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STORAGE CONTAINERS USED FOR PRESERVATION OF SOYBEAN SEEDS OF DIFFERENT SOURCES

KM Haque[1], MA Karim [1*], MM Haque[1], MAA Khan[1], ARM Solaiman[2], E Zaman[3], MAA Mamun[3] and H Higuchi[4]

[1]Seed Technology Unit, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh
[2]Department of Soil Science, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh
[3]Department of Agronomy, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh
[4]Graduate School of Agriculture, Kyoto University, Kitashirakawa, Sakyo, Kyoto 606-8502, Japan

***Correspondence:** M. Abdul Karim, Department of Agronomy, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh, E-mail: akarim1506@yahoo.com

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ABSTRACT

A study was conducted to evaluate the storage conditions of soybean seeds of different sources, namely formal, i.e. Bangladesh Agricultural Development Corporation (BADC), private seed traders and farmers' own preserved seeds. The selected locales of the farmers sources were i) Laxmipur, ii) Noakhali, ii) Sariatpur, iii) Chandpur, iv) Bhola, and vii) Barisal districts, that of the private seed traders were i) Thakurgaon, ii) Natore, iii) Laxmipur, and iv) Chandpur districts, and of BADC seed processing centers were i) Meherpur, ii) Feni, iii) Pabna (Tebunia) and iv) Faridpur districts. The results revealed that most of the farmers (58.33) stored seeds of their own crop or obtained through farmer to farmer seed exchange, while 28.33% farmers used private seed traders' seed. Only 13.34% farmers used BADC produced seeds. The study also indicated that 64% farmers stored their seeds in containers like jute bags, earthen pots and local made tin containers. Few farmers (36%) used comparatively better moisture proof plastic bags for the storage. Unlike farmers, private seed dealers used 90% airtight plastic bags and 10% plastic coated jute bags. BADC primarily used modern humidity and temperature controlled storage for bulk seed storage, followed by storage in moisture proof small plastic bags to sell seed to farmers through local seed dealer. The study further revealed that 90% of the farmers, having 1-5 years of soybean farming experience, stored their seeds in containers like jute bags, earthen pots and locally made tin containers, while 75% of them, having 6-10 years of soybean cultivation experiences used the containers that were not properly moisture proof, e.g. tin containers and perforated jute bags. Ninety percent of the farmers having 11-15 years of cultivation experience stored their seeds in airtight containers like plastic bags and plastic coated jute bags. It was also observed that farmers trained by extension people regarding seed preservation did not use perforated jute bags or earthen pots for seed storage. Therefore, training on seed preservation helped the farmers to realize that storing soybean seeds in airtight condition would increase the plant establishment during crop cultivation.

Keywords: Soybean, store, seeds, farmers

Introduction

Soybean (*Glycine max* (L.) Merrill) cultivation is increasing in Bangladesh due to its high demand for making animal feed as well as for different forms of human food. It is an important crop for the farmers of char land of Laxmipur, Noakhali, Chandpur, Sariatpur, Bhola and Barisal districts of southern part of Bangladesh (Chowdhury *et al.* 2013, Sultana *et al.* 2020). According to USDA (2020) soybean area and production level were estimated to 80,000 hectare and 152,000 tonnes, respectively in 2019. The soybean and soymeal imports were 1.1 million tons and 550,000 tons, respectively to keep pace with the demand in the feed industry.

Farmers use soybean seeds of different sources for cultivation, such as their own preserved seeds, seeds from private sectors and Bangladesh Development Corporation (BADC 2015). Many farmers do not have adequate knowledge on quality seeds production, processing and proper storing. Small private traders in the rural area also quite often do not take appropriate measures, such as maintenance of proper storage temperature or using proper seed container for seed storage. Contrary, though BADC is a public organization it may face inappropriate storage conditions due to mechanical or technical problem such as failure of electricity supply. According to Sehlu *et al.* (2008) seed quality in the formal sector is maintained through established seed quality control

procedures, though the quality may not always be maintained throughout the period of production to sowing by the farmers. Seed quality of the semiformal seeds and informal sources are thought to be inferior. However, some farmers are also experienced in storing their seeds following standard procedures.

The storage conditions and storage materials may enhance or damage the viability of soybean seeds to a great extent (Balesevic-Tubic *et al.* 2010). Therefore, farmers may or may not get good germination vis a vis good harvest from their own or collected seeds. A comprehensive understanding on maintaining seed quality by the farmers and seed sellers is an important prerequisite for improving farm household access to seed sources. The objective of this study was to analyze the soybean seed storage conditions of formal and informal seed sources.

