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Effect of few Plants as Protectant on Seed of Pigeon pea (Cajanas cajan L.) Stored in Different Containers

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Abstract

Seed is the most important part of plant for propagation. Proper storage of seed in suitable container in viable condition for future use is a meticulous task. Insane application of artificial seed protectants is producing lethal effects on general public and environment. Therefore, in present study naturally available plants as seed protectant are tried on seed of Pigeon pea stored in four containers; gunny bag, tin box, plastic bag, glass bottle. Plant powders of *Azadirachta indica* A.Juss, *Cyperus rodundus* L. and *Ocimum basilicum* L. found useful to be as seed protectant for test pulse.

Introduction

Pigeon pea (*Cajanas cajan* L.) is an annual shrub of about 6-7 feet. The inflorescence is a typical axillary raceme bearing papilionaceous flowers. It is cultivated as a mixed crop with Kharif cereals in low rainfall areas. Sowing is done in June – July and harvested after 6-8 months, between January- Februarys. It is commonly cultivated in Tamil Nadu, Bihar, Rajasthan, Maharashtra, Orissa and Uttar Pradesh.

Pigeon pea contains protein 20.4 g/100 g of seeds and carbohydrates are 60.4 g/100 g of seeds suggesting that it is also good source of protein and carbohydrates, it also contain thiamin (0.45mg), niacin (2-9mg) and riboflavin (0.19mg). It has better quality of fiber (7g/ 100g of seeds). (Shakuntala Manay et.al.1987).

Storage and preservation of seed of crop is now a day is done using fungicides and pesticides of inorganic origin. Unabated application of artificial seed protectants is causing holistic damage to the ecosystem. Ideally a pesticide must be lethal to the targeted pest, but not to non-targeted beings, including human. Unfortunately, this is not the case, so the controversy of use and abuse of pesticide has surfaced. The rampant use of these chemicals caused havoc to the living forms (Wasim Aktar et.al. 2009). M. A. Hossain et.al. (2014) found effectiveness of tobacco leaf powder in controlling oviposition, adult emergence of *Callosobruchus chinensis* pest causing seed infestation to stored Chickpea. Rajapakse (2006) successfully used some plants to control infestation of beetles on stored seed crops.

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Materials and Methods

Collection of Test Pulse, Plants and Preparation of Plant Parts Powder:

Pigeon pea (*Cajanas cajan* L.) collected from local farms and market in Nanded district of Maharashtra, India. The test treatment plants; *Azadirachta indica* A.Juss., *Ocimum basilicum* L. and *Cyperus rotundus* L.; used as bio-powder plant protectants, collected from local area of Nanded district, Maharashtra, India and identified from their morphological characters using 'Flora of Marathwada' (Naik, 1998). Plants were cut, separated into different parts stem, leaves, root, surface sterilized with 0.1% $HgCl_2$ and washed to remove disinfectant with sterile distilled water. Sterilized plant parts kept for drying in hot air oven at 60°C for 48 hours.

Application of Plant Part Powders to Seed of Test Pulse Pigeon Pea:

The dried plant parts leaf, stem and root crushed to powder with the help of grinder. The test plant powders thus obtained passed through sieve to get fine powder and stored in polythene bags.
One kilogram seed of Pigeon pea dusted separately with ten gram leaf powder of *Azadirachta indica* A. Juss, *Ocimum basilicum* L. and rhizome powder of *Cyperus rotundus* L. Treated seed of the pulse were stored in different containers like gunny bag, plastic bag, tin box and glass bottle. After storing seed of test pulse in different containers for one year, the seeds 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 served as control.

Results and Discussion

The results in the figure 1 show, seed from all the containers; treated with leaf powder of *Azadirachta indica* A. Juss. Sowed reduced seed mycoflora and enhanced seed germination, shoot and root length. As regards to untreated seeds maximum seed mycoflora was observed in the seeds stored in plastic bag (66 %), followed by glass bottle (63 %) and least in gunny bag (59 %). Treated seeds stored in plastic bag showed maximum seed mycoflora (43 %) and least in gunny bag (27 %).

