



PRESENT STATUS OF ONION BULB AND SEED PRODUCTION IN KHULNA REGION AND EFFECT OF CONTAINERS ON STORABILITY OF ONION SEEDS

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Abstract: A survey was done to collect information on present status of onion bulb and seed production and the status of onion seed market in Khulna region and studies were conducted on the effect of different seed containers on storability of onion bulbs and seeds. The survey was conducted at three upazillas of Khulna district viz. Batiaghata, Dumuria and Paikgacha. From land preparation to harvesting, the operations performed by the farmers following orthodox way of cultivation. They use locally produced seeds collected from different sources, irrigate onion field when they feel necessary, use fertilizers containing macro nutrients solely and do not follow any pest control measure. Only 7.5% traders sell solely onion seeds and rest of the traders sell different spice seeds along with the onion seeds. The traders usually do not use any chemicals to preserve the seeds and they prefer naphthalene to other chemicals in this purpose. Kalashnagari was found best among the three varieties in respect of germination percentage (49.33%) and length of the seedlings (5.428 cm). Despite of polythene bags, tin container showed better performance in storing of onion seeds by showing more germination capacity of seeds (43.82%), comparatively less infection by fungus (14.04%), less number of abnormal seedlings (11.24%) and good length of germinated seedlings (4.96 cm). Minimum weight loss (18.53%), maximum regeneration (89.37%) and maximum length of shoots (18.75 cm) was obtained from the bulbs stored in enclosed chamber in polythene bags, gunny bags and polythene bags respectively.

Key words: Onion, status, bulb, seed, storage

Introduction

The onion (*Allium cepa* L.) is by far the most important of the bulb crops and is one of the important spices as well as vegetable crops. It is grown for consumption in the green stage and as mature bulbs. Onion contains 86.8% water, 1.2% protein, 0.1% fat, 11.6% carbohydrate, 0.18% calcium, 0.05% phosphorus, 0.9% iron, 0.4% minerals and vitamin B and slight vitamin C are found (Kabir, 1994). Onion is an important crop in all continents with world production of about 25 million tones and is commercially cultivated in a little over hundred countries of the world. Of the 15 vegetable crops listed by FAO (Anon, 1973), onion ranks second after tomato in terms of annual world production.

The major part of onion production in Bangladesh is from seed; either sown directly or grown as a transplanted crop (Rahim and Siddique, 1991). The seed available in market is very poor in quality, in respect of germination, vigor and varietal purity. In addition, some times a scarcity of seed severely decreases the production of onion. Scarcity arises mainly due to climatic limitations, which present a major problem for onion seed production in Bangladesh. Onion is biennial crop for the purpose of seed production. In one season bulbs are produced from seed and in the second season bulbs are replanted to produce seed. Onion seeds are poor in keeping quality and lose viability within a year. Therefore, it is essential to produce seeds freshly and use the same for bulb

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production (Bose *et al.*, 1986). Onion seeds are mainly produced in Bangladesh in particular areas of Faridpur, Natore and Rajshahi districts (Rahim and Siddique, 1991). Khulna is one of the districts situated in the coastal and saline zone of Bangladesh, where the total cultivable land area is 1,48,891 ha including different land types having a major portion of high land and medium high land (about 1,34,128 ha.) (Karim *et al.*, 1990) which have potentiality of growing crops including onion. The Khulna region is affected by varying levels of salinity and there is no complete report on the production of onion bulb and seed in this region as well as other salinity affected regions.

In Bangladesh, onion bulbs are harvested over a short season. The bulbs are stored by the farmers under room conditions. The prevailing high temperature restricts the storage life of onion bulbs. In our country yet we have no definite techniques for the storage of onion bulbs. Our farmers traditionally store onion bulbs using gunny bag, earthen pot, bamboo box etc. after a little bit of sun drying the harvested onion bulbs. As a result, a huge amount of onion bulbs become damaged every year. Onion seed production problem is also an extremely serious one in Bangladesh. Sometimes a scarcity of seed severely decreases the production of onion. The seed growers of our country do not follow any standard method regarding storage of the onion seeds (Rahim, 1991).

