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Seed Packaging in Vegetables

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Abstract

It is important to package seed in dry containers for proper storage. For small quantities of seed, these containers may be tin cans, jars, or pots that are glazed on the inside; even reinforced boxes or bags can be suitable. Metal or plastic jerricans, or drums are often used to package large quantities of seed. Regardless of the type of container employed, it should be of standard size and shape, if possible, so that when one is filled with seed of a known purity percentage, the approximate number of seeds it contains can be estimated. Also, containers of standard sizes and shapes are easier to handle. This paper deals about the importance of seed packing and different types of packing materials.

Introduction

Seed packaging is the process of filling, weighing and sewing of bags with seed. It should provide maximum possible protection from ground moisture, rain, insect pests, moulds, rodents, birds, etc. It should protect grain from excessive moisture and temperature favourable to both insect and mould development.

Why are Seeds Packaged?

Seeds are packaged to prevent absorption of water from the atmosphere after drying, to keep each accession separate and prevent contamination of the seeds from insects and diseases.

When should Seeds be Packaged?

The best time to package seeds is directly after the moisture content has been determined and found to be within the required limits for safe storage. Seeds should be packaged into containers and sealed in the drying room or without delay.

How should Seeds be Packaged?

Different containers and special equipment for sealing are available for the storage of seeds. Storage containers for base collections should be hermetically sealed and moisture-proof. Cans, bottles, and laminated aluminium foil containers are all acceptable for both base and active collections.

Difference between Packing and Packaging

Packing

Packing a product means enclosing it in a safe covering so that it does not get damaged during transportation. The aim of packing a product is to transport it safely

to retail stores. No product information except the reference number. For e.g., medicine, agriculture, etc.

Packaging

Packaging a product means enclosing it in a safe covering to prevent its damage transportation and also for display it for retail. Designing and packing product for sales and storage. It displays cost price, manufacturer, and representative images. For e.g., marketing and advertising industries, etc (Figure 1).



Figure 1: Seeds in sealed containers

Types of Seed Collection

There are three types of seed collection viz.

Base collection: It includes maximum no. of accessions available in a crop. Conservation upto long term like 50 years or more. Stored at -18 to 20 °C hermetically sealed. Moisture content 5%.

Active collection: Germplasm is actively utilized in breeding programmes. Conservation upto Medium term like 8-10 years. Stored at -0°C. Moisture content 8%.

Working collections: It is utilized by breeders in their crop improvement programme. Conservation upto Short term 3-5 years. Stored at 5-10 °C. Moisture content 8-10 %.

Objectives of Packaging

- Product identification
- Product convenience
- Product protection
- Product promotion
- Attractiveness

How Many Seeds should be Packed?

The number of seeds to be packed for storage will depend on the species being conserved and how often seeds will be removed for monitoring, distribution or regeneration. The FAO/ IPGRI Genebank Standards (1994)

recommend that for material which shows little morphological variation (genetically homogenous accessions), 3000 seeds are acceptable, but 4000 seeds are preferable to represent each accession. For materials showing large morphological variation (genetically heterogeneous accessions), an accession should consist of at least 4000 seeds are preferred. In Genebanks, it is easier to work in weights, but seed number can easily be converted from weights if the 100-seed or 1000-seed weight is known. For example, to determine the number of seeds in a sample for which the 100-seed weight is known:

$$\text{Number of seeds in the sample} = \frac{\text{Sample weight (g)}}{\text{Weight of 100 seeds (g)}} \times 100$$

Table 1: Number of seeds/gm in Vegetable Crops (Source: greenharvest.com.au@seed supplies)

Vegetable	Seeds/gram	Seeds/Kg
Tomato	250-300	2,50,000 -3,80,000
Chillies	150-200	2,00,000
Okra	15-25	8000
Egg plant	200-250	2,50,000
Pumpkin	8-15	10,000
Radish	90-140	1,40,000
Cucumber	30-45	40,000
Lettuce	600-1200	12,00,000
Pea	4-5	2000
Watermelon	6-20	20,000
Asparagus	24-50	12,000-25,000
Artichoke	20-25	
Beetroot	40-60	48,000
Kale	250-300	2,00,000
Carrot	400-1200	4,00,000-12,00,000
Cauliflower	250-300	2,00,000
Cabbage	190-300	3,50,000
Waxgourd	10	10,000

Essentials of Good Packaging

- Should be attractive
- Should protect the content
- Should be convenient
- Prevention from adulteration
- Should assure adjustability
- Extends product life

The factors to be considered while selecting the packaging materials-

- Kinds of seeds to be packed
- Quantity of seed

- Cost of packaging material
- Period of storage
- Value of seed

Classification of Packaging Material

- Moisture and vapour pervious containers
- Moisture impervious but vapour pervious containers
- Moisture and vapour proof containers

Moisture and Vapour Pervious Containers

These containers allow entry of water in the form of vapour and liquid. These are suited for short term storage. e.g., cloth bags, gunny bags cotton bags, paper cardboard, fibre board (Figure 2 and 3).



