Studies On the Storage Stability of Dried Foods (Onion) in Glass and Plastic Packaging Materials

Ahamad Tijjani Halliru*[1], Mohammed Audu[*2] and Abubakar Dauda Sarawa*[3]

[1]*Department of environmental health technology; Mai Idris Alooma Polytechnic P.M.B 1020 Geidam, Yobe state, Nigeria.*
[2]*Department of science laboratory technology; Mai Idris Alooma Polytechnic P.M.B 1020 Geidam, Yobe state, Nigeria.*
[3]*Department of food science and technology; Kaduna Polytechnic Kaduna, Kaduna state, Nigeria.*

ABSTRACT

Fresh onion was sliced and dried at temperature of 43^{o}c using dome drier. The dried onion was packaged in in two different packaging materials, that is glass and plastic. Each of the packaging was produced in eight packs as sample for weekly analysis. The storage stability and microbial loads were determined after each week for eight consecutive weeks. Following the analysis, the result shows that the moisture content decreased uniformly from week '0' to week '7' in the range of (8.53% -8.57%). After the eighth week it was discovered that the samples in both glass and plastic packs were within acceptable range but, glass was found to be better for packaging dried foods (onion) since the microbial loads were found to be low.

Keywords: *Packaging, Plastic, Glass, Dried foods*

Introduction

Food packaging has evolved from simply a container to hold food, to something today that can play an active role in food quality (Risch, 2009). Thousands of years back, natural materials such as skin, reeds, grasses and e.t.c were the only materials use for packaging foods. As ore and metals were discovered, and metals and pottery were developed leading to invention of other packages. An approximate chronology is as follows.

20,000 years ago ceramic amphorae were developed in the Middle East.

5,000 years ago- wood barrels, boxes, crates wooden boxes were found in Egyptian tombs.

3,500 years ago - mass produced ceramics and pottery inventions of the pottery wheel.

2,500 years ago- glass containers, glass blowing developed by the Phoenicians and Syrians.

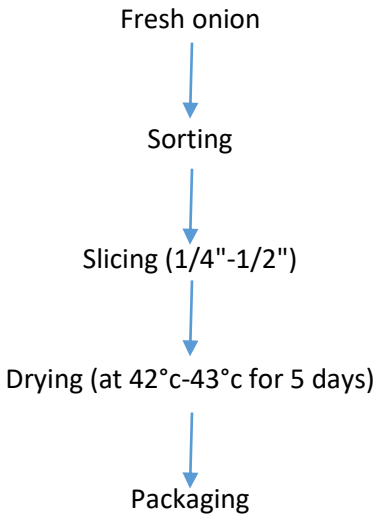
2000 years ago - paper and cellulose fiber but not true papers were developed.

In last 100 years many changes and advances have been seen in food packaging as a result of huge social change (Reduce packaging, 2011. In 1980s, study in Russia show that lack of packaging distribution and storage facility resulted in annual losses of 45% of fresh vegetable, as high as 70% potato, 55% fresh fruits, 50% grain, one million tons of meat and one and half million tons of fish. Notable advances in packaging in the 20th century include aluminum foil containers in 1950s, heat shrinkable plastic films - 1958, styrene foam 1930-1950, PETE (polyethylene terepthalate) containers in 1977. (Scrib, 2011).

Food packaging can be defined as a complex and dynamic system aiming to safely prepare foods for transportation, distribution, storage, retailing, handling and end-use, and safely deliver the foods to consumer in a sound condition and acceptable quality. (Floros, 1993). Food packaging lies at the very heart of the modern food industry and very few foods are sold unpackaged. Good packaging prevent waste and ensure that the food retains its desired quality throughout its shelf life. (G.L. Robertson 2014) Food packaging is an integral component of food industry and help to store foods and beverages in hygienic manner. At times food packaging can be cause of concern for food safety and its efficacy to provide what is expected. Sometimes packaging materials such as certain types of plastic, polythene and Styrofoam can release toxins when they are heated and can be dangerous to consumers. Some packaging materials irradiated with the food can transfer unsafe non-food substances in to the food. The packaging makes use of variety of substances including dyes for colorful labels, glues and adhesives for keeping package closed. (R.K. Gupta and P. Dudeja, 2017).

