

Practical 12

PREPARATION OF MODEL OF A LOW COST STORAGE STRUCTURE FOR HORTICULTURAL PRODUCE

EXERCISE 12.1: Preparation of Model of Zero Energy Cool Chamber for Storage of Fruits and Vegetables.

Objective :

- To acquaint with the principle and working of Zero Energy cool chamber for storage of fruits and vegetables.
- To prepare model of low cost storage structure for horticultural produce.

Delivery schedule : 02 periods

Student expectations/learning objective:

- Studying the principle and working of Zero Energy Cool Chamber for storage of horticultural produce.

Pre-learning required: Knowledge about different storage methods of horticultural produce with particular reference to low cost storage structures.

Handouts/material required/equipment's & tools: Paper sheet and pen to note down the instructions, bricks (400 No.), sand, bamboo, khaskhas/straw, gunny bags, plastic crates etc., with a source of water.

Introduction:

Owing to improper post-harvest operations, especially storage, 30-40% of the fruits and vegetables produced in the country are lost resulting in poor returns to farmers and high cost to consumers. Storage of fresh horticultural produce, being highly perishable, particularly under the tropical climate in India, is a major challenge needing immediate attention. Horticultural produce are living entities and carry out all the vital activities such as respiration and/or transpiration, etc.,

while in storage. The spoilage of these commodities can be controlled to a large extent by maintaining proper storage conditions. In this direction, indigenous low cost storage structures have been developed for the preservation of different horticultural produce. The indigenous low cost methods for storage of horticultural crops are designed to check microbial, enzymatic and oxidative spoilage in the stored/preserved materials. These produces can be stored safely up to a few months without excessive spoilage.

Zero Energy Cool Chamber (ZECC) is based on the principle of direct evaporative cooling system. It is a double brick-wall structure, the cavity is filled with sand and walls of the chamber are soaked in water. It can be constructed easily anywhere with locally available materials like bricks, sand, bamboo, khaskhas/straw, gunny bags, etc., with a source of water. The chamber can keep the temperature 10-15°C cooler than the outside temperature and maintain about 90% relative humidity. It has been found to be very useful. It is most effective during the dry season. It can be easily constructed near the farmer's fields and store a few days' harvest before dispatching it to the market. In this way, the farmers can avoid the clutches of the middlemen and are not forced to make any distress sale. In India, 90% of horticultural produce is sold in fresh form. Owing to the presence of middlemen, the price of horticultural raw material is 60-100% higher in mandis than in growing areas. Apart from farmers' fields, the cool chambers can be installed profitably wherever fruits and vegetables are held temporarily, e.g., (i) packing stations, (ii) village mandis, (iii) whole sale markets in metropolitan cities, (iv) railway stations, (v) interstate bus terminals, (vi) retail outlets, (vii) big hotels and institutional catering centres, (viii) defence establishments in remote places where supplies come once in a week or so, and (ix) fruits and vegetables processing factories.

Some specific advantages of ZECC

- Can be constructed by an unskilled person
- No mechanical or electrical energy needed
- Reduces losses and pays for itself in a short time.
- Useful for temporary storage of curd, milk and cooked food.
- Can also be used for mushroom cultivation, sericulture, storage of bio-fertilizers, hardening of tissue-cultured plants, etc.

The following table gives a comparison of the storage life of different horticultural produce under cool chamber and ambient conditions.

Crop	Part of the year	Cool chamber		Ambient temperatures	
		Days	Weight loss (%)	Days	Weight loss (%)
Mango	June-July	9	5.0	6	14.9
Banana	Oct.-Nov.	20	2.5	14	4.6
Grapefruit	Dec.- March	70	10.2	27	11.9
Sapota	Nov.- Dec.	14	9.5	10	20.9
Lime	Jan.-Feb.	25	6.0	11	25.0
Kinnow	Dec.-Feb.	60	15.3	14	16.0
Potato	March-May	90	7.7	46	19.1
Tomato	April-May	15	4.4	7	18.6
Amaranth	May-June	3	11.0	<1	49.6
<i>Methi</i>	Feb.-March	10	10.8	3	18.0
<i>Parwal</i>	May-June	5	3.9	2	32.4
Okra	May-July	6	5.0	1	14.0
Carrot	Feb.-March	12	9.0	5	29.0

Construction:

- Select an upland having a nearby source of water supply.
- Make floor with brick 165 cm x 115 cm..
- Erect the double wall to a height of 67.5 cm leaving a cavity of 7.5 cm.
- Drench the chamber with water. Soak the fine river bed sand with water.