None of the research, extension and field service organizations of Bangladesh have looked at the production and storage of onion bulbs and seeds in detail yet. There seems to be no reason why onion seed is only produced in some pockets of Faridpur, Rajshahi and Natore and not in other northern or southern parts of Bangladesh. Department of Agricultural Extension and other organizations related to agriculture can provide with very few information on onion production in Khulna region. So, to get detailed information on present status of the onion production in Khulna region, a survey work was conducted. In this regard three important upazillas – Paikgacha, Dumuria and Batiaghata were selected as the study area. The status of onion seed trading, effect of different containers on the storage of onion bulbs and seeds were also observed. The objectives of the study were assessing the present status of the farmers, their involvement with onion production and the cultural practices followed by them for onion seed production in the study area; observing the present status of onion bulb and seed supply in the markets in Khulna region; exploring the existing problems and their possible solutions for better marketing of onion seeds; observing the storage performance of onion bulbs and seeds stored in different containers under different storage conditions.

Materials and Methods

The survey on the present status of onion growers, cultural practices done by them and the existing problems in growing onion in Khulna region was conducted with randomly selected 200 farm families from 3 upazillas viz. Dumuria, Batiaghata and Paikgacha of Khulna district, Bangladesh. Pre-tested interview schedule was used in the study which contained both simple and direct form of question to collect data on the selected variables. The independent variables considered in the study were age, education, farm size, family size, annual gross income, annual net income, relation with different organizations, cosmopolitaness, agricultural experience and agricultural knowledge and dependent variables are cultural practices for onion growing, involvement of the farmers with onion cultivation, problem confrontation and solution of existing problems. The collected data was coded, tabulated in a data-sheet and analyzed statistically.

To Study the trend of onion seed trade a survey was conducted with 80 seed traders selected by stratified sampling technique at different markets of Nirala, Daulatpur, Barobazar and Rupsha of Khulna district and Sadar thana of Narail district. Data was collected on the types of seed sold and relevant matters. Problems on onion seed market and their possible solutions were also found out.

To observe the effect of different containers and storage conditions on storability of onion bulbs of Taherpuri Variety was taken as plant material and Gunny bag (C₁), Polylined gunny bag (C₂), Cloth bag (C₃), Paper box (C₄), Polythene bag (C₅) and open floor (C₆) were the selected containers. The bulbs were stored in enclosed chamber (S₁) and open condition (S₂). The experiment was laid out in Completely Randomized Design (CRD) with twelve treatments and each of them was replicated in three times. In every two alternate days the parameters were observed as weight loss, rotting, percentage of germination and length of the germinated shoot of the stored onion bulbs.

The effect of storage containers on storability of onion seeds was observed with the seeds of three onion varieties viz. Faridpuri Bhati, Kalashnagari and Taherpuri. Seven types of storage containers (Cloth bag, Polylined cloth bag, Gunny bag, Polylined gunny bag, Plastic container, Tin container, and Polyethylene bag) were used here. The experiment was laid out in Completely Randomized Design (CRD) with three replications. After one months of storage, only 300 seeds from each storage containers were taken in petridishes using blotting paper as substrate. At the tenth day of setting up the experiment, data were recorded on percentage of germination, length (root + shoot) of a seedling (cm), percentage of fungus affected seedlings and percentage of abnormal seedlings. The experiment repeated every one month interval and continued up to a satisfactory result. The result obtained from the study was statistically analyzed by ‘F’ test and the significance of differences between pairs of means was evaluated by Duncans’ Multiple Range Test (DMRT).

Results

Involvement of the farmers with onion cultivation: The status of farmers’ involvement with onion cultivation in respect of their personal characteristics has been shown in Table 1. The farmers of 20-30 years of age having above secondary level of education, holding a family of 5-8 members with a marginal size of farm (0.5 to 1.5 ha) were more involved with onion cultivation. The onion growers’ annual gross income ranges from 50,000 Tk. to 75,000 Tk and net income was less than 10,000 Tk. The onion growers are not related with different organizations, however they were cosmopolite and most of them have less than 10 years of agricultural experience with moderate knowledge of agriculture. Most of the onion growers were slight problem confronting group.

