SHELF LIFE OF GRAPE FRUIT PEEL PRESERVED CATFISH (*Clarias gariepinus*)

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ABSTRACT
Hot water extract of grape fruit peel (Citrus paradisa) was used as a preservative for catfish (Clarias gariepinus) to determine if it can extend its shelf life and how the dipping duration affects this. It was observed that hot water extract of grape fruit peel was able to extend the shelf life of catfish (Clarias gariepinus) from the 20 hours to between 24 and 26 hours post – slaughter after which it became unfit for consumption. Also, the dipping duration did not affect the preservative action of hot water extract of grape fruit peel on the fish. Thus, it means that grape fruit peel extract only required a contact with fish for some time to exert its preservative action on it.
Keywords: citrus peel, food spoilage, alternative antimicrobials

INTRODUCTION

Shelf life of fish can be defined as the time during which it remains stable and retains its desired qualities. Shelf life is different from expiration date in that the former relates to food quality while the latter to food safety. Food spoilage is a metabolic process that causes food to be undesirable or unacceptable for human consumption due to changes in sensory and nutritional characteristics (Doyle, 2007).

A preservative is a natural or synthetic chemical that is added to products such as foods, pharmaceuticals, paints, biological samples and wood to prevent decomposition by microbial growth or by undesirable chemical changes. Except the food grown in home gardens, all food products have preservative. Every manufacturer adds preservative to the food during processing. The purpose is generally to avoid spoilage during the transportation period. Because food is so important to survival, food preservation is one of the oldest technologies used by human beings (Foulke, 1993).

Fish is a very high protein source and its demand is higher than what local production can meet. Despite the inability of the local fish production to meet the corresponding demand, large quantities of fish is lost to post-harvest losses in Nigeria. Natural preservation methods have also been abandoned for synthetic methods which have now been discovered to have adverse effects on the health of the final consumers of fish; leading to cancer and lung problems. There has been increasing concern of consumers about foods free from or with low levels of chemical preservatives because these could be toxic to humans (Borris, 1996). Concomitantly, consumers have also demanded for foods with long shelf-life and low risk of causing food borne diseases. This perspective has put pressure on the food industry for progressive removal of chemical preservatives and adoption of natural alternatives to achieve its goals concerning microbial safety. This resulted in increasing search for new technologies for use in food conservation systems, which include: modified atmosphere packaging, combined effect of under-lethal procedures, alternative antimicrobial compounds (with bacteriostatic or bactericidal effect), combination of conventional (used in low levels) and alternative antimicrobials (Brul and Coote, 1999).

The grape fruit is a substantial citrus tree grown for its fruit. All parts of the fruit have uses. The fruit is mainly consumed for a tangy juice (Fellers *et al.*, 1990). The antimicrobial efficacy of grape fruit is tested by extracting the active ingredients in it by using glycerine in the extraction method (Woedtke *et al*., 1999).

MATERIALS AND METHODS

Preparation of Fish Sample

The fish samples catfish (*Clarias gariepinus)* were purchased from a fish farm at Kainji, Niger State. The fish were transported in kegs to the fish museum at Federal College of Freshwater Fisheries Technology, New Bussa, Niger State for shelf life studies. All the fish were slaughtered and gutted before it was dipped in the grape fruit peel extract for 10 minutes and 20 minutes in separate bowls. The working table was washed and later cleaned using ethanol.

Collection of Plant Materials

The plant materials were collected from Monday Market in Kainji, Niger State and it was later weighed using a sensitive weighing balance. The plant materials used was Grape fruit (*Citrus paradisa*) peel.

Preparation of Grape Fruit Peel Extract

The grape peel was washed with clean water and weighed. The extraction was done as follows;

1. 400g of dry grape fruit peel was blended and soaked in 200 ml of hot boiling water for 1 hour. The pulp obtained was left in clean, sterile glass container and shaken vigorously to allow for proper extraction (Azu and Onyeagba, 2007).
2. Filtration was done using a sterile muslin cloth after which the extract obtained was air – dried and stored for use.

