Effect of containers and storage conditions on the health status of okra seed

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Abstract: The experiment was conducted to find out the effect of containers and storage conditions on the seed health status of okra in farmers house and laboratory conditions. The containers used in both conditions were tin box, plastic jar, glass bottle, polythene bag and cloth sac (cotton). The health status of seed was tested before storing and also three times at every two monlth interval. Seed germination and percent of normal seedlings were reduced due to storage time. Highest reduction in germination and normal seedlings were recorded in cloth sac and lowest in polythene bag. Fungi belonging to six different genera were found to be associated with the seed samples used in both conditions. These fungi were *Fusarium* spp., *Colletotrichum dermatium, Aspergillus flavus, Penicillium sp, Macrophomina phaseolina* and *Curvularia lunata*. In general storage molds were increased over the whole storage duration; the lowest in polythene bag and highest in cloth sac. Higher fungal population was encountered in farmer's seed. Regarding health status of seed, performance of the laboratory condition was found better where in polythene bag gave best result among the containers used in the experiment.
Key words: Container, storage conditions, Okra.

Introduction

Okra (*Abelmoschus esculentus* L.) is a popular vegetable crop belonging to the family of Malvaceae. Several varieties of this crop are widely cultivated both in Kharif and Rabi season in Bangladesh. It is grown both in commercial plot and home garden. It is a highly nutritions and delicious vegetable which is rich in vitamins (A, B & C) and minerals (Rashid, 1976). In Bangladesh, though okra is grown throughout the country in both the seasons (Rabi & Kharif), the yield per hectare is not satisfactory. During the growing seasons of 2003-2004, Bangladesh produced 24000 metric tons of okra in 18000 acreages with an average yield of 1.37 metric tons per acre (BBS, 2004), whereas the yield in many other okra growing countries is as high as 3.5 tons per acre (Thomson and Kelly, 1957).

Diseases are one of important factors for low yield of Okra in Bangladesh. Okra suffers from a number of different diseases. Among these, 14 are seed-borne of which six are major and eight are minor (Akanda, 1993). Major seed-borne diseases of okra in Bangladesh are seed rot caused by *Aspergillus* spp. anthracnose caused by *Colletotrichum dermatium,* seed rot/seedling blight caused by *Fusarium oxysporum* and *Fusarium solani* and stem rot caused by *Macrophomina phaseolina* (Fakir, 1982). Sowing of seeds from infected lots lead to poor stand and out-break of diseases in the field (Mathur *et al*., 1975).

Some times the quality of seeds as regards to seed health is influenced by the storage condition of seed. A suiable container with suitable storage condition can maintain the seed quality. Farmers store their seeds in different indigenous storage methods and containers which are not suitable for maintaining the quality of seeds. Therefore, selection of proper storage containers may minimize the infection of seed borne pathogens and retain the seed viability, germinability and vigor. The present experiment was undertaken to find out the suitable containers for preserving seeds and to observe the effect of storage time on the prevalence of fungi in different seed containers.

Materials and Methods

The experiment was carried out in the laboratory of Plant Pathology Department, Bangladesh Agricultural University, Mymensingh and in the farmer's house at the village Paglabazar in Mymensingh. Three kilogram seed of okra var. BARI-1 were collected from Nutun Bazar seed store, Mymensingh sadar upazilla. The seed samples were divided into two parts. One part was stored in the laboratory and another part in the farmer's house. The health status of the seeds was tested for three times at two months interval. Five types of storage containers and two coditions were considered as follows: A. Containers (i) Tin box (ii) Plastic jar (iii) Glass bottle (iv) Polythene bag (v) Cloth sac (cotton). B. Conditions: (i) Laboratory condition (ii) Farmer's condition

Preservation of seed samples: The selected containers were filled with seeds and closed with lids. The polythene bags and cloth sacs were tightend with thread properly and stored in the Plant Pthology Laboratory, BAU Mymensingh (Temp. $25+2^0$C) and in the farmer's house at Paglabazar. Initial moisture content of the seeds was 10-12%. 200-300g seeds were used per container to fill up the containers based on the size. The lids of the containers were placed firmly as far as possible to make it air tight. The containers were kept in the wooden almirah in both the conditions.