Table1. Major groups involved with onion cultivation in relation to the characters of the farmers under study

Selected characters	Major group involved with onion cultivation				Total (% of the total involved farmers)
	Small scale production	Only bulb production	Only seed production	Both bulb and seed production	
Age	20-30 years				24 (18.96%)
	10	11	2	1	
Education	Above secondary education				25 (19.75%)
	10	10	4	1	
Family Size	5 to 8 members				39 (30.81%)
	24	11	4	0	
Farm size	Marginal (0.5-1.5 ha.)				31 (24.49%)
	18	7	5	1	
Ann. gross income	Tk. 50000-75000				32 (25.28%)
	17	11	3	1	
Annual net income	Less than Tk. 10000				43 (33.97%)
	22	17	4	0	
Relationship with different organizations	No relationship				33 (26.07%)
	21	10	2	0	
Cosmopoliteness	Cosmopolite				39 (30.81%)
	23	12	3	1	

Agricultural Experience	Less than 10 years				26 (20.54%)
	15	8	2	1	
Agricultural knowledge	Moderate Knowledge (Score 25-50)				50 (39.50%)
	31	13	5	1	
problems confrontation	Slight problem confronting group				39 (30.81%)
	17	17	5	0	

Cultural practices done for onion production: Most of the onion growers (59.5%) use organic and macronutrient containing fertilizers, 20.3% farmers use combined fertilizers i.e. organic, macro & micro nutrient containing fertilizers (Table 2). Among the 79 farmers no one use micro nutrient containing fertilizers or the combination of organic & micro nutrient containing fertilizers and 6.3% farmers do not use any fertilizer. Among the farmers 26.6% onion growers use no irrigation and 40.5% of the growers give irrigation twice to cultivate onion. Only 8.9% of the farmers apply irrigation for more than two times during the cultivation period. The farmers mentioned the name of three insects that usually attack the onion plants but most of the farmers (93.67%) do not follow any control measure. A small number (6.33%) of the farmers apply some insecticide but they do not know what they are applying or what its prescribed rate of application is. Four diseases were mentioned by the onion growers those hamper the onion production namely white-tip, yellow dwarf (locally named virus disease), bulb rot and stem rot. The most common disease that affects onion field in the study area was bulb rot and stem rot mentioned by 23.29% and 11.39% farmers respectively. No one uses any control measure or applies any pesticide due to ignorance about the use of pesticides to control the diseases.

Table 2. Cultural practices done for onion production

Practices	Category of practices	Respondents					
		No. of farmers	Users % respondents	Non Users No. of farmers			
Fertilizer Application	i. Macro (N,P, K, S)	7	8.9	5			
	ii. Micro (Zn, Ca)	0	0				
	iii. Organic Manure	4	5.1				
	iv. Macro & organic	47	59.5				
	v. Micro & organic	0	0				
	vi. Combined	16	20.3				
		Frequency	No. of farmers	Percentage			
Irrigation	No irrigation		21	26.6			
	Once		19	24.1			
	Twice		32	40.5			
	Many times		7	8.9			
Controlling insects	Name of the insect/disease	Symptoms	Respondents (%)	Do not follow any measure (%)	Control measures followed		
	I. Thrips	i. Tips of the leaves become dried.	i. 7.59	93.67	% of farmers	Name of the measure/ pesticide	Rate of application
	II. Aphids (locally named Jab poka)	ii. Leaves become weak, dried and die / Suck the sap from the leaves.	ii. 5.06				
	III. Cricket (locally named as gugro poka)	iii. Cut the roots and bulb at early stage.	iii. 5.06				
				6.33	They do not know what they are applying.	Do not apply any prescribed rate.	

