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EFFECT OF ADDITIVES ON THE QUALITY OF STORED TRUE SEEDS OF ONION

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ABSTRACT

Onion (*Allium cepa* L.) is an important spice crop propagated by bulbs which are produced from true seeds. True seed production of onion is a very highly technical approach. Technical information on different aspects of production of true seeds of onion is very limited in Bangladesh. Germination failure due to improper storage of true seeds of onion is one of the problems for the farmers to produce true seeds of onion. The experiment was laid out in a completely randomized design with four replications to select suitable additives for storage of true seeds of onion. Six treatments viz. A_0= No additive, A_1= Silica gel, A_2= Neem leaf crush, A_3= Dry ash, A_4= Chalk powder and A_5= Mahogani fruit crush were consisted to achieve the objective. The experiment was conducted at On-Farm Research Division, Agricultural Research Station, BARI, Bogra during 2012-2013. The results revealed that the percentage of germination, moisture content of seed and prevalence of seed borne fungi were significantly influenced by the different treatments. Results showed that among different treatments, silica gel as additive was the best combination for retaining quality of onion seeds upto 6-7 months in the storage.

KEYWORD: Additive, quality, storage, true seeds, onion.

INTRODUCTION

Onion has great economic importance due to its medicinal and dietetic values. It is widely used as condiment, salad and dressing of food. The average consumption of onion in Bangladesh is 25 g/head/day (BBS, 2010). It is grown in almost all the districts of Bangladesh; its commercial cultivation is concentrated in Faridpur, Dhaka, Rajshahi, Comilla, Mymensingh, Jessore, Rangpur and Pabna (BBS, 2010). Onion is grown in about 128745 ha of land. The annual production is 894,000 tons of onion bulbs (BBS, 2010). The demands of quality true seeds are increasing day by day. The price of true seeds is also high. The seeds available in the market are poor in quality. The total production of onion seed in Bangladesh is about 150 tons/year but the requirement is more than 900 tons (BBS, 2010). True seeds of onion are hygroscopic in nature. It can absorb moisture from air at high relative humidity and its moisture content become equilibrium to the air moisture. High moisture content of seeds encourage respiration causing raise in heat which favour storage moulds and storage pests to multiply quickly resulting deterioration of quality of stored true seeds of onion (Sharma *et al*. 2002). Seed stored under poor storage conditions are prone to invasion by storage fungi and infestation by storage pests. Germination failure due to improper storage of true seeds of onion is major problem for the farmers to produce true seeds of onion. Additives like ash and chalk powder are used to prevent absorption of moisture from air by the seeds. Repellants like neem (*Azadirachta indica*) and other botanics are used to avoid insect infestation and fungal attack (Rahman, 2004). Keeping all the above mentioned facts in view, the present study was undertaken to select suitable additive for storage of true seeds of onion.

MATERIALS AND METHODS

The experiment was conducted at On-Farm Research Division, Agricultural Research Station, BARI, Bogra during 2012-2013. The experiment was laid out in a completely randomized design (CRD) with four replications. True seed of BARI-piaj-1 were used as test material. Five types of additives were used in this study. The treatments were such as A_0= No additive, A_1= Silica gel, A_2= Neem leaf crush, A_3= Dry ash, A_4= Chalk powder and A_5= Mahogani fruit crush. Data on Purity analysis, % germination and % seed borne fungi were recorded and analyzed statistically following Duncans Multiple Range Rest (DMRT).

Seed sampling

Seed samples were taken at random at 30 days interval starting from storage for germination and seed health test. Testing were continued upto 6 months of seed storage.

Additive placement

Five types of additives viz. silica gel, neem leaf crush, dry ash, chalk powder and mahogani fruit crush were used. Each additive was used in each separate container. Silica gel was used @ 2 packet/ kg seed and directly placed on the top of seed in the container. In case of other four additives viz. neem leaf crush, dry ash, chalk powder and mahogani fruit crush, first a sheet of the news paper was put over the onion seeds in each container and 1″ layer of each additives was placed on the news paper. Then the seeds were stored for 180 days.

Purity analysis

The purity analysis of seed samples were conducted following International Roles for Seed Testing (ISTA, 1996). Each sample was mixed and divided by seed divider. In each case 5 g working sample was taken. The working sample was separated into three components viz. pure seed, other seed and inert matter and the percentage of each component was calculated by weight basis.

Seed germination

Germination test was carried out in a plastic tray at the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh according to the International Rules for Seed Testing (ISTA, 1996). Sand was used as substrate for germination test. The plastic tray was filled with moist sand. Adequate moisture was maintained in the substrate. Four hundred pure seeds were taken at random from each treatment (sample). One hundred seeds were placed in each tray and were considered as a replication. There were four replications for each treatment. Number of normal seedlings, abnormal seedlings, dead seeds and ungerminated seeds were counted. The first counting was done on the 6^{th} and the second counting on the 12^{th} day after placing the seeds on the substrate. Germination percentage was determined by the following formula.

$$\text{Germination (\%)} = \frac{\text{Number of normal seedlings}}{\text{Number of seeds tested}} \times 100$$

