ISSN: 2454-1907
DOI: https://doi.org/10.29121/ijetmr.v5.i5.2018.234

IJETMR
International Journal of Engineering Technologies and Management Research
A Knowledge Repository

EFFECT OF POT IN POT COOLING SYSTEM ON THE STORAGE LIFE OF OKRA (*ABELMOSCHUS ESCULENTUS*)

Olaifa O. Peter [*1], Oyedele O.J. [2], Bolaji O.B. [3], Shittu L.L [2]

[*1] Department of Animal Production Technology, Federal College of Wildlife Management, P.M.B. 268, New Bussa, Nigeria

[2] Department of Food Science and Engineering, Ladoke Akintola University of Technology, Ogbomoso, Nigeria

[3] Lower Niger River Basin, Ilorin P.M.B. 1529, Kwara State, Nigeria

Abstract:

Evaporative cooling system is a physical phenomenon in which the surrounding air cools an object or a liquid in contact with it. An extensive literature has been reviewed. The materials and methods used in the research involves, the two clay pots (bigger and smaller size), water, Okra, measuring devices (Thermometer and Hygrometer), and the wooden cover. A smaller pot was kept inside a bigger clay pot and the Inter-space was filled with river-bed sand which was made moist by adding water thrice a day i.e. morning, afternoon and evening. The result obtained showed that the okra can be stored for 14days in the mean temperature of (27.27, 32.92 and 29.68 ^{O}C) and relative humidity of (97.43, 47.08 and 66.30 %). Conclusively, the pot in pot evaporative cooler could be used in New Bussa, Nigeria during the dry season when the temperature is high and relative humidity is low.

Keywords: Cooling; Okra; Storage; Evaporation.

Cite This Article: Olaifa O. Peter, Oyedele O.J., Bolaji O.B., and Shittu L.L. (2018). "EFFECT OF POT IN POT COOLING SYSTEM ON THE STORAGE LIFE OF OKRA (ABELMOSCHUS ESCULENTUS)." *International Journal of Engineering Technologies and Management Research*, 5(5), 124-127. DOI: https://doi.org/10.29121/ijetmr.v5.i5.2018.234.

1. Introduction

Evaporative cooling system is a physical phenomenon in which the surrounding air cools an object or a liquid in contact with it. When considering with the air in the wet-bulb temperature as compared to the air's dry-bulb temperature is a measure of the potential for evaporation cooling. The greater the difference between the two temperature the greater the evaporative cooling effect. This evaporative cooling chamber fulfills all these requirements and is helpful to small farmers in rural area (Dadhich *et al*., 2008).

Evaporative cooling system depends on the condition of the air and it is necessary to determine the weather condition that maybe encounter to properly evaluate the possible effectiveness of evaporative coolers (Mentzer and Dale, 1960) and is working best in hot and dry climates. These conditions are common where big part of the population have no access to conventional electrical refrigerators to keep fruits, vegetable and forages fresh in hot and dry climates. (Likes northern

ISSN: 2454-1907
DOI: 10.5281/zenodo.1296839

Burkinafaso with daily maximum air temperature of 30^0C - 45^0C. this system of evaporative cooling system enable to reach temperature between 13^0C - 22^0C inside the cooler. The clay pot or earthen pot cooler can extend the shelf life of fruit forage and vegetable; farm produce item and important food item that are widely consumed because they form an essential part of the balance diet in animal and human, fruit forage and vegetable are important source of vitamins and mineral. They also provide carbohydrate and protein which are needed for normal healthy growth of animal (Olusunde *et al*., 2009), in developing countries likes Nigeria Agriculture constitutes the bulk of the informal sector of the economy.

2. Objectives

- To access the cooling efficiency of the pot in pot cooling system in term of its speed of cooling i.e the degree of cooling over a period of time.
- To determine whether pot in pot evaporative cooler is suitable for preserving Okra during hot and dry season.

3. Justification

In a well-developed places like the urban area where electric appliances are available, their focus mainly is on the use of electric refrigerator which may not be affordable by everyone particularly the local farmers due to finance and the cost hence, there is need for designing pot in pot evaporative cooling system (ESC) which could be affordable and durable for local farmers to store their vegetable.

4. Problems

- Evaporative cooling system requires a constant water supply to soften/moisten the membrane Therefore, need to be watered daily.
- High dew point (humidity) condition decreases the cooling capability of the evaporative cooler.
- No dehumidification traditional air conditioners remove moisture for the air except in very dry location.
- Evaporative cooling adds moisture and in dry climate, dryness may improve thermal comfort at high temperature.

5. Materials and Methods

Materials and methods include:

- Earthen pot
- Sand
- Okra (*Abelmoschus esculentus*)
- Measuring device (Thermometer and hygrometer)
- Water
- Lid (Wood).