- Fill the 7.5 cm cavity between the double walls with this wet sand.
- Make top cover with bamboo (165 cm x 115 cm) frame and 'sirki' straw or dry grass.
- A thatch/tin shed made over chamber to protect from direct sun or rain or snow.

Operation:

- Keep the sand, bricks and top cover of the chamber wet with water.
- Water twice daily (morning and evening) to achieve desired temperature and relative humidity.
- Alternatively fix a drip system for watering with plastic pipes and micro tubes connected to an overhead water source.
- Store the fruits and vegetables in perforated plastic crates.
- Cover crates with thin polyethylene sheet.
- Cool chamber should be reinstalled once in 3 years with new bricks
- Utilize the old bricks for other purposes.

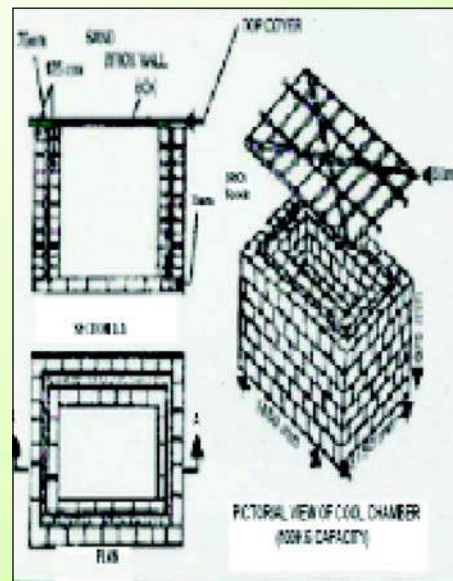
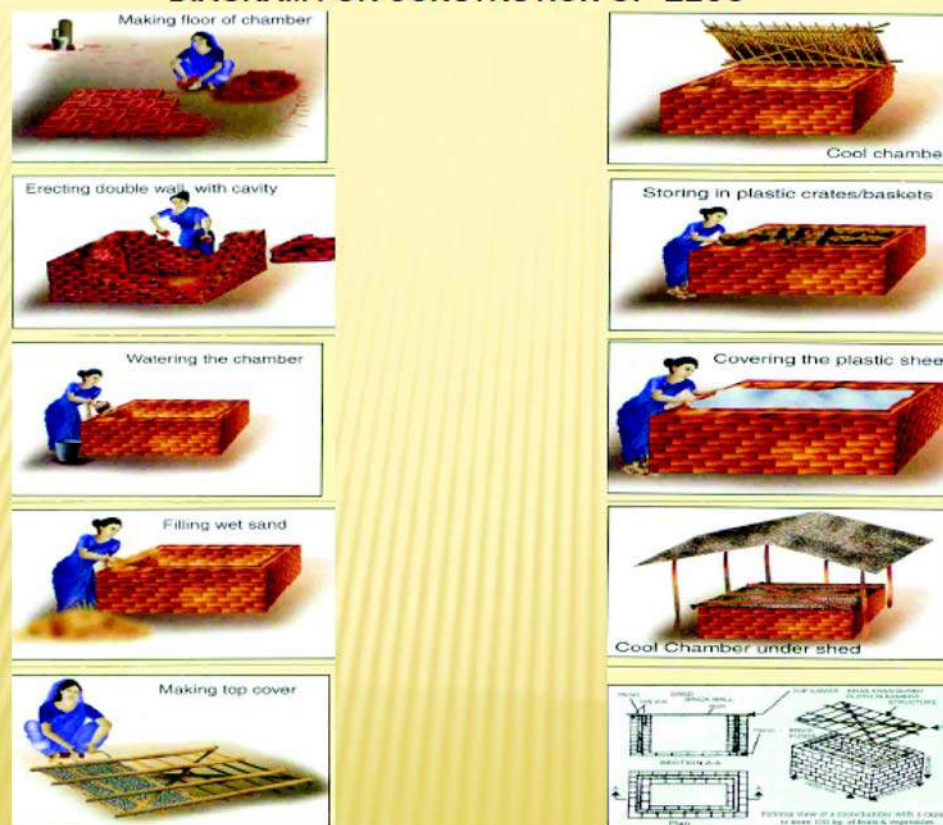


DIAGRAM FOR CONSTRUCTION OF ZECC



Exercise:

1. Visit any nearby farm where a Zero Energy Cool Chamber has already been constructed and being used for storage of horticultural produce.
2. Prepare a model of Zero Energy Cool Chamber.





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