	White tip	Tips of the leaves dry and become white.	1.27	100	--	--	--
Controlling diseases	Yellow dwarf (locally known as virus disease)	Plants do not develop and become yellowish.	1.27				
	Bulb rot	Bulbs are rotten and plant lodges.	23.29%				
	Stem rot	Leaves are rotten near the soil level/ Whole plant is rotten at early stage.	11.39				

Seeds sold by the traders in the study area: The seed traders sell different types of spices seed (Table 3) and onion seed is a common item in the trade centers. Among the traders 15% seed traders sell onion garlic and pepper and only 7.5% traders do not sell any other spice seeds except onion. Less number of traders sells cumin, coriander, ginger and turmeric seeds. This was might be due to the reason that farmers mostly use own seed stock for cultivation of these spices. A considerable number of traders (37.5%) sell <30 Kg of onion seeds/year and 33.75% of the traders sell >90 Kg of seeds (Table 4). Such a view was observed as some retailers emphasized on onion seeds as a trading commodity and the local farmers mainly collect a little amount seed to cultivate onion for own only.

Table 3. Seed sold by the traders in Khulna region

Seed sold by the traders	%of the respondents
All crop seed	30
Vegetables and spices seed	42.5
Field crop seed	27.5
Spice Seeds	
Onion + pepper + garlic + ginger	5
Onion + garlic	3.75
Turmeric + cumin + onion	3.75
Ginger + onion + garlic	3.75
Cumin + pepper + onion	1.25
Turmeric + pepper + onion	2.5
Ginger + onion + cumin	1.25
Onion + garlic + pepper	15
Coriander + onion	1.25
Onion	7.5
Onion + coriander + pepper	2.5
Onion + pepper	6.25
Onion + cumin + pepper + turmeric	2.5
Onion + garlic + pepper	11.25
Onion + ginger + garlic	2.5
Onion + ginger + pepper	7.5
Onion + ginger + turmeric	2.5
Onion + cumin	1.25
Onion + turmeric + cumin + coriander	+1.25

Table 4. Amount of onion seed sold, source and time of seed collection

Onion seeds sold/year	Percentage of the seed traders	
<30 kg	37.5	
31-60 kg	18.75	
61-90 kg	10	
>90 kg	33.75	
Seed source (of seed traders)		
Own production	25	
Farmers' Production	28.75	
Import	22.5	
Other seed traders	23.75	
Time of seed collection		
	Percentage of seed traders	
Winter period	October-November (time of seed collection)	75
	December-January (time of seed sell)	
Summer period	March-April (time of seed collection)	50
	May-June (time of seed sell)	

Table 5. Onion varieties available in seed market

Varieties available in market	Percentage of seed traders
Taherpuri	28.75
Murikata	16.25
Faridpuri vati	52.5
Jhitka	12.5
Gootibij	22.5
Red ball of Karachi	12.5
Indian Bombai	11.25
Local	11.25
Kalashnagari	8.75

Onion varieties available in the market: Among the traders 52.5% traders sell the seeds of Faridpuri Vati, 28.75% traders sell seeds of Taherpuri and 22.5% traders sell seeds of Gootibij (Table 5). Small number of traders sells seeds of exotic and local varieties.

Preservation of seeds by the traders: To preserve the onion seeds about 25% traders use polythene bag and 45% traders store seeds after drying them in sunlight. The traders mostly use no

chemicals to store the seeds, however only 18.75% traders use naphthalene to preserve the seeds for long time (Table 6).

Table 6. Selection of the storage container by the traders

Use of storage container	Percent respondents
Earthen pot	18.75
Metallic pot	10.00
Bamboo basket	18.75
Gunny bag	15.00
Polythene bag	25.00
Cloth bag	12.50
Protection Measures	
Rejects all the seeds of a lot	35.00
Dry for few days in sunlight	45.00
Use of purification agent	12.50
Mixing of infected seeds with 7.50 pure seeds	
Use of chemical substances	
Sevin dust	5.00
Rhidomil	5.00
Bordeaux mixture	6.25
Formalin	6.25
Vitavax	2.50
Naphthalene	18.75
Rovral	12.50

Table 7. Combined effect of containers and storage conditions on storage behaviour of onion bulbs