Figure 2: Seeds in Godown



Figure 3: Cloth bags

Moisture Impervious but Vapour Pervious Containers

These allow entry of water in the form of vapour and not in liquid. The seeds in these containers can't be carried over for long period in hot humid conditions. e.g., polythene bags of < 300 gauge thickness and urea bags (Figure 4).

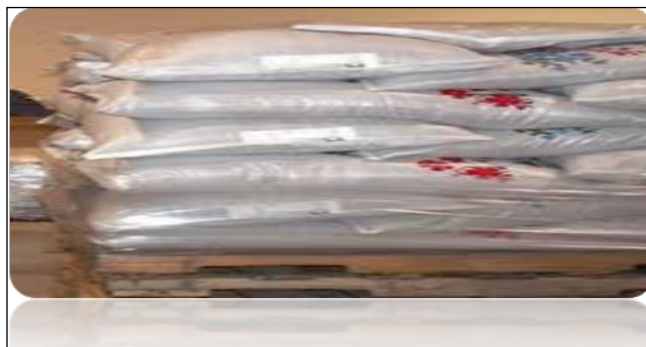


Figure 4: Seeds in aluminium foil covers

Moisture and Vapour Proof Containers

These are resistant to the passage of moisture but over a long period of time, these will be a slow passage of water vapour tending to equilibrate the relative humidity inside and outside the container. It is very much suitable for short or medium term storage and has given excellent results. For e.g., polythene bags of > 700 gauge thickness, aluminium foil pouches, rigid plastics etc. (Figure 5).



Figure 5: seeds in moisture and vapour proof containers

Table 2: Vapour proof containers: Moisture content for foundation and certified seed recommended by Indian minimum seed standards

Crop	Foundation seed %	Certified seed %
Brinjal, Tomato, Chilli	6	6
Okra, Spinach	8	8
Gourds	6	6
Cabbage, cauliflower, Knol-khol	5	5
Celery	7	7
Lettuce	6	6
Onion, potato	6	6

- Lower internal seed moisture is found beneficial in increasing seed germination in vacuum packed and air-tight containers than cloth bags and polyethylene bags.

- High content of seed moisture and relative humidity are congenial for seed metabolites as well as for growth of fungus.

Steps in Packaging

Step 1: Prepare For Packaging

Step 2: Package the Seeds

Step 3: Enter the Data into the Data Files

Step 4: Check the Quality of the Containers

Testing Quality of Containers

- Fill the containers with regenerated self-indicating silica gel and seal it in the same way in which seeds are stored.
- Accurately determine the weight of the containers with an analytical balance.
- Hold the containers over water (but not touching it) in a desiccators for about a week.
- Remove the containers from the desiccators and allow the surface to dry.
- Weigh the containers, record the change in weight and examine the colour of the silica gel.
- If the weight of the containers remains constant, then they are moisture proof and the seal is good.
- If the weight of the containers increases and the silica gel has turned pale blue or pink, then they are of poor quality or the seal is leaking moisture.
- Adjust the seal and repeat the test to confirm the quality of the containers.

Information Recorded on Seed Packaging

- Date of packaging
- Accession number
- Type of container
- Container number
- Weight of container empty
- Weight of container and seeds
- Weight of seeds

Barcoding

Bar-coding is a computerized coding system that uses a printed pattern of bars of varying widths to uniquely identify accessions. Bar-codes are read by optically scanning the printed pattern and using a computer program to decode the pattern. The data contained in a bar-code can vary: in its simplest form, it can be just an accession number while in other cases; the bar-code can hold more elaborate passport and inventory details (Figure 5).



Figure 5: Barcoded covers of seeds

Equipments Used in Packing

Seed Counting and Packaging Machine

Seed counting and packaging machine comprise both a counting unit and a packaging system, all combined in one revolutionary solution. It is a fully automatic, four-channel counting machine, designed for accurate and fast counting and packaging procedures (Figure 6).