Seed germination was reported to be increased in treated seeds than in untreated seeds stored in all containers. Maximum seed germination in case of treated seeds was noticed in the seeds stored in gunny bag (98 %), followed by tin box (89 %) and minimum in plastic bag (70 %). Untreated seeds stored in gunny bag showed maximum seed germination (79 %) and least in plastic bag (67 %). shoot and root lengths were increased in treated seeds over untreated ones, stored in all containers. shoot and root lengths were a bit more in untreated and treated seeds stored in gunny bag.

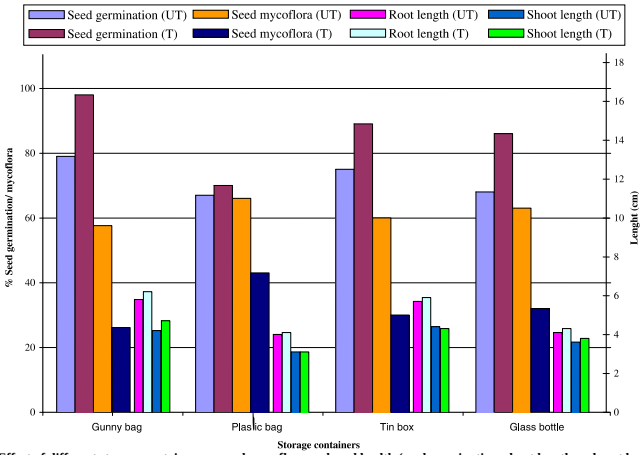

Figure 1: Effect of different storage containers on seed mycoflora and seed health (seed germination, shoot length and root length) of Pigeon pea (*Cajanus cajan* L.) seeds treated with leaf powder of Azadirachta indica A. Juss
(UT = Untreated, T = Treated)

Seed treated with rhizome powder of *Cyperus rotundus* L. (Fig. 2) indicated reduced seed mycoflora and increased seed germination, shoot and root length stored in all the containers. Untreated seeds stored in plastic bag showed maximum seed mycoflora

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(62 %) and least in gunny bag and tin box (60 % each). Treated seeds stored in plastic bag showed maximum seed mycoflora (37 %) and least in tin box (20 %), followed by gunny bag (26 %).

Seed germination was significantly increased in treated seeds than in untreated seeds, stored in all containers. Maximum seed germination in untreated seeds was recorded in gunny bag (80 %), followed by tin box (69 %) and least in glass bottle (65 %). Similarly maximum seed germination in treated seeds was recorded in the seeds stored in plastic bag (100 %), followed by tin box (98 %) and minimum in glass bottle (76 %). Shoot and root lengths were found to be increased in treated seeds than in untreated seeds, stored in all containers. Shoot and root lengths in treated seeds showed more or less increase in the seeds stored in all containers.