Preservation of Fish Using Extract

The fish samples were dipped inside the extract for 10 and 20 minutes in separate bowls.

Shelf Life Studies

The fish samples that had been preserved with the plant extract was monitored for spoilage at an interval of 4 hours and the organoleptic characteristics noted.

RESULTS

The results of this work show a variation between catfish (*Clarias gariepinus*) preserved with grape fruit peel extract and dipped for different times and the one not preserved with it. Table 1 shows the organoleptic characteristics of catfish (*C. gariepinus*) monitored 4 hourly at ambient temperature post slaughter. Tables 2 and 3 show the 4 hourly organoleptic characteristics of catfish (*C. gariepinus*) dipped for 10 and 20 minutes respectively in grape fruit peel extract.

Table 1: Organoleptic characteristics of catfish (*Clarias gariepinus*) monitored four hourly at ambient temperature post slaughter

TIME (h)	EYES	GILL	SKIN	FLESH
0	Convex, dark pupils cornea, iridescent	Bright, fresh odour	Bright grey at dorsal region silvery at ventral region	Firm
4	Convex, loss of brightness	Pale red, fresh odour	Pale red at dorsal region	Firm
8	Convex, cloudy and cornea	Reddish, fresh odour	Dark red at dorsal region dry at ventral region	Firm
12	Flat, cloudy and slightly sunken	Bleached, neutral odour	Dark red at dorsal region red at ventral region	Firm
16	Flat	bleached, very sour	Reddish brown at dorsal region	Less firm
20	Black, pupil, grey cornea	Sour	Brown at dorsal region	Less firm
24	Convex, black pupil	Pale white, very sour	Dark red at dorsal region at ventral region	Neither firm nor soft
28	Very sunken	White, rancid	Dark red at dorsal region and red at ventral region	Soft
32	Black sunken or concave	White very sour / rancid	Dark red at dorsal region and red at ventral region	Very soft leaves finger indentation
36	Concave white pupil grey cornea	Pale greenish, very sour and strong rancid	Dark grey at dorsal region and grey at ventral region	Soft no elastic
40	Very sunken or concave	Greenish ammoniacal odour	Dark grey at dorsal region and red at ventral region	Very soft and flabby

Table 2: Organoleptic characteristics of catfish *(Clarias gariepinus)* preserved with grape fruit peel extract (dipping duration: 10 minutes)

TIME(h)	SKIN	EYE	GILL	FLESH
0	Bright, shining, clear mucus, firm belly	Transparent, clear, protruding iridescent, white cornea dark pupil	Bright red, fresh odour	Firm, flexible,elastic
4	Bright shining, clear mucus, firm belly	Protruding, loss of brightness white cornea, dark pupil	Dark red, fresh odour	Firm elastic
8	Bright, shinning clear mucus, firm belly	Protruding, loss of brightness white cornea, dark pupil	Dark red, fresh odour	Firm elastic
12	Dull, soft belly	Flat, white and slightly cloudy pupil	Bleached, fresh odour	Less firm slightly elastic
16	Dull, soft belly	convex opaque grey cornea	Bleached, neutral odour	Less firm slightly elastic
20	Dull Less firm	Convex opaque grey cornea	Bleached, neutral odour	Less firm slightly elastic
24	Dull, less firm	Convex, opaque grey cornea	Bleached, neutral odour	Less firm slightly elastic
28	Dull, soft	Sunken, opaque grey cornea	Brown colour, sour	Soft, slightly elastic
32	Dull, very soft leaves finger indentation	Sunken, opaque grey cornea	Very sour, brown colour	Soft, slightly elastic
36	Dull, soft belly	Sunken, opaque grey cornea	Very sour brown colour	Soft, slightly elastic
40	Slime thicken and turn turbid, dull	Sunken, opaque grey cornea	Pale green rancid odour	Soft non elastic
44	Slime thicken and turn turbid	Very Sunken	Putrid odour	Soft non elastic
48	Slime thicken and turn turbid	Sunken	Putrid odour greenish	Soft non elastic