Treatment combination	Weight loss (%)	Rotting (%)	Regeneration (%)	Length of shoot (cm)
C ₁ S ₁	33.20 bc	5.43 b	89.37 a	4.49 c
C ₁ S ₂	34.40 b	0.67 b	74.31 a	3.72 c
C ₂ S ₁	32.00 bc	46.77 a	48.69 bc	15.94 ab
C ₂ S ₂	38.53 ab	41.34 a	43.27 c	12.52 b
C ₃ S ₁	33.87 b	4.84 b	69.80 ab	3.36 c
C ₃ S ₂	29.60 bc	8.84 b	75.26 a	3.87 c
C ₄ S ₁	50.27 a	15.11 b	80.79 a	2.80 c
C ₄ S ₂	28.53 bc	0.66 b	70.26 ab	3.70 c
C ₅ S ₁	18.53 c	47.96 a	32.25 c	18.75 a
C ₅ S ₂	32.27 bc	57.66 a	42.08 c	14.61 ab
C ₆ S ₁	38.67 ab	6.28 b	77.46 a	3.78 c
C ₆ S ₂	33.47 bc	4.87 b	79.44 a	3.12 c
Level of significance	0.01	0.01	0.01	0.01

C₁= Gunny bag, C₂= Polylined gunny bag, C₃= Paper box, C₄= Cloth bag, C₅= Polythene bag and C₆=Open floor; S₁= Enclosed chamber and S₂= Open condition

Effect of storage containers and conditions on storage behavior of onion bulbs: The loss of weight of onion bulbs was significantly (Table 7) varied with the combination of containers and storage conditions. It was found that the maximum weight loss was (50.27%) in combination of cloth bag and enclosed chamber (C₄S₁) in contrast to other combinations of containers and storage conditions followed by open floor in enclosed chamber (38.67%). Rotting was found to be maximum (57.66%) in polythene bag in open condition in contrast to other combinations of containers and storage conditions followed by polythene bag in enclosed chamber (47.96%). The minimum rotten onion bulbs were observed in cloth bag in open condition (0.66%). High moisture content in polythene bags irrespective of the storage condition favoured the growth of fungal pathogens and thus the rate of rotting was increased (Hayden *et al.*, 1997). Maximum regeneration of bulb (89.37%) was observed in gunny bag in enclosed chamber in contrast to other combination of containers and storage conditions followed by cloth bag in enclosed chamber (80.79%). Shoot length was maximum (18.75 cm) in polythene bag in enclosed chamber.

Effect of varieties and storage containers on storability of onion seeds: The highest percentage of germination of onion seeds were recorded in the variety Kalashnagari (49.23%) and the lowest (38.53%) in Taherpuri (Table 8). There was significant difference among the storage containers used regarding germination percentage (Table 9). Germination percentage was the highest (43.82%) in tin containers (T₆). The cloth bag (T₁) showed the lowest percentage of germination (33.49%).

Table 8. Effect of different varieties of onion on seedling performance of stored seeds

Variety	Germination percentage	Length of the seedlings (cm)	Fungus affected seedlings (%)	Abnormal seedlings (%)

Table 9. Effect of different containers on seedling performance of stored seeds

Seed containers	Germination (%)	Length of the seedlings (cm)	Fungus affected seedlings (%)	Abnormal seedlings (%)
T0	27.51	4.01	13.76	14.24

Faridpuri	42.83	4.35	17.48	13.60
Bhati				
Taherpuri	38.52	4.60	14.80	10.60
Kalashnagari	49.23	5.43	14.52	12.12
Level of significance	0.01	0.01	NS	0.05

NS= Non Significant

T1	33.49	3.95	15.64	9.88
T2	40.71	4.56	16.80	12.56
T3	36.99	3.84	15.92	11.12
T4	43.38	4.27	14.24	13.68
T5	42.22	4.80	18.12	11.44
T6	43.82	4.96	14.04	11.24
T7	42.76	5.02	16.36	12.88

Level of significance

NS = Non Significant, T0 = Here seeds were in packed form as collected, T1 = Cloth Bag, T2 = Polylined cloth bag, T3 = Gunny bag, T4 = Polylined gunny bag, T5 = Plastic container, T6 = Tin container, T7 = Polythene bag

From the study it was found that the percentage of germination decreased as the storage life of the seeds increased (Fig. 1).

The trend of reduction in percentage germination was rapid in Taherpuri than the others. The findings of Yoo (1996) support the finding of the present study.