Materials and Methods

The study was designed to gather information on different aspects of soybean farmers and seed storage conditions of different sources of seeds. Relevant data were collected through a quantitative method i.e. face to face interview administered under an interview schedule. The locales of the study belonged to six districts for farmers source, viz. i) Laxmipur, ii) Noakhali, ii) Sariatpur, iii) Chandpur, iv) Bhola and vii) Barisal, four districts for private seed traders source, such as i) Thakurgaon, ii) Natore, iii) Laxmipur, and iv) Chandpur, and four BADC seed processing centers located in i) Meherpur, ii) Feni, iii) Pabna (Tebunia) and iv) Faridpur districts. Each farmer of the selected district, each private seed trader of each district and selected BADC seed processing center were the units of data analysis. Sixty farmers from six major soybean growing districts, twelve private seed traders from four districts and four BADC seed processing centers were selected as samples following Judgmental Sampling Technique.

In order to collect relevant information from the respondents, an instrument was carefully designed keeping the objectives of the study in view. The instrument contained both open and closed questions. The questions were arranged systematically to understand easily by the respondents. All possible precautions were taken to avert bias and maintain fidelity of respondents. All the responses in the interview schedule were given numerical code value and local units, which were converted into standard units. The collected data were compiled, tabulated and analyzed in accordance with the objective of the study. Data presented in percentage were arcsine transformed before statistical analysis. All the statistical analysis was done using SPSS-15 wherever necessary.

Results and Discussion

It was found that the average size of the holdings among the farmers was 0.8 ha and ranged from 0.25 to 3.5 ha (Table 1). The result of the survey revealed an important relationship between the size of the farm and seed sources. Most of the farmers (58.33) stored seeds from their own crop, or seeds obtained through farmer to farmer seed exchange, while 28.33% farmers used private seed traders' seed. Only 13.34% farmers used BADC produced seeds. The farmers with relatively large holdings purchased their seeds from either BADC or private source, probably because of high germination capacity of the seeds compared to that of farmers own seeds. In fact almost all the farmers indicated their willingness to purchase good quality seeds from reliable sources even at high price. However, they expressed their dissatisfaction with the non-availability of the good quality soybean seeds at the local level.

The study also indicated that 64% farmers stored their seeds in storage containers like jute bags, earthen pots and local made tin containers, which were not properly moisture proof and resulting a higher level of moisture content in their stored seeds (Table 2). Few farmers (36%) used comparatively better moisture proof plastic bags for the seed storage. Unlike farmers, private seed

Table 1. Sources of soybean seeds used by different categories of farmers

Sources of seeds	Ratio of respondent farmers under different farm categories (%)				Total (%)
	0-0.5- ha	0.5-1.0 ha	1.0-1.5 ha	>1.5 ha	
Stored from previous crop (farmers seed)	16	10	6	3	58.33
Private seed traders	2	2	8	5	28.33
BADC source			4	4	13.33

The percent data were arcsine transformed.

Table 2. Types of soybean seed storage containers used in different seed sources

Types of container	Different seed sources (%)		
	Farmers	Private seed traders	BADC
Jute bag	13	-	-
Tin container (airtight to some extent)	33		-
Plastic container (airtight)	36		-
Plastic bags (airtight)		90	100
Earthen pot (porous)	18		
Plastic coated jute bags(airtight)		10	

The percent data were arcsine transformed.

dealers used 90% airtight plastic bags and 10% plastic coated jute bags. BADC primarily used modern humidity and temperature controlled room for bulk seed storage. It also used moisture proof small plastic bags to sell the seeds to farmers through local seed dealer. The lower moisture contents (8.63–10.8%) in seeds of BADC and private traders (8.56–10.43%) as observed in the study can be explained by the modern seed preservation system of both the sources. BADC and private seed traders used air tight plastic bags which are effective against moisture gain by the seeds. The study also indicated that the usage of perforated jute bags and earthen pots by the farmers resulted in increased moisture content (up to 13.9%) in seeds. Accordingly, presence of lesser amount of moisture content in private and BADC seeds can be explained by their storage materials which were properly moisture proof. With the storage duration, moisture content in seeds stored in porous earthen pots and perforated jute bags increased due to hygroscopic nature of the seeds (Tandoh 2017).

A relationship was drawn between seed moisture content and storage in airtight container (Figure 1). The relationship clearly explained that seed moisture increased with the less use of airtight containers, and exactly that happened for the relatively higher seed moisture content in the farmers own seeds. Farmers seeds stored in perforated jute bags and earthen pots were marked by the presence of