Methodology

Fresh onions obtained, and the chemical and reagents are of analytical grade obtained from Analysis Laboratory Department of Food Science and Technology University of Maiduguri, Mohammad Goni College of Agriculture, Maiduguri. And the department of science laboratory technology Mai Idriss Alooma polytechnic, Geidam. The fresh onions are selected, the buds and scales were removed carefully, with minimum loss of the onion flesh. The onions are then sliced using a very sharp knife into 4 2. It was then spread thinly on trays before placing in to dome drier. It was allowed to dry in the drier at temperature of 42-43°c during the day time. The drying was achieved in five days with turning the sliced onions in the tray at interval of 5-6hours hours to avoid sticking and decay. The dried onions are packed under clean and hygienic condition.



Flow chart for dried onion.

Microbial Analysis

The following media were prepared and used during the analysis. Potato dextrose agar (PDA) Nutrient agar (NA) Eosine methylene blue agar (EMBA) Deoxycholate citrate agar (DCA) Manitol salt agar (MSA).

Potato Dextrose Agar (PDA): PDA was the nutrient medium used for mold growth detection. The preparation of the medium involved boiling of 200g of peeled potato, already cut in to pieces in one liter of water for 30 minutes. It was then filtered and 15g of glucose was dissolved in the filtrate with 20g of agar. One capsule of chloramphenicol capsule was dissolved in 10 ml of ethanol and 4ml of the solution was added to the medium this was followed by autoclaving at 121°c and pressure of 15 bar, then allowed to cool below 40^0c before pouring. (Horrigan and McCance,1976). This medium supports the growth for bacteria that has no special nutritional requirements (Total aerobic plate count). In preparing the medium 28g of the nutrient agar was dissolved in one liter of distilled water and sterilized in autoclave at 121°c and pressure of 15 bar and them cooled to 40°c before pouring and inoculation (Horrigan and Mc Cance, 1976).

Eosine Methylene Blue Agar (EMBA) This medium was used for the detection of E. coli growth. 37.5g of the agar was dissolved in one liter of distilled water (Horrigan and Mc Cance, 1976).

Deoxycholate Citrate Agar (DCA)This medium was used for salmonella and shigella detection. For the medium preparation 48g of the agar was dissolved in one liter. It was placed on heat at 80^0c with agitation to dissolved it completely (Collins and Lyne, 1970).

Manitol Salt Agar (MSA) Manitol salt agar was used to distinguish staphylococcus from non-staphylococcus. For the preparation of the medium 11.08g of the agar was dissolved in one liter of distilled water. (Collins and Lyne, 1970).

Results and Discussion

The table below show the mould growth in the three samples for eight different weeks. The result shows no any mould growth in any of the sample in week 0. In week 1 and 2 show growth only in sample packed in tetra-pack. Growth were observed in both packages from week 3 to week 7, with tetra-pack having slightly higher growth compared to glass and plastic. The growths

observed are within the acceptable limit since they did not exceed 10cfu.

Mould growth in the samples

Week	Glass	Plastic	Tetra-pack
0	N.D	N.D	N.D
1	N.D	N.D	1.3 x 10^1cfu/100g
2	N.D	N.D	1.4 x 10^1cfu/100g
3	1.2 x 10^1cfu/100g	1.0 x 10^1cfu/100g	1.9 x 10^1cfu/100g
4	1.4 x 10^1cfu/100g	1.3 x 10^1cfu/100g	2.3 x 10^1cfu/100g
5	1.7 x 10^1cfu/100g	1.9 x 10^1cfu/100g	2.7 x 10^1cfu/100g
6	1.9 x 10^1cfu/100g	2.2 x 10^2cfu/100g	1.6 x 10^2cfu/100g
7	2.2 x 10^2cfu/100g	2.6 x 10^2cfu/100g	1.9 x 10^2cfu/100g

Microbial Analysis Results

Microbial analysis of each of the three packs was carried out weekly to determine the bacterial loads in the packaged samples. The results are as tabulated below:

Coliform Count

Week	Glass	Plastic	Tetra-pack
0	N.D	N.D	N.D
1	N.D	N.D	1.3 x 10^1cfu/100g
2	N.D	N.D	1.4 x 10^1cfu/100g
3	N.D	N.D	1.6 x 10^1cfu/100g
4	1.5 x 10^1cfu/100g	1.1 x 10^1cfu/100g	2.9 x 10^1cfu/100g
5	1.8 x 10^1cfu/100g	1.4 x 10^1cfu/100g	2.3 x 10^1cfu/100g
6	1.4 x 10^2cfu/100g	1.7 x 10^2cfu/100g	2.1 x 10^2cfu/100g
7	2.6 x 10^2cfu/100g	1.9 x 10^2cfu/100g	2.6 x 10^2cfu/100g