Table 3: Organoleptic characteristics of catfish (*Clarias gariepinus*) preserved with grape fruit peel extract (dipping duration: 20 minutes)

TIME (h)	SKIN	EYES	GILL	FLESH
0	Bright, shinning, clear mucus, firm belly	Transparent, clear, protruding irridescent, white cornea dark pupil	Dark red	Less firm, elastic
4	Bright shinning, clear mucus, firm belly	Transparent, clear, protruding irridescent, white cornea dark pupil	Dark red	Firm, flexible elastic
8	Bright, shinning clear mucus, firm belly	Protruding, loss of brightness white cornea, dark pupil	Dark red	Firm, flexible elastic
12	Dull, soft belly	Flat, white and slightly cloudy pupil	Brown colour	Firm flexible elastic
16	Dull, soft belly	Sunken opaque grey cornea	Brown colour	Soft, slightly elastic
20	Dull, soft belly	Sunken, opaque grey cornea	Greenish colour	Soft, non elastic
24	Dull, soft belly	Sunken, opaque grey cornea	Brown colour	Soft, non elastic
28	Dull, soft belly	Sunken, opaque grey cornea	Brown colour	Soft, non elastic
32	Dull, soft belly	Flat, white and slightly cloudy pupil	Brown colour	Soft, non elastic
36	Dull, soft belly	Sunken, opaque grey cornea	Brown colour	Soft, non elastic
40	Slime thicken and turns turbid, dull	Sunken	Greenish colour	Soft, non elastic
44	Slime thicken and turns turbid, dull	Sunken	Bleached colour	Soft, non elastic
48	Slime thicken and turns turbid, dull	Sunken	Bleached colour	Soft, non elastic

DISCUSSION

Fish preservation is an important stage of fish production, as it helps in the reduction of post harvest losses and also keeping fish for time of scarcity.

The results of this work show that catfish can be preserved using a natural preservative which could lead to reduction in post harvest losses. The shelf life of catfish was extended from 20 hours as seen in the unpreserved catfish (Table 1) to between 24 – 26 hours in the catfish preserved with grape fruit peel seeds extract (Table 2 and 3). The unpreserved catfish in Table 1 was fit for consumption till 20 hours post slaughter unlike the observation of Kazeem (2007) and Ephraim (2009) who monitored catfish post slaughter at ambient temperature and found that it was fit for consumption till 24 hours post slaughter. This variation may be due to the environmental temperature because the experiments were performed in different environments Kazeem (2007) and Ephraim (2009) in Abeokuta, Ogun State, while this present study was done in New Bussa, Niger State.

It was also observed from the study that the duration of dip did not have any effect on the preservative action of grape fruit peel seed extract. This is because the extract was able to extend the shelf life of catfish to 24 – 26 hours before it became unfit for consumption at the 28 hours post slaughter for both the 10 minutes and 20 minutes dipping duration. This observation agrees with the findings of Ephraim (2009) who determined the quantity of antimicrobial compounds in ethanol extract of grape fruit peel extract. The hot water, cold water and ethanol extracts of grape fruit peel contained 14.29%, 3.25% and 9% of the antimicrobial compounds respectively. This observation thus revealed that the ability of grape fruit peel extract to extend the shelf life of fish does not depend on the dipping duration but requires that there be enough quantity of the antimicrobial compounds in the extract.

CONCLUSION

It can thus be concluded from this study that hot water extract of grape fruit peel is a yet to – be exploited natural preservative for catfish, which can help in reducing fish post- harvest loses. Grape fruit peel extract as observed from this study can thus be concluded to have ability to preserve catfish (*Clarias gariepinus)* and also extend its shelf life with no health hazards unlike the synthetic preservation. Fish mongers (processors, live fish sellers) can also have better products put on sale at a lower cost of production, since all that is required is just the grape peel and hot water.

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