Effect of kitchen ash and that from oil palm inflorescences in the conservation of perishable products in Mbujimayi

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Abstract: Production of market garden crops play a major role in human nutrition by providing vitamins, amino acids, trace elements such as iron, zinc, etc. on the one hand and on the other hand they contribute significantly to the income of families in sub-saharan Africa. However, the great difficulty encountered by households in the tropical region in general and in particular in Mbujimayi, is the conservation of market garden crops for a long period of time and the losses recorded are around 40 – 50%, or even more. This is how a conservation test based on kitchen ash and that from oil palm inflorescences was carried out in the town of Mbujimayi in boxes of 1350 cm2 (45 cm long x 30 cm wide) during the period from August 10 to September 6, 2021, i.e. one (1) month and 4 days of storage. The treatments consisted of T0 (the control treatment), T1 (the cooking ash) and T2 (the ash of the oil palm inflorescences). Thus, for treatments T1 and T2, each room had received 4 glasses (one glass weighs approximately 70g) of kitchen ash and that of oil palm inflorescences. After experimentation, it appears that the kitchen ash preserved better (for at least 20 days under ambient conditions) the pepper, tomato and cucumber (Tables 1, 2 and 3) compared to the ash of the inflorescences of the palm and the witness.

Keywords: Conservation, perishable products, kitchen ashes and oil palm inflorescences, Mbujimayi, RD. Congo

I. Introduction

In the agricultural production system, vegetable crops play a major role in human nutrition by providing vitamins, amino acids, trace elements such as iron, zinc, etc. on the one hand (Agassounon, et al., 2012) and on the other hand they contribute significantly to family income in sub-Saharan Africa (Scheepens et al., 2011; Combris et al., 2007; Guede, 2009; Kaanane, 1998; FAO, 1996) .

In DR. Congo, this sector supplies the markets with more than 8 million tons of fruit vegetables per year (Guede, 2009; PADAP, 2008). Among these fruit-vegetables, the most cultivated are the pepper (Capsicum annum L.), the cucumber (Cucumis savitus L.) and the tomato (Lycopersicon esculentum Mill) which occupy a place of choice both nutritionally and economically (Anonymous, 2021; Guede, 2009; Roger, 1971).

However, the great difficulty encountered by households in the tropical region in general and in particular in Mbujimayi, is the preservation of perishable foodstuffs for a long time given that they rot quickly during storage causing losses estimated 40 – 50 %, or even more (Scheepens et al., 2011; Kaanane, 1998; FAO, 1996).

This state of affairs in Mbujimayi is experienced acutely and is said to be due to the lack of electric current, thus forcing households to regularly obtain fruit vegetables such as: peppers, tomatoes and cucumbers in the various markets of the city or even when they have a large quantity, they spread them on the ground on the pavement at room temperature to avoid their rotting (CTA, 2008; Akpavi et al., 2007). Thus, conservation techniques such as freezing and refrigeration are difficult to recommend in the current context of the city of Mbujimayi due to the lack of power. To this end, the use of techniques for preserving perishable foods that make use of locally available resources such as

ashes, would be an appropriate solution, in the sense that it is widely used in the fight against insects, weeds smells, in hand disinfection and in food preservation in rural areas (Scheepens et al., 2011; Djidji, 2005).

It is with this in mind that a conservation trial for peppers, tomatoes and cucumbers based on cooking ash and that from oil palm inflorescences was initiated and carried out in the town of Mbujimayi with a view to to appreciate the effectiveness of these two ashes in the conservation of fruit vegetables. To achieve this objective, a test was installed in boxes of 1350 cm2 (45 cm long x 30 cm wide) in Mbujimayi during the period from August 10 to September 6, 2021, i.e. one (1) month and 4 days. conservation.

II. General information on food preservation

Food preservation is a set of processing processes that preserve the taste and nutritional properties of foodstuffs (Nimpagaritse, 2019; Scheepens et al., 2011; CTA, 2008).

II.1. Benefits of storing vegetables - fruits

(1) Fresh vegetables begin to lose their qualities as soon as they are harvested, subsequently being damaged, withered and eventually rotten; (2) Storing leafy vegetables and fruits in a cool place allows them to be preserved for a long time; (3) Drying fresh leafy vegetables and fruits reduces their volume and weight, making them easier to store and transport, and avoiding wastage; (4) Storing and drying fruits and vegetables provides the family with a better diet throughout the year, also earning more money (CTA, 2008).