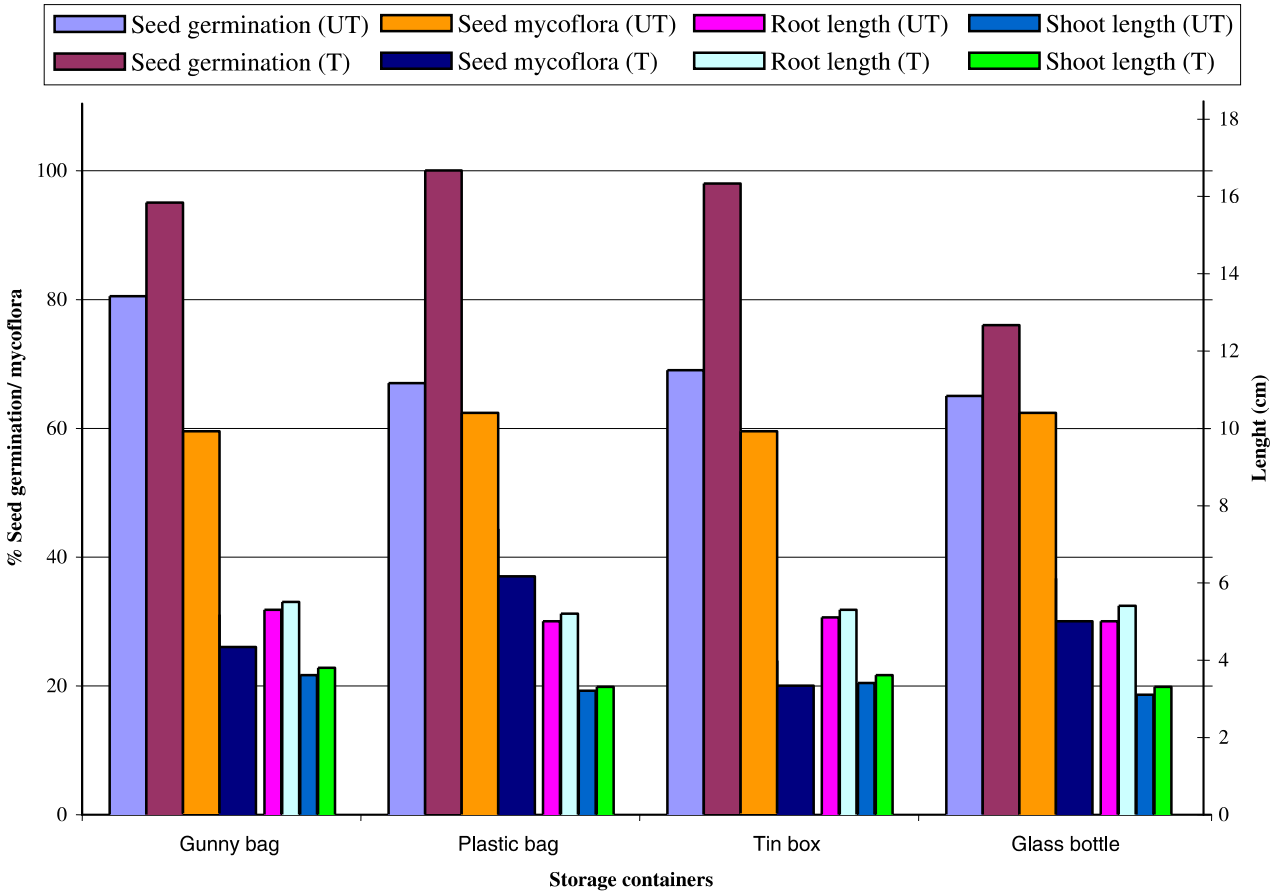

Figure 2: Effect of different storage containers on seed mycoflora and seed health (seed germination, shoot length and root length) of Pigeon pea (*Cajanas cajan*) seeds treated with rhizome powder of *Cyperus rotundus L*(UT = Untreated, T = Treated).

Figure 3 show; Seeds treated with *Ocimum basilicum* L. showed reduced seed mycoflora and increased seed germination, shoot and root length in all the containers. Seed mycoflora of treated seeds was found to be reduced compared to untreated seeds stored in all containers. In case of untreated seeds, maximum seed mycoflora was recorded in the seeds stored in plastic bag (68 %) and minimum in tin box (61 %); followed by glass bottle (63 %). Treated seeds stored in tin box and glass bottle showed maximum seed mycoflora (30 % each), whereas least was recorded in gunny bag (15 %), followed by plastic bag (27 %).

Seed germination was considerably improved in treated seeds over untreated seeds, stored in all containers. Maximum seed germination, in case of untreated seeds was noticed in the seeds stored in gunny bag (92 %) and minimum in plastic bag (76 %). Treated seeds stored in gunny showed maximum seed germination (100 %), followed by the seeds stored in tin box (95 %) and least in plastic bag (83 %). Shoot and root lengths were increased in treated seeds than in untreated ones, stored in all containers. Treated seeds showed increased shoot and root lengths in all the containers in more or less quantity.