Seed health test: The health status of the seed sample was tested before Storing by Blotter incubation test (ISTA, 1996). Three layers of blotting paper (Whatman No. 1) were soaked in sterilized water and placed at the bottom of a 9 cm diameter plastic petridish. Twenty five seeds were placed on the moistened blotting paper petridish. Twenty five seeds were incubated at 25 ± 2^0c under 12 hours alternating cycles of Near Ultra Violet (NUV) light and darkness for 7 days. After incubation, the seeds were examined under stereo binocular microscope in order to record the incidence of different seed borne fungi. Temporary slides were prepared from the fungal colony and observed under compound microscope if necessary. Appropriate keys (Booth, 1971, Misra *et al*., 1994) were consulted for identification of the fungi. The results were presented as percent incidence for individual pathogen.

Germination test: Germinability of the grains was determined accordingly in the petridish. Germination was counted after 7 dahs and observations were made for (i) total seedlings (ii) normal seedlings and (iii) abnormal seedlings. The experiment was laid out in Randomized Cmoplete Block Design (RCBD). A standard computer

package statistical procedure (MSTAT) was followed to difference was also calculated and to know the rank of the mean, Duncan's Multiple Range Test (DMRT) was followed.

Results

Effect of storage durartion (two, four and six months) on germination and seed borne infection of fungi in seeds stored in different containers in laboratory condition

Effect on germinability: Mean germination of seeds stored in different storage containers after two months storage is presented in Table 1. Highest germination (68.00%) was observed in T_4 (Polythene bag) and lowest (54.00%) in T_5 (Cloth sac) While T_1 (Tin box), T_2 (Plastic jar), T_3 (Glass bottle) resulted 60.50% 57.00% and 59.00% respectively. In case of normal seedlings, highest (78.67%) was in T_4 and the lowest (68.50%) in T_5. Effect of storage containers on seed germination in laboratory condition after four month is presented in Table 2. Highest seed germination was recorded in T_4 (65.00%) and the lowest germination wsa found in T_5 (51.50). In case of normal seedlings highest (77.61%) was in T_4 and the lowest (60.00%) in T_5. Effect of storage containers on seed germination in laboratory condition after six month is presented in Table 3. The results showed that maximum germination was found in T_4 (62.50%) which was significantly different from all the treatments. The minimum germination was found in T_5 (39.50). The highest percentage of normal seedling was recoeded in seed stored in T_4 (76.00%). Seeds stored in T_5 produced the lowest (55.00%) percentage of normal seedlings Which was significantly lower than all other containers Table 3.

Table 1. Effect of different containers in laboratory condition (after two months of storage)

Treatments	% Seed germination	% Normal seedlings	% Prevalence of pathogens					
			Fusarium spp.	*Colletotrichum dermatium*	*Aspergillus flavus*	*Penicillium sp.*	*Curvularia lunata*	*Macrophomina phaseolina*
T_1	60.50b	74.38b	14.00d	3.00a (5.955)	10.00d	8.00d	5.50d	3.00b (8.747)
T_2	57.00c	73.68b	17.50b	3.00a (8.747)	13.00b	9.00b	6.50b	4.00a (11.54)
T_3	59.50b	73.10b	16.50c	2.50b (7.351)	11.00c	8.50c	6.00c	3.50b (10.144)
T_4	68.00a	78.67a	13.50d	2.50b (4.559)	6.50e	6.50e	4.50e	2.50c (5.955)
T_5	54.00b	68.50c	18.50a	3.50a (10.144)	13.50a	1063a	7.50a	5.00a (12.76)
LSD<0.05	1.538	1.679	0.9716	0.9783	0.2445	0.6094	0.541	2.022

Table 2. Effect of different containers in laboratory condition (after four months of storage)

Treatments	% Seed germination	% Normal seedlings	% Prevalence of pathogens					
			Fusarium spp.	*Colletotrichum dermatium*	*Aspergillus flavus*	*Penicillium sp.*	*Curvularia lunata*	*Macrophomin a phaseolina*
T_1	58.50b	71.79b	15.00b	2.00c (5.955)	11.00 c	8.50d	5.00d	3.00b (8.747)
T_2	55.00c	69.09b	19.50b	2.50b (7.37)	15.50a	11.00b	6.50b	4.00a (11.54)
T_3	55.00c	70.00b	17.00c	2.50b (7.37)	12.50b	9.50c	5.50c	3.50b (10.144)
T_4	65.00a	77.61a	14.50b	1.50c (4.559)	6.50b	5.50e	2.50e	2.00c (5.955)
T_5	51.50d	60.00c	22.50a	3.50a (10.144)	16.00a	12.50a	7.00a	4.50a (12.15)
LSD<0.05	2.402	3.627	1.192	1.413	1.396	0.7133	0.3503	2.461

