



Efficacy of bio-based extracts on shelf life and quality attributes of orange fruits during storage in Makurdi



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Abstract

Over the years, extending the shelf life of harvested Orange produce has been a major challenge in Sub Sahara Africa. Most of the recommended Postharvest treatment methods and technologies developed over the years for enlongating shelf life and maintaining post-harvest qualities of Orange fruits are not accessible and affordable to the local farmers in most developing countries including Nigeria. Even though lots of researchers have worked on various synthetic chemicals like mancozeb, benomyl and carbendazim to control the postharvest diseases of fruits and to improve its storage life, the use of these synthetic preservatives poses serious health hazards and leads to environmental pollution. With the growing health consciousness among people and increasing consumer demand for pesticide residue free agricultural commodities, I am motivated to find better alternatives that are cost effective, non-toxic and ecofriendly with low residual action to prevent disease infections and maintain post-harvest quality of Orange fruits.

INTRODUCTION

- Sweet orange (*Citrus sinensis* L.) belonging to the family Rutaceae is one of the most widely grown fruit crops in the world.
- Sweet orange is a major source of vitamins, especially vitamin A, C, D, B1 and B2 as well as sufficient amount of folacin, calcium, iron, potassium, thiamine, niacin and magnesium with high antioxidant potential.
- The world total Orange production is 146.6 million metric tonnes with Nigeria contributing 4.1 million metric tonnes of the total world production.
- *Aloe vera* gel and Gum arabic is applied to fruits as an edible coating which has been widely used for most fruits and vegetables.
- Edible coatings have various favourable effects on fruits such as imparting a glossy appearance and better colour, retarding weight loss, or prolonging storage/shelf life by preventing microbial spoilage



STATEMENT OF THE PROBLEM

- The accessibility and affordability of advanced technologies to the local farmers is limited in most developing countries including Nigeria.
- The use of synthetic chemical preservatives poses serious health hazards and leads to environmental pollution.
- Developing an alternative method that is cost effective, non-toxic and eco-friendly with low residual action to prevent disease infections and maintain post-harvest quality of fruits is very important in extending the shelf life of harvested orange fruits.

SIGNIFICANCE OF THE STUDY

- The outcome of this study will contribute to the already existing knowledge on the use of edible coating for the preservation of fruits by providing alternative methods of preservation using *Aloe vera gel* and *Gum arabic* to control post harvest losses.
- The use of bio-based extracts on produce will provide environmentally safe, cheap and acceptable postharvest control measures to both farmers and consumers.

AIM AND OBJECTIVES OF THE STUDY

- The aim is to evaluate the effect of bio-based extracts on shelf life and quality attributes of orange fruits during storage.
- The objectives of the study are to;
 - Evaluate the effect of *Aloe vera gel*, *Gum Arabic*, and the mixture of *Aloe vera gel* and *Gum arabic* on shelf life and quality of orange fruits during storage
 - Isolate and Identify fungal organisms causing decay of orange fruits during storage and test their pathogenicity
 - Determine the phytochemical constituents present in *Aloe vera gel* and *Gum arabic*.

Experimental Design and Randomization of Treatments

- The experiment will be laid out in Completely Randomised Design (CRD) with a factorial arrangement and replicated three (3) times. The factors will be Two (2) varieties of Orange fruits; Valencia and Washington and Three (3) treatments; *Aloe vera gel*, *Gum arabic* and mixture of *Aloe vera gel* and *Gum arabic* plus a control
- Treatment Combinations = 2 x 4 = 8
- Number of Replications = 3
- Total plots therefore = 3 x 8 = 24
- Each plot will contain 8 fruits = 8 x 24 = 192 fruits.

Experimental Procedure:

Cleaning → Immersion in Bio-based extract(*Aloe vera*, Gum Arabic, and mixture of *Aloe vera* and Gum arabic).

Data will be taken at 0, 1, 2, 3 and 4 weeks. ← Storage ← Air drying

EXPERIMENT ONE Evaluation of Bio-based Extracts on Shelf life and Quality of Orange Fruits during Storage

- The cleaned fruits will be completely immersed in the medium of *Aloe vera gel*, *Gum arabic* and mixture of *Aloe vera gel* and *Gum arabic* and allowed to stay for two to four minutes
- they will be removed, air dried and placed in plastic crates and stored at room temperature.
- Observations will be taken at 0, 1, 2, 3 and 4 weeks respectively.

- Data to be collected include;
- Total Soluble Solid (TSS) (° Brix)
 - Weight Percentage (g).
 - Fruit Firmness (N/cm)
 - Decay Percentage (DP %)
 - Ascorbic Acid Content (mg/ml)
 - pH
 - Reducing Sugars (%)
 - Temperature and relative humidity (°C/%)
 - Titratable Acidity (TTA) (%)
 - Marketability

MATERIALS AND METHODS

Healthy Oranges of two varieties (Valencia and Ibadan sweet) will be harvested manually using a secateur to cut at the bottom of the fruits at harvest maturity from a known farm at Vandeikya Local Government Area of Benue State.

EXPERIMENT THREE

- **Determination of Phytochemical Constituents present in *Aloe vera gel* and *Gum arabic*:** This will be determined using Gas Chromatography – Mass Spectrophotometry (GC-MS) analysis.

DATA ANALYSIS

The data obtained from the study will be subjected to analysis of variance (ANOVA) using GENSTAT statistical package. Means will be separated by using Least Significance Difference (F-LSD) at 5% level of probability.

EXPERIMENT TWO

Isolation, Identification and Pathogenicity of Fungi Pathogens causing Decay of Orange Fruits.

- **Media Preparation:** The media that will be used for isolation of spoilage organisms will be Potato Dextrose Agar (PDA) which will be prepared according to the manufacturer's instruction.
- **Isolation of Fungi:** Small sizes will be cut from orange fruits infected with rot and surface sterilize by dipping in 1% (NaOCl) solution for 1 minute. Then removed and rinsed in several changes of sterile distilled water then placed on sterile paper towel to dry.
- They will then be placed on solidified PDA medium. Three replications will be made for each sample
- The inoculated plates will incubated at room temperature and observation will be made for microbial growth. Sub-culturing will be done to obtain pure cultures of the isolate.
- **Identification of Fungal Isolates**
- **Pathogenicity Studies:** The method adopted by Ezeibekwe and Ibe (2010) will be used in this study.



CONCLUSION AND RECOMMENDATIONS

- Conclusion and recommendations will be drawn from the results and table of test carried out on the Bio-based extracts used in the preservation of the orange fruit.

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