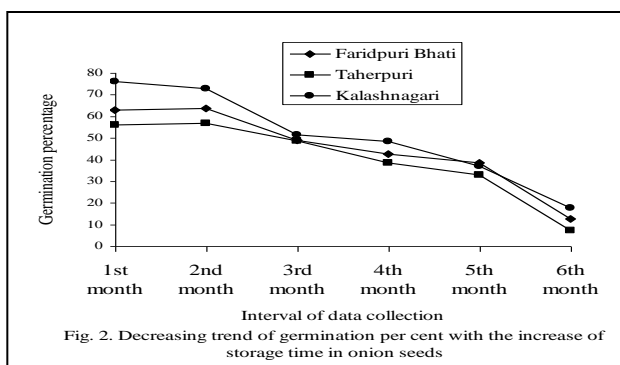


Fig. 2. Decreasing trend of germination per cent with the increase of storage time in onion seeds

The results of the study showed significant difference among the varieties regarding length of the seedlings. Kalashnagari showed the best result (5.43 cm) than Faridpuri Bhati and Taherpuri (Table 8). There was significant difference among the varieties in producing abnormal seedlings. Taherpuri performed better by producing lower number of abnormal seedlings during the study period. The highest number of abnormal seedlings (3.56) was found in the seeds stored in polyethylene bags. Most of the seedlings showed vigorous growth in case of the seeds stored in cloth bags (T₁) as the number of abnormal seedlings was lowest (Table 9).

Discussion

From the study it was observed that, about 39.5% farmers are involved with onion cultivation. Among the onion growers, 22% farmers produce onion in small scale, 13.5% farmers produce only bulb, 3.5% farmers produce only seed and 0.5% farmers produce both bulb and seed. It was found that the farmers differentiated the problems with different degrees they felt. From the opinions of farmers, as mentioned, some problems were identified as most important and these were lack of good quality seed, disease or insect-infected seed, high level of soil salinity, presence of middlemen, low price of onion in local market due to entrance of onion from neighboring countries, lack of proper storage facilities, improper marketing system etc (Table 10). It was found that among 200 farmers 82 farmers feel slight problem, 90 farmers feel moderate problem and 28 farmers feel severe problem for production of onion in the study area.

Table 10. Problems confronted by the farmers during onion cultivation

Serial No.	Description of the problem	Number of respondents regarding extent of problem (%)			
		No problem (%)	Slight problem (%)	Moderate problem (%)	Severe problem (%)
1	Lack of good quality seed	9.5	4.5	79	7
2	Diseased or insect-infected seed	6	34	56	4
3	High price of improved variety of seed	4	46	21	29
4	It is not possible to prepare the land in time	26	35	32	7
5	High level of soil salinity	5	10.5	44.5	40
6	Lack of available fertilizer when necessary	4	36	54.5	5.5
7	Price of fertilizer increases when necessary	3	41	50	6
8	Lack of knowledge about compost or inorganic fertilizer	9.5	39.5	47	4
9	Lack of opportunity to prepare inorganic fertilizer	19	30	47	4
10	Lack of knowledge about the exact time of attack of insect pests	9.5	55.5	30	5
11	Don't identify the symptom of diseases and pest attack in field	4	37	49	10
12	Don't use pesticides timely	5	50	40	5
13	Price of pesticides increases when necessary	5.5	63	30	1.5
14	Lack of knowledge about appropriate quantity of pesticides	4.5	20	73	2.5
15	Market price falls during production period	2.5	47.5	40	10
16	Don't get appropriate price due to middle man	6.5	30	61	2.5
17	Price of local onion decreases due to entrance of foreign onion	1.5	10	58.5	30
18	Lack of proper storage facility	2.5	30	30	37.5
19	Lack of transport facility	35	27.5	35	2.5
20	Sometime no flowers appear	2.5	20	50	27.5
21	No seed formation although flower appears	2	30	65	3

According to the opinion of farmers, some solutions were suggested to be most effective to mitigate the problems and these were supply of seed or bulb by BADC, establishment of cold storage for onion, training of farmers about modern production technology of onion bulb and seed in salinity affected region, maintaining quarantine rules and regulations, improvement of irrigation facilities, development of marketing system etc (Table 11).