Table 3. Effect of different containers in laboratory condition (after six months of storage)

Treatments	% Seed germination	% Normal seedlings	% Prevalence of pathogens					
			Fusarium spp.	*Colletotrichum dermatium*	*Aspergillus flavus*	*Penicillium sp.*	*Curvularia lunata*	*Macrophomina phaseolina*
T_1	54.00b	67.59b	22.00c	1.50c (4.559)	12.00d	9.00b	4.00c	2.50a (7.726)
T_2	53.00b	66.00b	22.50c	2.50ab (7.951)	15.50b	12.50a	5.00b	3.00a (8.747)
T_3	53.00b	66.98b	25.00b	2.00bc(5.955)	13.50c	12.00a	4.00c	2.50am (8.50)
T_4	62.50a	7600a	19.00b	1.50c (4.559)	10.50e	8.50b	4.00c	1.50b (4.559)
T_5	39.50c	55.00c	27.50a	3.00a (8.747)	20.50a	1300a	6.00a	3.50a (10.144)
LSD<0.05	1.095	2.088	0.9716	1.835	1.272	0.9946	0.1943	2.437

Figures in the parentheses are Arc sine transformed value, Column having similar letter(s) do not differ significantly at 1% level of significance, T_1 = Tin box, T_2 = Plastic Jar, T_3 = Glass bottle, T_4 = Polythene bag and T_5= Cloth sac

Effect on the prevalence of different fungi stored in different containers: The Prevalence of *Fusarium* spp. was recorded 14.00% (T_1), 17.50% (T_2), 16.50% (T_3), 13.50% (T_4) and 18.50% (T_5). Highest percent prevalence was in T_5 (18.50)% and the lowest in T_4 (13.50%). *Colletotrichum dermatium* was highest (3.50%) in T_5 and lowest (2.50%) in T_4 Which was similar to T_3 (2.50). In case of *Aspergillus flavus* the highest (13.50%) incidence was recorded in T_5 and the lowest (6.50) in T_4. The highest incidence of *Penicillum* sp. was found in T_5 (10.63%) which was significantly different from the other containers. The lowest incidence of this pathogen was found in T_4 (6.50%). Incidience of *Curvularia lunata* was highest in T_5 (7.50%) and the lowest was in T_4 (4.50%). Maximum and significantly different incidence of *Macrophomina phaseolina* was recorded in T_5 (5.00%). The lowest was found in T_4 (2.50%). The percent prevalence of different associated fungi is presented in Table 2. The highest prevalence of *Fusarium* spp. was in T_5(22.50%) and the lowest in T_4 (14.50%). The incidence of *Colletotrichum dermatium* was highest (3.50%) in T_5 and lowest (1.50%) in T_4. In case of *Aspergillus flavus* the highest (16.00%) incidence in T_5 which was sugnificantly different from T_1 (11.00%), T_3 (12.50) and T_4 (6.50) but statistically similar to T_2 (15.50%). The lowest (6.50) and prevalence in T_4 which was statistically different from other treatments. The highest incidence of *Penicillium* sp. was found in T_5 (12.50%) which was significantly