II.2. Factors influencing the preservation of vegetables – fruits

a. Internal factors

After harvest, agricultural products are still alive and their life processes continue. They breathe and use the oxygen in the air to burn their reserves. Their volume decreases and they produce carbon dioxide and heat. The maturation process also continues. The fruits often change color as they ripen and their flesh gradually softens. Then the fruit is overripe and unfit for consumption. Respiration, maturation and water loss are internal factors that determine the quality of stored vegetables and fruits (Scheepens et al., 2011; CTA, 2008).

b. External factors

External factors, which also play an important role in the loss of quality and quantity of stored products, include:

Mechanical damage: Fresh fruits and vegetables are often at risk of being cut due to their tender texture and high moisture content. Careless, improper handling and poor packaging during storage and transport cause bruises, cuts, breaks, bruises or otherwise damage fresh fruits and vegetables (Scheepens et al., 2011; CTA, 2008).

Microorganisms (fungi and bacteria): after harvest, the natural defense mechanisms of agricultural products decline rapidly. Roots, tubers, fruits and vegetables are then easily infected by bacteria and fungi (molds). Both types of microorganisms thrive in products that contain sufficient moisture and cause them to rot (Scheepens et al., 2011; CTA, 2008).

III. General information on cooking ash and that of oil palm inflorescences

Ash is a basic residue from the combustion or incineration of organic materials, and by extension of products such as coal, lignite or various wastes burned in incinerators, in the open air or in chimneys or ovens. Their composition varies according to the types of plant species burned, the parts of the plants (bark, trunk, or young branches for example), etc.

Thus, the ashes of cooking and inflorescences of the oil palm serve many purposes in African households, it is used: (1) to wash linen and remove stains from clothes; (2) to eliminate bad odors; (3) to brush teeth and whiten yellowed teeth; (4) to manage the problem of blood pressure (ash of the inflorescences of the oil palm: KCl). For this purpose,

the ash from the inflorescences of the palm tree is recommended for people who are intolerant to cooking salt (NaCl); (5) The ash from cooking and from the inflorescences of the palm tree is used as a fertilizer or amendment and helps to increase the pH level of the soil and thus promotes plant growth. (6) to protect the plants from frost during periods of extreme cold and, (7) to preserve vegetables - fruits for a long time, fill the container with ashes, then place your fruits, taking care that they do not touch each other not.

IV. Materials and Method

IV.1. Study environment

The pepper, tomato and cucumber fruit conservation trial was set up in the town of Mbujimayi in Kasai-Oriental.

IV.2. Materials

Pepper, tomato and cucumber fruits were purchased at the Bakwadianga market and used as biological material. Also the inflorescences of the oil palm for obtaining ash. The wooden boxes (1350 cm^2, i.e. 45 cm long x 30 cm wide) were used to preserve the fruits.

IV.3. Methodology

To achieve the objective of this study, a conservation trial was installed in boxes of 1350 cm2 (45 cm long x 30 cm wide) in Mbujimayi in the commune of Diulu. The direct observation technique made it possible to assess the effectiveness of kitchen ash and that from oil palm inflorescences in the conservation of peppers, tomatoes and cucumbers under the mesological conditions of Mbujimayi.

IV.3.1. Experimental apparatus

The conservation trial was set up under a full randomized experimental design with three replicates. Thus, three (3) boxes of 1350 cm2 (45 cm long x 30 cm wide) each partitioned into three chambers of 15 cm x 30 cm made it possible to constitute the following treatments: T0 (control treatment), T1 (ash of kitchen) and T2 (ash from oil palm inflorescences). It should be noted that each small room, for treatments T1 and T2, had received 4 glasses of kitchen ash and that of oil palm inflorescences (one glass weighs about 70g).

IV.3.2 Conduct of the trial

The trial was installed during the period from 08/10 to 09/6/2021. The following operations were carried out: (1) Obtaining the ash: the ash from the kitchen was collected under the brazier, then it was sifted to obtain a finished powder on August 12, 2021. With regard to the ash male inflorescences of the oil palm, we harvested the inflorescences on the oil palm, on August 10, 2021, we incinerated them, then sieved to collect ash on 08/12/2021. (2) Purchase of fruits: peppers, tomatoes and cucumbers were purchased at the Bakwadianda market (local market) on August 13, 2021. (3) Start of the experiment on August 14, 2021. Each small room had received five fruits of pepper, tomato and cucumber; then covered them with ashes. For the entire experiment, we respectively used 45 fruits of pepper, tomato and cucumber arranged in 9 boxes of 1350 cm2 (45 cm long x 30 cm wide) at the rate of 3 boxes per fruit, that is i.e. three crates for pepper, tomato and cucumber.