Table 11. Possible solutions of the existing problems in onion cultivation

Sl. No.	Means of solution	Very good (%)	Good (%)	Not so good (%)
1	Supply of seed or bulb from BADC or other authentic agency	30	70	0
2	Establishment of cold storage for onion	60	40	0
3	Training of farmers about production technology of onion bulb and seed in salinity affected region	35	65	0
4	Improvement of quarantine rules and regulations in border area	37.5	62.5	0
5	Development of irrigation facilities	53	47	0
6	Development of marketing condition	56	44	0

The largest group (54.4%) of the farmers generally uses small bulb for onion cultivation, 6.3% farmers use seed, and 11.4% farmers use both seed and bulb. From the study it was found that 22.8% farmers collect seeds from seed seller and only 2.5% collect from other farmers (Table 12). Only 5.1% farmers use their preserved seeds in the proceeding year and similar number of farmers collects seeds from any other sources. The type of propagating materials, their sources of collection and extent of use varies with the situation and requirement. Data presented on seed storage in the table 13 show that most of the farmers do not store onion seed. A small number of farmers (6.3%) always store onion seeds in ordinary gunny bags.

Table 12. Propagating materials and source of collection.

Table 13. Seed storage status in the studied region.

Sl. no.	Propagating materials	Extent of use (%)			
		Never	Sometimes	Always	If needed
1.	Seed	55.7	17.7	6.3	2.5
2.	Seedling/Small bulb	12.7	21.5	54.4	3.8
3.	Both seed and bulb	57	13.9	11.4	3.8
4.	Seeds collected from seed seller	44.3	20.3	22.8	--
5.	Seeds collected from other farmers	68.4	11.4	2.5	1.3
6.	Seeds from personal reserve	73.4	1.3	5.1	--
7.	Seeds collected from other sources	53.2	7.6	5.1	2.5

Sl. no.	Means of storage	Extent of use (%)			
		Never	Sometimes	Always	If needed
1.	Closed glass or plastic pot	76	2.5	1.3	--
2.	Ordinary gunny bag	69.6	5.1	6.3	1.3
3.	Poly lined gunny bag	67.1	2.5	5.1	--
4.	Ordinary cloth bag	70.9	2.5	--	--
5.	Cloth bag lined with polythene inside	76	--	--	--
6.	Closed earthen pot	76	1.3	--	--
7.	Others	67.1	1.3	5.1	2.5

According to the seed traders the highly demanded onion varieties were Faridpuri Vati, Taherpuri, Indian Bombai, Kaloshnagari and Red Ball of Karachi (Table 14). Most of the traders think that these are the high quality varieties and also high productive, less sensitive to pests and diseases and early harvesting type. Most of the traders prefer indigenous varieties to the exotics as the indigenous varieties are available in cropping season, high productive, produce good quality seeds, seed preservation and germination capacity is better (Table 15).

Table 14. Causes of high demand of some onion varieties in seed market and percentage of the respondents

Varieties	High quality (%)	High productivity (%)	Less attack of pest and diseases (%)	Early harvesting (%)
Faridpuri Vati	56.25	63.5	68.75	75
Taherpuri	43.75	50	56.25	62.5
Indian Bombai	25	31.25	37.5	43.75
Kalashnagari	18.75	25	31.25	37.5
Red ball of Karachi	12.5	18.75	25	31.25

Table 15. Evaluation of the indigenous and imported onion seeds

Factor		Indigenous (% of respondents)	Imported (% of respondents)
Price	High	87.5	12.5
	Low	12.5	87.5
Availability in cropping season	-	81.25	18.75
Seed preservation quality	Good	75	25
	Bad	25	75
Seed germination capacity	High	68.75	31.25
	Low	31.25	68.75
Seed production	High	62.5	37.5
	Low	37.5	62.5
Productivity	High	81.25	18.75
	Low	18.75	81.25

Table 16. Problems in onion seed selling and other relevant facts

Problems in onion seed market	Respondents (%)
Lack of good quality seed	8.75
Absence of appropriate techniques to protect seeds from disease and insect infestation	5
High price of the seeds of improved varieties	36.25
Farmers mainly use bulbs than seeds for onion cultivation	50
Farmers do not use pesticides	6.25
Lack of proper storage facilities	46.25
Existing seed production problems in farmers level	37.5
Market price falls during production period	12.5