Figure 6: Seed counting machine

Automatic Seed Packing Machine (Robot)

This machine is very suitable for automatic filling and sealing of pre-formed and printed aluminium laminated or synthetic sealable packets. This machine is mostly used when large series of packets should be filled and sealed. Minimum packet size 82 x 11 mm and maximum packet size 165 x 230 mm (Figure 6).

Seed Packet Bundling Machine

This machine can be connected to almost any kind of seed packing machine. This packet bundling machine is very suitable for automatic collecting of filled seed packets. By means of a piece of elastic, the packets are



Figure 6: Automatic seed packing machine

bundled automatically. The machine can handle packet sizes of maximum 215 x 165 mm (Figure 7).



Figure 7: seed packet bundling machine

Seed Packet Collecting Machine

This machine is used for automatic collection of filled packages in paper window boxes. This machine can be connected with our automatic seed packing machine (robot). The paper box must be closed manually (Figure 8).



Figure 8: seed packet collecting machine

Seed Weighing Scale

These weighing scales are used for accurate semi automatic weighing of seeds. Different models for different capacities are available. Very suitable for packing small series/ orders and for seeds that cannot be counted (Figure 9).

Seed Weighing Machine

This seed weighing is used for automatic, accurate and fast weighing of all kind of seeds. This machine can be used as stand alone for manual filling, but also in



Figure 9: seed weighing machine

combination with our packing machines. Different capacities are available (Figure 10).



Figure 10: seed weighing machine

Mobile Seed Weigher

This seed weigher is used for automatic weighing of all kind of seeds. This set-up is transportable and therefore can be moved easily to any other seed department. You can collect the seeds in bags or buckets (Figure 11).

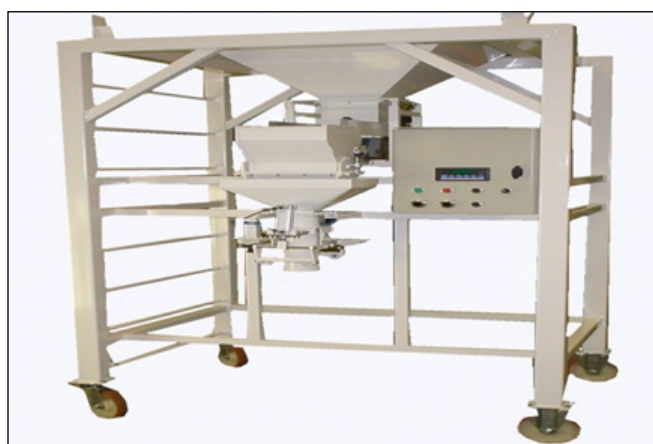


Figure 11: Mobile seed weigher

Bag Sewing System

- These sewing systems are used for closing bags after filling them with seeds.
- Mainly used for bags with a larger quantity of seeds (5-25 kg).

- The machine uses cotton threads.
- It can be used for open mouth bags made of paper, jute, polypropylene or polyethylene.
- It can be used for different bag sizes and can be set up to work together with our weighing systems (Figure 12).



Figure 12: Bag sewing machine

Packet Sealer

This vertical belt sealer is suitable for sealing aluminium, PE, PP and thin laminate packets. Pre-made bags are sealed standing up, which is ideal for seed bags that would spill if sealed laying flat (Figure 13).



Figure 13: Packet sealer

Precautions

Remember that containers removed from cold storage or freezers should be allowed to warm to room temperature before opening to avoid condensation of water on the seed surface. This may take several hours, especially for large seeds and those removed from sub-zero temperatures. The self-adhesive labels and ink used for labelling must be water resistant and very durable.

Conclusion

Seeds are packaged to prevent absorption of water from the atmosphere after drying, to keep each accession separate and prevent contamination of the seeds from insects and diseases. It is important to package seed in dry containers for proper storage. For small quantities of seed, these containers may be tin cans, jars, or pots that are glazed on the inside; even reinforced boxes or bags can be suitable. Metals, gunny bags, drums etc., can be used to store the seeds in large quantities. Regardless of the type of containers used, it should be standard size and shape, if possible, so that when one is filled is with seed of known purity percentage, the approximate number of seeds it contain can be estimated. Containers of standard size and shapes are easy to handle. For subsequent identification, each package of seed or each aggregation of packages representing a given collection should be labelled. Preservation of seed with initial quality until it is needed for planting.