IV.3.3. Observation Parameter

During the study, only one parameter was observed, it is the shelf life (in days).

IV.3.4. Statistical Data Analysis

Statistical analysis of data was performed with Statistix 8.0 software. In order to separate the means and assess the effectiveness of the different treatments, the analysis of variance (ANOVA) was completed by the LSD test at the 5% threshold to identify the treatment(s).) which differ(s) significantly from the others. Thus, this significant difference between the means is marked by the different alphabetical letters (a, b, c, etc.).

V. Résultats

In this point, we present the effect of kitchen ash and that from oil palm inflorescences in the conservation of pepper, tomato and cucumber.

Table 1. Effect of cooking ash and that of oil palm inflorescences in the conservation of peppers

Treatments	Shelf life in days	
	50% decay (partial decay) ± Standard deviation	100% decay (partial decay) ± Standard deviation
T0	9.00c±1.00	11.00c±1.00
T1	18.67a±2.31	27.00a±2.65
T2	12.67b±1.16	19.33b±1.53
Mean	13.44	19.11
CV(%)	11.89	9.71
LSD(5%)	1.31	1.52

The means followed by the same letter do not differ significantly at the 5% level according to the LSD test

Reading Table 1 reveals after analysis of variance that half of the pepper fruits rotted 18.7 days after storage for treatment T1 (kitchen ash), 12.67 days for T2 (ash from palm inflorescences oil) and 9 days for the control (T0) (LDS0.05=1.31). However, the same table indicates that total rot occurred 27 days after storage for treatment T1 (kitchen ash), 19 days after storage for treatment T2 (ash from oil palm inflorescences) and 11 days after preservation for the control (T0) (LDS0.05=1.52).

Table 2. Effect of kitchen ash and that of oil palm inflorescences in the preservation of tomato

Treatments	Shelf life in days	
	50% decay (partial decay) ± Standard deviation	50% decay (partial decay) ± Standard deviation
T0	5.33c±1.53	8.33c±1.53
T1	13.67a±1.53	26.00a±3.61
T2	9.00b±1.00	19.33b±4.16
Mean	9.33	17.89
CV(%)	14.73	18.45
LSD (5%)	1.12	2.69

The means followed by the same letter do not differ significantly at the 5% level according to the LSD test.

According to Table 2, partial fruit rot occurred 13.67 days after storage for treatment T1 (kitchen ash), 9.33 days after storage for T2 (ash from oil palm inflorescences) and 5. 33 days after storage for T0 (the control) after analysis of variance. As for total fruit rot, it occurred 26 days later for T1 (kitchen ash), 19.33 days later for T2 (ash from oil palm inflorescences) and 8.33 days later for T0 (the control) according to the analysis of variance.

Table 3. Effect of kitchen ash and that of oil palm inflorescences in the preservation of cucumber fruits

Treatments	Shelf life in days	
	50% decay (partial decay) ± Standard deviation	**50% decay (partial decay) ± Standard deviation**
T0	6.00b±1.00	8.33c±0.58
T1	20.33a±2.89	26.00a±2.65
T2	14.67a±4.04	20.33b± 1.53
Mean	13.667	18.22
CV(%)	21.40	9.85
LSD (5%)	2.39	1.47

The means followed by the same letter do not differ significantly at the 5% level according to the LSD test.

According to Table 3, the analysis of variance shows that the rotting of half of preserved fruits (50% rots) took place 20.33 days after preservation for the treatment based on kitchen ash (T1), 14 67 days after storage for the treatment based on the ash of oil palm inflorescences (T2), 6 days after storage for the control (T0). The same table tells us that total rotting of preserved fruits occurred 26 days later for treatment T1 (kitchen ash), 20.33 days later for treatment T2 (ash from oil palm inflorescences) and 8, 33 days later for the control according to the analysis of variance.

VI. Discussion

In view of the results given in Tables 1, 2 and 3, it appears that the treatment based on kitchen ash (T1) preserved for a long time the pepper, the tomato and the cucumber compared to the ash of the inflorescences of the oil palm (T2) and the control. The difference observed between cooking ash (T1) and that of oil palm inflorescences (T2) would be explained by the active ingredients contained in cooking ash which act both as a fungicide and a bactericide, which is why we uses it in the fight against orchid rot, in bacterial development and in the fight against bad smells. These two characteristics would have influenced the extended shelf life of bell pepper, tomato and cucumber. The results of this study corroborate with those found by Ndabashinze 2017 and Spritzi, 2020.