different from the other containers. The lowest incidence of this pathogen was found in T_4(5.50%) which was significantly lower than T_1 (8.50%), T_2 (11.00%) and T_3 (9.50%). Incidence of *Curvularia lunata* was highest in T_5 (7.00%) and the lowest in T_4 (2.50%). The highest incidence of *Macrophomina phaseolina* was found in T_5 (4.50%) but significantly different from T_1 (3.00%) and T_4 (2.00%). The lowest incidence of this pathogen was found in T_4 (2.00%) Table 2. The highest pervalence of associated fungi which was observed in laboratory condition after six months is persented in Table 3. The highest prevalencr of *Fusarium* spp. was in T_5 (27.50%) and the lowest in T_4 (19.00%) which was different from T_1 (22.00%), T_2 (22.50%) and T_3 (25.00%).The incidence of *Colletotrichum dermatium* was maximim in T_5 (3.00%) which was statistically different from others. Lowest incidence was recorded in T_4(1.50%). In case of *Aspergillus flavus* the highest (20.50%) incidence recorded in T_5 which was significantly
different from T_1 (12.00%), T_2 (15.50%), T_3 (13.50) and T_4 (10.50%). The lowest incidence of this pathogen was found in T_4 (10.50%). The highest incidence of *Penicillium sp.* was found in T_5 (13.00%) which was significantly different from T_1 (9.00%) and T_4 (8.50%) but statistically similar to T_2 (12.50%) and T_3 (12.00%). The lowest incidence of this pathogen was found in T_4 (8.50%). Incidence of *Curvularia lunata* was highest in T_5 (6.00%) which was significantly different from other treatments. The lowest incidence of this pathogen was observed in T_4 (4.00%) which was significantly different from T_2 (5.00%) and T_5 (6.00%) but statistically similar to T_1 (4.00%) and T_3 (4.00%).The highest incidence of *Macrophomina phaseolina* was found in T_5 (3.50%) which differed significantly with T_4 (1.50%) but statistically similar to T_1 (2.50%), T_2 (3.00%) and T_3 (2.50%). The lowest incidence of this pathogen was found in T_4 (1.50%) (Table 2).

Effect of storage durartion (Two, Four and Six months) on germination and seed borne infection of fungi in seeds stored in different containers in farmer's condition

Effect on seed germinability: Effect of storage containers on seed germination on farmer's condition is persented in Table 4. There were significant differences among the containers. The highest germination was recorded in T_4 (60.50%) which was significantly different from T_1 (57.50), T_2 (55.50%). The lowest germination was recorded in T_5 (51.50%). The highest normal seedlings produced in T_4 (75.20%) and the lowest (60.96%) normal seedlings were produced in T_5.

Table 4. Effect of different containers in farmer's comdition (after two months of storage)

Treatments	% Seed germination	% Normal seedlings	% Prevalence of pathogens					
			Fusarium spp.	*Colletotrichum dermatium*	*Aspergillus flavus*	*Penicillium sp.*	*Curvularia lunata*	*Macrophomina phaseolina*
T_1	57.50b	70.43b	20.50c	3.00b (8.747)	11.00d	8.50c	6.50b	3.50b (10.144)
T_2	55.50b	6936b	22.50b	3.50ab (10.144)	16.00b	10.00b	7.00b	7.50a (15.556)
T_3	57.00b	70.17b	22.00b	3.00b (8.747)	12.50c	9.50b	6.00c	6.00a (13.99)
T_4	6050a	75.20a	1950c	2.00c (5.955)	6.50e	8.00c	5.00d	3.50b (10.14)
T_5	5150c	60.96c	24.50a	4.50a (12.15)	17.50a	13.50a	8.00a	8.50a (16.78)
LSD<0.05	2.748	1.757	1.296	2.157	0.9241	0.6363	0.7644	2.778

Table 5. Effect of different containers in farmer's condition (after four months of storage)

Treatments	% Seed germination	% Normal seedlings	% Prevalence of pathogens					
			Fusarium spp.	*Colletotrichum dermatium*	*Aspergillus flavus*	*Penicillium sp.*	*Curvularia lunata*	*Macrophomina phaseolina*
T_1	56.50b	66.37b	19.00b	3.00b (8.747)	13.50c	8.50b	5.00b	3.50bc (10.14)
T_2	54.00b	65.00b	22.50b	3.00b (8.747)	17.50b	1250a	6.50b	5.50a (13.24)
T_3	55.00b	67.27b	21.50c	2.50b (7.37)	16.50b	12.00a	5.50c	5.00ab (12.76)
T_4	58.50a	74.35a	19.00b	2.00c (5.95)	12.50c	8.50b	5.00b	3.00c (8.747)
T_5	50.00c	55.00c	23.50a	4.00a (11.54)	20.50a	13.00a	7.50a	7.50a (15.56)
LSD<0.05	3.611	2.19	0.88828	2.454	1.407	1.009	0.2729	2.713

Table 6. Effect of different containers in farmer's condition (after six months of storage)