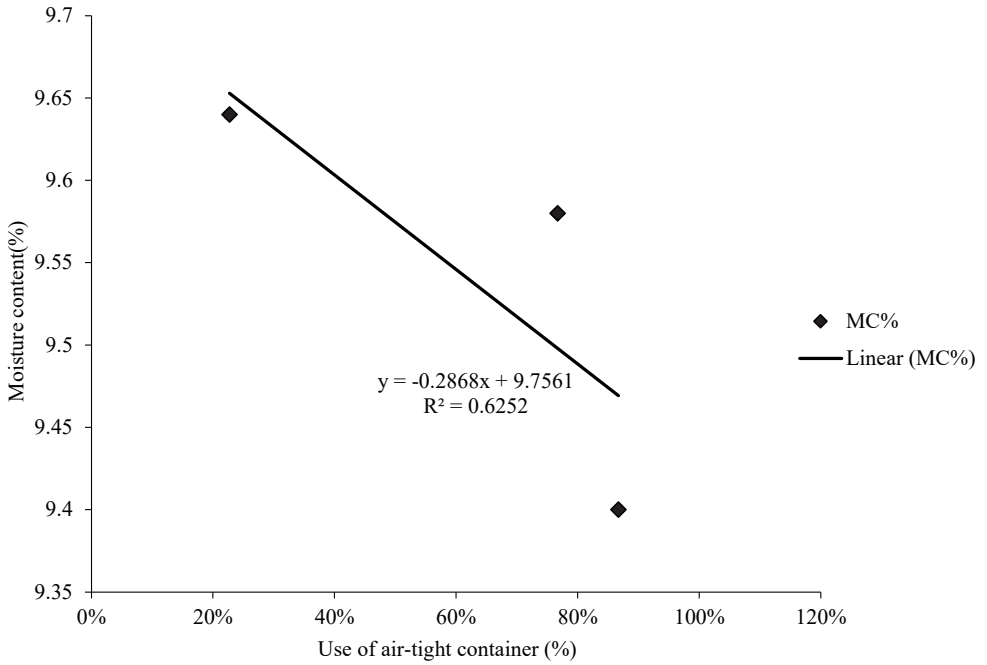

Figure 1. Relationship between use of airtight containers and moisture content present in the soybean seeds of that container.

Table 3. Types of seed storage containers used by farmers having different length of soybean farming experiences

Types of container	Length (year) of soybean farming experience of the farmers (%)				Total (%)
	1-5	6-10	11-15	>15	
Jute bag	10.00		-	-	10.00
Tin container (local made)	3.30	16.60	3.30	-	23.20
Plastic container	-	6.60	20.23	6.60	33.43
Earthen pot	20.07	-	-	-	20.07
Plastic coated jute bags	-	3.30	10.00	-	13.30

The percent data were arcsine transformed.

Table 4. Types of containers used by farmers (%) with or without training on storage methods

Types of container	Categories of farmers (%) based on with or without training	
	Trained (%)	Non-trained (%)
Jute bag	-	12.00
Tin container (local made)	21.00	5.00
Plastic container	24.00	
Earthen pot	-	20.00
Plastic coated jute bags	18.00	

The percent data were arcsine transformed.

higher moisture content compared to the seeds of BADC and private seed traders, which were stored in air-tight plastic bags.

The study further revealed that 90% of the farmers (accounted for 33% of total surveyed farmers), having 1-5 years of soybean farming experience, stored their seeds in containers like jute bags, earthen pots and locally made tin containers (Table 3). It was also revealed that 75% of the farmers, having 6-10 years of soybean cultivation experiences (accounted for 20% of the total farmers), used containers not properly moisture proof (e.g. tin containers and perforated jute bags). Ninety percent of the farmers having 11-15 years of cultivation experience, which accounted for 30% of the total farmers, stored their seeds in airtight containers like plastic container and plastic coated jute bags. Therefore, the number of farmers using non-airtight containers was decreased with their experiences in soybean farming.

It was noticed that the farmers trained by extension people regarding seed preservation did not use perforated jute bags or earthen pots for storage of soybean seeds (Table 4). Cent percent non-trained farmers, which accounted for 32% of the total, used porous jute bags and earthen pots for storing their soybean seeds. Furthermore, 65% of the trained farmers, which accounted for 43.33% of the total surveyed farmers, used air tight containers for seed storage. Thus, training on seed preservation helped the farmers to realize that storing soybean seeds in airtight condition would increase the plant establishment during crop cultivation.

Seeds should never be stored at moisture content higher than 14% (Douglas 1975, Tanner and Hume 1978), as they lose viability at a faster rate than those at a lower moisture content. The declination of germination capacity with the high moisture content is related to the hygroscopic nature of seeds, especially under warm temperature, which in turn is associated with the relative humidity of the surroundings (Delouche *et al.* 1973) and the result of this study revealed a similar phenomenon.

It was concluded that seeds of formal source (BADC) are stored in airtight conditions. The seeds of private seed traders are mostly stored in airtight plastic bags and also few in plastic coated jute bags. Only 36% farmers who have long experience in soybean farming used airtight seed containers. However, training of the farmers on soybean seed storage techniques improved their knowledge on proper storage of seeds. Therefore, it is suggested to impart training to the farmers on seed storing methods regularly.

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