ISSN: 2454-1907
DOI: 10.5281/zenodo.1296839

6. Research Location

This project was carried out at Federal College of Wildlife Management (FCWM) Farm and research site under a tree located at the farm premises. The location is situated between kanji dam and New bussa town along awuru road. It lies between longitude 4^{O} 330N and latitude $7^{O}31^{O}$ E-10E (Onyeanusi, 1998).

7. Climate

The average monthly temperature of 34 ^{O}C the highest value being 41 ^{O}C with a mean annual relative humidity of 60 % the average annual rainfall is 104.45mm.The first rainfall normally come in march reaches a peak in July to August and decline in September (Onyeanusi, 1998).

8. Methodology

Two different sizes of earthen pots were installed on a small hole. A small clay pot with bottom surrounded with polythene to prevent leakages was kept inside a bigger clay pot and the inter space is filled with river-bed sand which was made moist always by adding water thrice a day; In the morning, afternoon, and evening. The pot had a wooden cover. The thermometer and hygrometer were installed to take the record of temperature and relative humidity at interval of time for 14 days.

9. Results

The result obtained is presented in Table 1 which shows the mean temperature and relative humidity of the stored Okra (*Abelmoscus esculentus*) for morning, Afternoon and evening. There were significant differences ($P<0.05$) in the values of temperature and relative humidity recorded. The temperature recorded was (27.27, 32.92, and 29.68 ^{O}C) for Morning, Afternoon and Evening respectively. Also, there were significant differences ($P<0.05$) in the value of relative humidity recorded (97.43, 47.08 and 66.30 %) for Morning, Afternoon and Evening respectively. The highest temperature was recorded in the noon due to high intensity of the sun and highest humidity was recorded in the morning due to high cooling effect.

Table 1: Mean Temperature and Relative Humidity of Okra stored in Pot in Pot evaporative cooler

	Morning	**Afternoon**	**Evening**
Temperature (^{O}C)	27.72	32.92	29.68
Relative humidity (%)	97.43	47.08	66.30

10. Discussion

The Okra was stored for a period of 14days in pot in pot evaporative cooler, the result shows that there was a reduction in moisture content of the stored produce within the data ranges, this is in agreement with the findings of Ngure *et al.* (2009) who reported that storage of fresh Okra at a temperature between 10 – 20 ^{O}C reduces the microbial activities. The main cause of deterioration in Okra is high moisture content. The decrease in the moisture content of Okra as the storage time

ISSN: 2454-1907
DOI: 10.5281/zenodo.1296839

increases could be due to transpiration, evaporation and respiratory activities of Okra samples in order to attain equilibrium with the ambient. This agrees with Santi *et al*. (1992).

Also, Longmone (2003) reported that the shelf life of a stored Okra is 17 days but the observation made from this study shown that Okra can be stored for 14 days. These 14days storage life is less than 17 days storage life reported by Longmone (2003). This could be as a result of the differences in the climatic conditions (temperature and relative humidity). From this study, it was observed that the pot in pot evaporative cooler can perform well under the condition of the above result without any changes in colour, texture and freshness of Okra in New Bussa region of Niger state, Nigeria and every other places of equal climatic data

11. Conclusion

Since the moisture is the main cause of deterioration in perishable goods and it has to get rid of, hence, pot in pot evaporative cooler could be used in New Bussa, Nigeria for a period of dry season when the temperature is high and relative humidity is low.

12. Recommendation

Based on the result obtained from this study, it was recommended that pot in pot could be used to store Okra especially during the dry season. Also, further research was recommended to determine if pot in pot could be used in storing animal feeds since it can perfectly store fruit and vegetables for a period of time.

References

[1] Dadhich, S.M., Dadhich. H. and Verma, R.C. (2008). Comparative study on storage of fruits and vegetables in evaporative cool chamber and in ambient. *Intl. J. Food Eng.* 4(1):1–11.
[2] Longmone A.P. (2003). *Evaporative cooling of good products by vacuum. Food Trade Rev* (Pennwalt Ltd) 47:13–16.
[3] Mentzer, J.E. and Dale, A.C. (1960). Evaporative Cooling of Animal Shelters. *Journal of American Society of Agricultural Engineers*. 816-819, 821.
[4] Ngure, J.W., Joseph, N., Aguyoh, G. and Goaquiong, L. (2009). Interactive effects of packaging and storage temperatures on the shelf-life of Okra. *ARPN J. Agric. Bio. Sci.*, 4(3): 43-52.
[5] Olusunde W. A., Igbeka, J.C. and Taiwo, O. O. (2009). Performance Evaluation of absorbent materials in Evaporative Cooling System for the Storage of Fruits and Vegetable. *International Journal of food Engineering*. Vol. 5, Issue 3

*Corresponding author.
E-mail address: olafa2012@ gmail.com