Treatments	% Seed germination	% Normal seedlings	% Prevalence of pathogens					
			Fusarium spp.	*Colletotrichum dermatium*	*Aspergillus flavus*	*Penicillium sp.*	*Curvularia lunata*	*Macrophomina phaseolina*
T_1	52.50b	63.80b	24.00b	2.00bc (5.955)	13.50b	12.00b	5.00f	2.50a (7.726)
T_2	50.00b	61.00c	30.00a	3.00a (8.747)	18.00b	17.00b	6.00b	3.00a (8.747)
T_3	51.50b	62.13c	29.00a	2.50ab(7.351)	16.50c	15.50c	5.50c	2.50am (8.50)
T_4	55.00a	72.72a	20.00c	1.50c (4.559)	13.50e	9.50e	4.50e	1.50b (4.559)
T_5	37.00c	50.40d	31.00a	3.00a (8.747)	21.50a	19.00a	6.50a	3.50a (10.144)
LSD<0.05	2.393	1.624	2.081	2.248	1.236	0.659	3.777	2.437

Figures in the parentheses are Arc sine transformed value, Column having similar letter(s) do not differ significantly at 1% level of significance, T_1 = Tin box, T_2 = Plastic Jar, T_3 = Glass bottle, T_4 = Polythene bag and T_5= Cloth sac

Effect of storage containers on seed germination in farmer's condition is persented in Table 5. Result showed that there were significant differences among the containers. The highest germination was recorded in T_4 (58.50%) and the lowest germination was recorded in T_5(50.00%) which was significantly lower than than other containers. The percentage of normal seedlings was highest in T_4 (74.35%) and normal seedlings were lowest in T_5 (55.00%). The effect of storage containers on seed germination in farmer's condition after six months is presented in Table 6. There were significant differences among the containers. The highest germination was

recorded in the seeds stored in T_4 (55.00%) and the lowest germination was recorded in T_5 (37.00%) which was significantly lower than other treatments. In case of normal seedlings maximum percentage was observed with T_4 (72.72%) which was significantly different from T_1 (63.80%), T_2 (61.00%), T_3 (62.13%) and T_5 (50.40%). The normal seedlings lower than other containers (Table 6).

Effect on The prevalence of different fungi: prevalence of fungi recorded on seeds stored in farmer's condition is presented in Table 4. Several fungal species viz. *Fusarium spp, Colletotrichum, Aspergillus, Penicillum, Macrophomina* and *Curvularia* were observed. Incidencr of *Fusarium* spp. was highest in T_5(24.50%) and lowest in T_4 (19.50%). The highest incidence of *Colletotrichum dermatium* was found in T_5 (4.50%) and the lowest incidence was observed in T_4 (2.00%) . Incidence of *Aspergillus flavus* was highest in T_5 (17.50%) and the lowest incidence of this pathogen was found in T_4 (6.50%) and the highest prevalence of *Penicullium* spp. was found in T_5 (13.50%) compared to other containers. The lowest incidence of this pathogen was found in T_4 (8.00%). The prevalence of *Macrophomina phaseolina* was highest in T_5 (8.50%) which was statisticllly similar to T_2 (7.50%), and T_3 (6.00) but differed significantly with T_1 (3.50%) and T_4 (3.50%) which was the lowest incidince. Incidence of *Curvularia lunata* was highest in T_5 (8.00%) and lowest in T_4 (5.00%).

Prevalence of fungi on seeds stored in farmer's condition is presented in Table 5. The incidence of *Fusarium* spp. was highest in T_5 (23.50%) and the lowest incidence of this Pathogen was in T_4 (19.00%). In case of *Colletotrichum dermatium,* Statistically maximum prevalence was found in T_5 (4.00%) and the minimum incidence was observed in T4(2.00%). *Aspergillus flavus* was highest in T_5 (20.50%) and the lowest incidence of this pathogen was found in T_4 (12.50%) which was significantly diffefent from other containers.The highest incidence of *Penicillum* sp. was found in T_5 (13.00%) and the lowest incidence of this pathogen was recorded in T_4 (8.50%). Incidence of *Curvalaria lunata* was highest in T_5 (7.50%) which was significantly different from all other treatments. The lowest was in T_4 (5.00%) which was similar to T_1 (5.00%). The pervalence of *Macrophonina phaseolina* was highest in T_5 (7.50%) and the lowest incidence was found in T_4 (3.00%) which was statistically similar to T_1 (3.50%) and significantly different from Other treantments.

