder were served as control.

Results and Discussion

The results in the figure show that, seeds treated with leaf powder of *Azadirachta indica A. Juss* showed reduced seed mycoflora and enhanced seed germination, shoot and root length in all the containers. Increased seed mycoflora was recorded in all the containers in untreated seeds than the treated ones. In untreated seeds more seeds mycoflora was recorded in gunny bag and plastic bag (50% each), whereas least seed mycoflora was recorded in tin box. In treated seeds least seed mycoflora was recorded in gunny bag (17%) and maximum in plastic bag (20%). Seed germination was found to be more in all the containers in treated seeds than in the untreated ones. In treated seeds more seed germination was recorded in the seeds stored in gunny bag (93%) followed by plastic bag (90%), tin box and glass bottle (80%). In untreated seeds seed germination was maximum in seeds stored in gunny bag (77%) followed by glass bottle (71%), tin box (70%) and plastic bag (68%).

As regards to shoot and root lengths, more length was recorded in treated seeds in all the containers compared to untreated seeds. Seeds from all the containers showed more or less similar lengths.

Seeds treated with *Ocimum basilicum L.*; stored in all containers showed reduced seed mycoflora and enhanced seed germination, shoot and root length. Seed mycoflora in untreated seeds stored in different containers was comparatively more than in the treated seeds. Maximum seed mycoflora in untreated seeds was found in the seeds stored in plastic bag (72%) and minimum in seeds stored in tin box (63%). The treated seeds, stored in gunny bag showed least seed mycoflora (42%) followed by seeds stored in tin box (48%), where as maximum seed mycoflora was recorded in the seeds stored in plastic bag (52%).

Seed germination was more in the treated seeds than in untreated seeds. Untreated seeds stored in gunny bag showed maximum seed germination (80%) and minimum in the seeds stored in plastic bag (63%). There was maximum seed germination in treated seeds stored in gunny bag (100%), whereas least was recorded in the seeds stored in plastic bag. Shoot and root lengths were increased in the treated seeds stored in different containers. Among all containers shoot and root lengths were slightly more in the seeds stored in gunny bag.

Seeds treated with *Cyperus rotundus L.* stored in all containers showed reduced seed mycoflora and enhanced seed germination, shoot and root length. The untreated seeds showed increased seed mycoflora than the treated seeds in all containers. In untreated seeds maximum seed mycoflora was recorded in glass bottle (48%) and minimum was in gunny bag (32%). Treated seeds showed maximum seed mycoflora in glass bottle (30%) and minimum in gunny bag (20%). Seed germination was minimum in untreated seeds compared to treated ones in all the containers. In case of untreated seeds more seed germination was found in the seeds stored in gunny bag (80%) followed by tin box (77%). In case of treated seeds more seed germination was in the seeds stored gunny bag (100%) followed by tin box (79%) and minimum in glass bottle (67%). Regarding shoot and root lengths, untreated seeds showed least lengths than treated ones in all containers. Shoot and root lengths were more or less similar in all seeds stored in different containers.

Similar finding were reported in safflower by Singh & Singh [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

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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 Jurjevic 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 (*Azadirachta indica*), Dholkalmi (*Ipomoea sepiara*), and Bishkatali (*Polygonum hydropiper*) at a dose of 5% w/w (25g botanical per 500g of lentil seeds), *Azadirachta indica A. Juss*.

In addition, *Polygonum hydropiper L.* were effective in preserving seed germination and seed vigor capacity of lentil. Rangnayaka 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 (0.002-0.01g) and peroxide values increased. The fatty acid content of palmitic, steric, linoleic acid decreased, but oleic acid content increased in Red Gram and Green 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 & Chavan [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. Rao 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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