Table 17. Possible solutions of the problems of onion seed trading

Possible solutions	Respondents (%)
Providing training for the farmers and seed traders on preservation of onion seeds	37.5
Ensuring the availability of onion seeds in cropping season	31.25
Encouraging the farmers to occupy more land for onion cultivation	6.25
Controlling of unauthorized onion seed import	25
Improvement of suitable varieties for saline soil	6.25
Providing training for the farmers about seed production.	12.5
Development of co-operative marketing system	18.75
Improving transport facilities	12.5
Providing loan for the seed traders	31.25

About half of the traders think that farmers mainly use bulbs than seeds for cultivation of onion. They also face the problems like lack of proper storage facilities, high price of the seeds of improved varieties, existing seed production problems in farmer's level and fall of market price during growing season (Table 16). According to the traders, most effective solutions are: providing training for the farmers and seed traders about preservation of quality seeds, ensuring the availability of onion seeds in growing season, providing loan for the seed traders, controlling unauthorized import of onion seeds through boarder and development of co-operative marketing system (Table 17).

The minimum weight loss of bulbs was observed in polythene bag in enclosed chamber (46.333g). Such result was obtained due to high moisture content in polythene bags and low rate of moisture loss from the enclosed chamber (Atta, 1998). Li *et al.* (2001) found a similar result while they stored oriental bunching onions in the open air (30 to 40% relative humidity) during winter and observed there a weight loss sometimes greater than 50%. According to them a combination of low temperature and high relative humidity is ideal for storage of oriental bunching onions. Regeneration of stored bulbs in polylined gunny bag and polythene bag was observed greater than other containers after few days of storage but it decreased with increasing of storage period due to increase of moisture and fungal infections. Similar result was found by Adamicki (1998) when he stored 17 onion cultivars for 6 months and observed the effect of an additional one month of storage at a higher temperature. The minimum rotten onion bulbs were in cloth bag in open condition (0.666%). High moisture content in polythene bags irrespective of the storage condition favoured the growth of fungal pathogens and thus there the rate of rotting was high (Hayden *et al.*, 1997). Maximum regeneration of bulb (89.367%) was observed in gunny bag in enclosed chamber in contrast to other combination of containers and storage conditions followed by cloth bag in enclosed chamber (80.791%). Minimum length (2.803 cm) of shoot was observed from the bulbs in cloth bag in enclosed chamber. Atta (1998) also observed similar result and marked post harvest continuous growth in polyethylene lined cartons due to high atmospheric moisture.

The percentage of germination of onion seeds varied significantly regarding the varieties and the storage containers under study. Magruker and Allard (1941) made a study on the storability of important onion cultivars and found that regardless of the storage conditions, the various cultivars showed marked difference in keeping quality. In an experiment, Das *et al.* (1998) stored the seeds of *P. vulgaris* in plastic containers, polyethylene bags or cloth bags at room temperature or in cold storage for up to 8 months. They observed that cold-stored seeds maintained a significantly higher germination percentage and better seed vigor than those stored at room temperature.

Conclusion

More than half of the farmers were found not involved with onion cultivation. Among the onion growers, most of them produce onion in small scale and a small number of them (13.5%) produce only bulb or only seed (3.5% farmers) and only 0.5% farmers produce both bulb and seed. Most of the farmers mentioned a number of causes for low production of onion in this locality and suggested a number of ways to mitigate them. Generally the onion growers apply organic manures and chemical fertilizers containing macronutrients and a small number of them apply pesticides for disease control but they do not know what they are applying and what its prescribed rate of application is. Most of the seed traders collect seed from farmers' production. The cloth bag in open condition performed better in long period storage of onion bulbs. Kalashnagari was the best among the three varieties and tin container showed the best performance in storing onion seeds.

Khan, S.A.K.U. 2006. Present status of onion bulb and seed production in khulna region and effect of containers on storability of onion seeds *Khulna University Studies*, Special Issue (1st Research Cell Conference): 63-73.

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