VII. Conclusion

To close this study, which had the theme: "effect of kitchen ash and that from oil palm inflorescences in the conservation of perishable products in Mbujimayi". Let us recall the objective of the study, which was to assess the effectiveness of kitchen ash and that of palm inflorescences in the preservation of perishable foodstuffs such as peppers, tomatoes and cucumbers.

To achieve this objective, a conservation trial was set up in complete randomized devices comprising three treatments, namely: T0 (control treatment), T1 (cooking ash) and T2 (ash from oil palm inflorescences). note that the 1350 cm2 boxes (45 cm long x 30 cm wide) were partitioned into three small rooms of 15 cm x 30 cm to constitute treatments T0, T1 and T2. Thus, for treatments T1 and T2, each room had received 4 glasses (one glass weighs approximately 70g) of kitchen ash and that of oil palm inflorescences. Before covering the chambers with ashes, we previously placed five fruits of pepper, tomato and cucumber; thus for the whole experiment 45 fruits of pepper, tomato and cucumber were used and arranged in 9 boxes, at the rate of 3 boxes per fruit, that is to say three boxes for the pepper, the tomato and the cucumber.

After experimentation, it appears that kitchen ash significantly lengthened the shelf life of peppers, tomatoes and cucumbers (Tables 1, 2 and 3) compared to ash from palm inflorescences and the control; therefore we recommend it to households in Mbujimayi in particular and those in the DR. Congo and sub-Saharan Africa in general use it to preserve their vegetables - fruits for at least 20 days under room temperature conditions, but to succeed in this technique, you must ensure that the fruits do not touch each other not.

VIII. Bibliographic references

1. Amar Kaanane, 1998. Postharvest Handling Methods for Smallholders: A Manual for Horticultural Crops, Hassan II Agronomic and Veterinary Institute, Rabat, Morocco, 221p
2. Anonymous (2021) Technical sheet in organic farming; cucumber cultivation in French Polynesia.
3. CTA, 2008. Conservation of leafy vegetables and fruits, CTA Practical Guides Collection, No 8, ISSN 1874-8864, 4p
4. Dévote Nimpagaritse, 2019. Guide to good practices, Fruit and vegetable production, technical guide to the production of fruit and vegetable crops, Bujumbura, 90p
5. FAO, 1996: Strategies and action plan, support for the intensification of market gardening and fruit production in urban and peri-urban areas, Ministry of Agriculture and Rural Development, Zaire, 12-16p.
6. Louise de Spritzi, 2020. Storing tomatoes: the experience in ashes. (https://spritzi.com/newblog/2020/07/19/conserver-ses-tomates-experience-dans-la-cendre)
7. Michelline Agassounon Djikpo Tchibozo, Selma Gomez, Fidèle Paul Tchobo, Mohamed M. Soumanou and Fatiou Toukourou, 2012. Tomato preservation trial by the technique of dehydration impregnation by immersion (Dii) In Int. J. Biol. Chem. Science. 6(2): 657-669
8. PADAP (Support program for peri-urban agricultural development in Kinshasa) 2008 Memento: technical and economic market gardening in Kimwenza (Kinshasa) agricultural practices and crop sheets, 30p.
9. Pierre Combris, Marie-Jo Amiot-Carlin, France Caillavet, Mathilde Causse, Jean Dlongville, Martine Padilla, Catherine Renard, Louis-Georges Soler, 2007. Fruits and vegetables in the diet, Issues and determinants of consumption, Scientific expertise collective INRA, ed. Quae, 20p
10. Piet Scheepens, Rik Hoevers, Francis Xavier Arulappan, Gerard Pesch, 2011. Storage of Agricultural Products, Agromisa Foundation and CTA, Wageningen, 84p
11. Rénovat Ndabashinze, 2017. Ash to preserve tomatoes (https://www.iwacu-burundi.org/de-la-cendre-pour-conserver-les-tomates)
12. S. Akpavi, M. Banoin, K. Batawila, R. Vodouhe and K. Akpagana, 2007. Farmer Strategies for the Conservation of Some Plant Genetic Resources in the Middle Mono in Togo in African Agronomy 19 (3): 337 - 349