The prevalence of different fungi on seeds stored in farmer's condition is persented in Table 6. The incidence of Fusarium spp. was highest in T_5 (31.00%) which was significantly different from T_1 (30.00%) and T_3 (29.00%). The lowest incidence of this pathogen was in T_4(20.00%). In case of Colletorichum dematium, maximum prevalence was found in T5(3.00%) which was significantly different from T_1 (2.00%) and T_4 (1.50%) but statistically similar to T_2 (3.00%) and T_3 (2.00%). The minimum incidence was observed in T_4 (1.50%) which was significantly different from other treatments. *Aspergillus flavus* was highest in T_5 (21.50%) and the lowest incidence of this pathogen was found in T4 (13.50%) which was significantly different from T_2 (18.00%), T_3 (16.50%) and T_5 (21.50%) but statistically similar to T_1 (13.50%). The highest incidence of *Penicillium* sp. was found in T_5 (19.00%) and the lowest incidence of this pathogen was result in T_4 (9.50%). Incidence of *Curvularia lunata* was highest in T_5 (6.50%) and the lowest incidence was in T_4 (4.50%). The prevalence of *Macrophomina phaseolina* was highest in T_5 (3.50%) which was statistically similar to T_1 (3.00%), T_2 (3.50%) and T_3 (3.00%) but significantly different from T_4 (2.00%). The lowest incidence was found in T_4 (2.00%).

Discussion

Results from the present experiment revealed that the occorrence of fungal flora is influenced bu seed containers, storage duration and storage condition. The incidence of occurrence of different fungi increased gradually with the time almost in all the containers. Increasing rate was different for different containers: This increasing rate was highest for T_5 (Cloth sac) and lowest in case of T_4 (Polythene bag). The performances of other treatments were almost similar. The highest germination was found in T_4 in both the conditions for all three durations which was significantly different from other treatments. The germination rate of T_4 was decreasing over the period but this decreasing rate was less than the other treatments. The highest decreasing rate was observed in T_5. The lowest germination was found in T_5 Which was signigicantly different from all other treatments. Significantly higher germination of seeds from T_4 (Polythene bag) container indicates that the viability of the seeds in This container rmains thgher. The lower moisture content of seeds stored in polythene bag probably help to maintain the seed quality during the storage period. Polythene bag was more impermeable than cloth sac (T_5) and that might help to drvelop increased seed moisture in cloth sac.

It was observed that there was significant difference in normal seedlings produced in different containers and conditions. In case of containers, the highest percentage of normal seedlings was produced in T4 and lowest in T_5. Regarding different conditions, better performance was found in laboratory than farmer's condition. Normal seedlings produced in different storage durations were observed and the result was hound that the storage duration had the decreasig rate of influence on production of normal seedlings in both the conditions for all the containers. With the increase in storage duration, prcentage of normal seedlings decreased and that of abnormal seeding s and dead seeds increased indicating the loss in seed viability. From the present study several fungi were redoeded on okra seeds. These fungi species were Aspergillus flavus , Fusarium spp. *Colletotrichum dimatium, Penicillium sp. Macrophomina phaseolina, Curvularia lunata.* Under this study *Fusarium spp.* was found to be the most predominant fungi in okra seeds which constituted 13.50% to 27.50% in laboratory condition and 19.50% to 31.00% in farmer's condition of infected seed sample of different containers. Next to *Fusarium spp*., *Aspergillus flavus* constituted 6.50% to 20.50% and 6.50% to 21.50% of infection under laboratory and farmer's condition respectively.

Regarding overall performance of laboratory and farmer's conditions, better performance was found in laboratory for all the containers, on the other hand T_4 was the best for all aspect of health status after storange. Highest germination and percent normal seddlings were also observed in T_4 for both the conditions while T_5 showed least effective performance. The incidence of storage fungi increased in laboratory as well as in farmer's condition for all the containers and this increasing rate was highest in T_5 and lowest in T_4. The field fungi were decreased in both the conditions and the decreasing rate was minimum in T_5 and maximum in T_4.

From the results it was found that the laboratory condition was better than farmer's house. The reasoms behind this may be the presence of high humidity in the later condition because their house was not brick built and the floor was not made in concrete. So, this condition cannot prevent the raising of humidity. Thus, it may be recommended to conserve the okra seeds in the laboratory conditions i.e. humidity prevented condition in polythene bag and it must be airtight. However, further research will be needed for meaningful conclusion.

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