Seed borne infection

Seed samples from each treatment were subjected to seed health test by Blotter incubation method following the procedure of International Rules for Seed Testing (ISTA, 1996). Three pieces of 9 cm diameter filter papers (Whatman No. 1) were soaked in distilled water and placed at the bottom of a plastic Petri dish. Four hundred seeds were taken at random from

each treatment. Twenty five seeds (25) were placed on filter paper in each petri dish. Sixteen petri-dishes were used for each treatment. The petri-dishes were incubated for 7 days. Seed borne infection was recorded. Temporary slides were prepared and examined under the compound electric microscope and identified with the help of appropriate keys. The numbers of infected seeds with fungal pathogen were recorded. The results were expressed in percentage as follows:

$$\text{Seed borne infection (\%)} = \frac{\text{Number of infected seeds}}{\text{Number of seeds tested}} \times 100$$

RESULTS AND DISCUSSION

The effect of additives on germination of onion seeds are presented in Table 1. The initial seed germination was 81% which decreased to 77% at 30 DAS when no additive was used. Germination was 80% in case of silica gel and neem leaf crush but it was 79% in mahogani fruit crush, 78% in case of dry ash and chalk powder. Seed germination was 79% in silica gel at 60 DAS but it was 78% in case of neem leaf crush and mahogani fruit crush. The germination was 78% in silica gel, 75% in case of neem leaf crush and mahogani fruit crush at 90 DAS where as 73% in chalk powder, 72% in dry ash and 70% when no additive was used. At 120 DAS, germination was 76% in silica gel, 73% in case of neem leaf crush and mahogani fruit crush, 71% in chalk powder, 70% in dry ash, where as 68% in case of no additive was used. Similar trend was observed at 150 DAS among the treatments. Finally, germination tests were done at 180 DAS. The germination was 68% in silica gel. It was 67% in neem leaf crush and 66% in mahogani fruit crush. But the germination was 57% in chalk powder, 56% in dry ash. The seeds stored without additives had the lowest germination (55%). This findings is in agreement with Rao *et al*. (2006) who noted that seeds packed in aluminum-laminated pouches beside those stored with silica gel maintained satisfactory germinability after 12 months. Similar observation by Rahman (2004) who reported that among the four storage containers, the best choice should be given to plastic drum. But neem leaf crush and chalk powder was also good additives for storing of onion seeds.

Table: 1. Effect of additives on the germination of true seeds of onion at different period of storage

Treatment	Germination (%)						
	Initial	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS
No additive	81	77 b	75 c	70 d	68 d	63 d	55 d
Silica gel	81	80 a	79 a	78 a	76 a	74 a	68 a

Neem leaf crush	81	80 a	78 ab	75 b	73 b	73 a	67 b
Dry ash	81	78 b	77 bc	72 c	70 c	64 cd	56 c
Chalk powder	81	78 b	77 bc	73 c	71 c	65 c	57 c
Mahogani fruit crush	81	79 a	78 ab	75 b	73 b	72 b	66 b
LSD $_{(0.05)}$	NS	0.98	1.86	1.19	1.25	1.07	1.14
CV (%)	5.21	4.23	5.36	5.58	5.70	5.54	5.82

Means followed by the same letter in a column did not differ significantly at 5% level by DMRT. NS= Not significant. DAS= Days after storage.

The effect of different types of additives on prevalence (%) of seed borne fungi of stored onion seeds are presented in Table 2. The fungus populations varied significantly among the different types of additives. There was no significant variation among the treatment in initial stage. The fungus population increased with the increase in storage period. The fungi population was 3.25% in silica gel and neem leaf crush, 3.75% in mahogani fruit crush, 4.50% in dry ash and chalk powder, 4.75% in without any additive at 30 DAS. The lower fungi (3.88%) population was recorded in silica gel at 60 DAS. It was 4.25% in neem leaf crush and mahogani fruit crush. But the higher population of fungi was 6.25% in without any additive followed by 5.00% in dry ash and chalk powder at 60 DAS. Similar sequence was observed at 90, 120, 150 and 180 DAS among the treatments. Final test of fungi population were done at 180 DAS. The lower population of fungi was 4.88% when the seeds stored with silica gel followed by 5.13% in neem leaf crush and 5.38% in mahogani fruit crush at 180 DAS. The higher population of fungi was 7.63% in seed samples which were stored without any additive. It was 7.38% in dry ash and 7.25% in chalk powder at 180 DAS. Rahman (2004) reported that neem and other botanics are used to reduce the fungal infection and avoid to insect infestation. The report of Karim *et al.* (2006) is in close agreement with findings of the study.

Table: 2. Effect of additives on prevalence (%) of seed borne fungi of stored true seeds of onion at different period of storage

Treatment	Prevalence of seed borne fungi (%)						
	Initial	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS
No additive	3.25	4.75 a	6.25 a	6.25 a	6.63 a	7.00 a	7.63 a
Silica gel	3.00	3.25 c	3.88 c	4.25 c	4.50 c	4.63 b	4.88 b
Neem leaf crush	3.00	3.25 c	4.25 c	4.50 c	4.88 c	5.00 b	5.13 b
Dry ash	3.25	4.50 a	5.00 b	5.63 ab	6.00 b	6.75 a	7.38 a
Chalk powder	3.25	4.50 a	5.00 b	5.50 b	5.88 b	6.50 a	7.25 a
Mahogani fruit crush	3.00	3.75 b	4.25 c	4.75 c	4.88 c	4.75 b	5.38 b
LSD $_{(0.05)}$	NS	0.37	0.43	0.67	0.51	0.54	0.72
CV (%)	12.82	9.06	8.83	12.89	9.16	9.14	11.28

Means followed by the same letter in a column did not differed significantly at 5% level by DMRT. DAS= Days after storage. NS= Not significant.

CONCLUSION

Based on the results of the experiment, silica gel as additive was the best combination for retaining quality of onion seeds upto 6-7 months in the storage.

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