E. Coli Count

Week	Glass	Plastic	Tetra-pack
0	N.D	N.D	N.D
1	N.D	N.D	1.1 x 10^1cfu/100g
2	1.0 x 10^1cfu/100g	1.2 x 10^1cfu/100g	1.3 x 10^1cfu/100g
3	1.4 x 10^1cfu/100g	1.2 x 10^1cfu/100g	1.5 x 10^1cfu/100g
4	1.5 x 10^1cfu/100g	1.3 x 10^1cfu/100g	1.8 x 10^1cfu/100g
5	1.7 x 10^1cfu/100g	1.4 x 10^1cfu/100g	2.4 x 10^1cfu/100g
6	1.2 x 10^2cfu/100g	1.3 x 10^2cfu/100g	2.0 x 10^2cfu/100g
7	1.4 x 10^2cfu/100g	1.5 x 10^2cfu/100g	2.6 x 10^2cfu/100g

Salmonella Count

Week	Glass	Plastic	Tetra-pack
0	1.0 x 10^1cfu/100g	1.0 x 10^1cfu/100g	1.4 x 10^1cfu/100g
1	1.3 x 10^1cfu/100g	1.1 x 10^1cfu/100g	1.9 x 10^1cfu/100g

2	1.6 x 10^1cfu/100g	1.2 x 10^1cfu/100g	1.4 x 10^1cfu/100g
3	1.7 x 10^1cfu/100g	1.3 x 10^1cfu/100g	2.9 x 10^1cfu/100g
4	1.9 x 10^1cfu/100g	1.5 x 10^1cfu/100g	3.4 x 10^1cfu/100g
5	1.0 x 10^2cfu/100g	1.2 x 10^2cfu/100g	3.7 x 10^1cfu/100g
6	1.4 x 10^2cfu/100g	1.4 x 10^2cfu/100g	2.3 x 10^2cfu/100g
7	1.6 x 10^2cfu/100g	1.7 x 10^2cfu/100g	2.6 x 10^2cfu/100g

Shigalla Count

Week	Glass	Plastic	Tetra-pack
0	N.D	N.D	N.D
1	N.D	N.D	1.3 x 10^1cfu/100g
2	N.D	N.D	1.9 x 10^1cfu/100g
3	1.5 x 10^1cfu/100g	1.2 x 10^1cfu/100g	2.3 x 10^1cfu/100g
4	1.7 x 10^1cfu/100g	1.3 x 10^1cfu/100g	2.6 x 10^1cfu/100g
5	1.8 x 10^1cfu/100g	1.6 x 10^1cfu/100g	2.8 x 10^1cfu/100g
6	1.2 x 10^2cfu/100g	2.0 x 10^2cfu/100g	2.0 x 10^2cfu/100g
7	1.4 x 10^2cfu/100g	2.3 x 10^2cfu/100g	2.4 x 10^2cfu/100g

Staphylococcus Count

Week	Glass	Plastic	Tetra-pack
0	N.D	N.D	N.D
1	1.4 x 10^1cfu/100g	1.0 x 10^1cfu/100g	1.5 x 10^1cfu/100g
2	1.5 x 10^1cfu/100g	1.2 x 10^1cfu/100g	1.7 x 10^1cfu/100g
3	1.7 x 10^1cfu/100g	1.4 x 10^1cfu/100g	2.3 x 10^1cfu/100g
4	1.9 x 10^1cfu/100g	1.6 x 10^1cfu/100g	2.7 x 10^1cfu/100g
5	2.3 x 10^1cfu/100g	1.9 x 10^1cfu/100g	2.9 x 10^1cfu/100g
6	2.1 x 10^2cfu/100g	2.0 x 10^2cfu/100g	2.1 x 10^2cfu/100g
7	2.4 x 10^2cfu/100g	2.4 x 10^2cfu/100g	2.4 x 10^2cfu/100g

Conclusions

According to the results of the current investigation, *L. Inermis* leaves have strong antibacterial ability against both grams positive and gram negative bacterial strains. The antibacterial activity of *L. Inermis* leaf extract was shown to be rather excellent when compared to the conventional antibiotics examined under identical circumstances. so that following a clinical investigation, it might be suggested as a green alternative to synthetic antibacterial medicines. Natural resources eloquently show the necessity of continuing discovery to the innovative research for a promising future due to environmental safety and eco-preservation.

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