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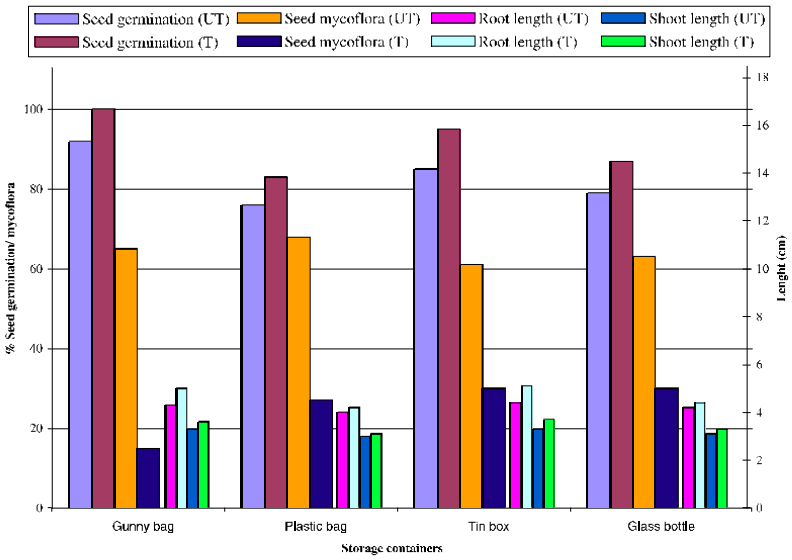

Figure 3: Effect of different storage containers on seed mycoflora and seed health (seed germination, shoot length and root length) of Pigeon pea (*Cajanas cajan*) seeds treated with leaf powder of *Ocimum basilicum L.*
(UT = Untreated, T = Treated).

Similarly, Singh and Singh (1979), 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 developed mainly *Aspergillus fumigatus*, *A.sydowii*, *A. flavus* and *A. niger*. Chandra *et al.* (1981) studied seed 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.* (2002) recorded 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.* (2007) studied changes in fungi and mycotoxins in pearl millet under controlled storage conditions; further they reported that, predominant fungi showed fluctuation in their incidence with changes in storage conditions such as temperature, moisture and humidity. Abdulaziz et.al. (2010) reported 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. (2011) used botanicals, such as whole leaf powder of Neem *(Azadirachta indica), Ipomoea sepiara,* and *Polygonum hydropiper* at a dose of 5% w/w (25 g botanical per 500 g of lentil seeds). In addition, *Polygonum hydropiper* L. were effective in preserving seed germination and seed vigor of lentil. Mysore Rangnayaka et.al. (2011) found that storage fungi reduced total fat (1.94-1.75g), triglycerides (1.46-1.07 g), whereas phospholipids (0.06- 0.21 g), 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 Chickpea during storage periods. Khalequzzman et.al. (2012) found 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 and Chavan (2012) reported negative nutritional and fatty oil alteration in soybean and safflower due to storage fungi; like *Alternaria* sp., *Fusarium* sp., *Macrophomina* sp., *Curvularia* sp., *Rhizopus* Sp., *Penicillium* sp. etc. Sethumadhav Rao et.al. (2014) reported that storage fungi like *Aspergillus flavus, A. niger, A. fumigatus, Cladosporium cladosporiodes* etc reduced carbohydrates, amino acids and phenols in the vegetables, increased storage period abnormally increased phenols and amount of reducing sugar. Dubale et.al. (2014) screened seed mycoflora of Maize (*Zea mays* L.) stored in traditional storage container *Gombisa* and sacks, common fungi reported were *Aspergillus flavus, A. fumigatus, A. niger, A. terreus, Cladosporium cladosporiodes, Drechslera halodes, Fusarium oxysporum* and *Penicillium chrysogenum*. Lambat et. al. (2015) reported polyethylene bag imparted much protection. Maria Sheeba Nazareth et.al. (2018) found Neem and Tulsi powder individually and synergistically (1:1) antifungicidal against mycoflora of four oil seeds; it also enhanced germination, emergence, shoot and root length of oil seeds.

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In vitro application of the selected plants could be used on larger scale in storage houses to eschew artificial harmful preservatives. It could be better replacement for the chemical plant protectants to protect the post-harvest products. The environmental degradation could be retarded to some extent as earth and its biome is at serious threshold of deterioration. All countries must heed the warnings of the 'union of concerned scientists' to protect the earth for future generations (Ripple et.al. 2017).

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