

Full Length Research Paper

Effect of local preservative (*Aframomum danielli*) on the chemical and sensory properties of stored warakanshi

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The effect of local preservative (*Aframomum danielli*) on the chemical and sensory properties of stored warakanshi was investigated. Fresh milk was processed traditionally into warakanshi and *Aframomum danielli* was added at 1, 2 and 3%, stored at 27±2°C, 7±2°C and evaluated at 0, 3 and 6 days for moisture, pH, protein, ash, peroxide value and sensory properties. Drop in pH was more prevalent at ambient temperature, moisture content varied at both temperatures. Crude protein and ash contents of warakanshi samples increased in the first 3 days at both temperatures and a short drop in protein and ash contents was observed for 3% warakanshi from 3 to 6 days at cold temperature. Peroxide value of 0% warakanshi (control) increased significantly while peroxide value at 1% and 2% warakanshi was significantly low. Warakanshi at 3% level of spice was best preferred to other samples of warakanshi at 0 day while 1% warakanshi was preferred to other samples at 3rd and 6th day of storage at cold temperature. *A. danielli* when used at 1% is more effective as a natural preservative in warakanshi without objectionable attributes in the sensory properties.

Keywords: warakanshi, storage aframomum danielli preservative temperature.

INTRODUCTION

“Warakansi” or simply “Wara” is a Nigerian soft white unripened cheese which derives its origin from the Fulani cattle rearers from northern Nigeria, who refer to the liquid cow’s milk as “Wara” and the curd-like texture of the cheese as “Kashi” (Ogundiwin, 1978). Wara is made from unpasteurized, unfermented whole milk by coagulation of the milk with Sodom apple leaf, pod or stem extract (vegetable rennet). It is usually eaten in its fresh, unripened state or smoked dried or fried in order to extend its short shelf life of about 2-3 days under ambient conditions. It is normally stored in its whey during this period and at the end of which fermentation of the product must have occurred thus rendering the product unacceptable to consumers.

Wara is not a fermented milk product as the enzyme Sodom apple proteinase does not require an acidic condition but is active at the normal pH of freshly collected milk. Thus, it is highly perishable with the

moisture content ranging from 50-60% when freshly prepared and a pH range of 6.0 – 6.5. The moisture content is dependent on the duration allowed for whey expulsion. The composition of wara shows that there is an increase of 4-7 times in the protein content (13%) and fat content (16%) and about 20-fold decrease in the lactose content (0.2%) relative to original milk. (Ihekoroye and Ngoddy, 1985).

The traditional processing method for making wara does not take into cognisance quality control measures. Unhygienic conditions of milking and processing of cheese make the risk of microbial contamination very high. These contribute not only to the short shelf life of the product but also more importantly to its potential health hazard. Such risks may result in food poisoning or intoxication and may lead to eventual death before the source is detected.

The natural spice, *A. danielli* is known to possess preservative properties (Adegoke et al., 2002). It is rich in nutrients and its antioxidant potential is better than synthetic antioxidants like butylated hydroxy toluene (BHT) and butylated hydroxy anisole (BHA) ((Adegoke and Skura, 1994; Adegoke and Gopalakrishna, 1998). It

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has a potent synergistic inhibitory effects on food spoilage yeast when used in combination with hydrostatic pressure (Adegoke et al., 1997) The preservative capability of the powder of *A. danielli* has been associated with phytochemical components tentatively identified as alkaloids (Adegoke et al., 2001). At present there is a global concern with the use of chemical preservatives in foods because of carcinogenic and mutagenic related problems.

Therefore this work is aimed at evaluating the effect of the use of local preservative *A. Danielli* on chemical and sensory properties of warakanshi

MATERIALS AND METHODS

Fresh cow's milk was obtained from Gaa Apaara in Oyo State, Nigeria following international sanitary procedures. This was transported in ice-cubes within a 2 h period to the Institute for Agricultural Research and Training (IAR&T), Ibadan where the processing took place.

A. danielli seeds were obtained from department of Food Technology, University of Ibadan, Ibadan, Nigeria.

Preparation of aqueous extract of *A. danielli*.

A. danielli seeds were sorted, washed and air-dried. They were then winnowed and milled into powder using hammer mill. The powder was sieved with a wire mesh to obtain fine powder (Figure 2). 1g of *A. danielli* powder was added to 100 ml of distilled water and mixed thoroughly.

These were centrifuged at 300 resolutions per minute. 20 min after which the supernatant was obtained as *A. danielli* extracts.

Preparation of warakanshi

Traditional method of preparing warakanshi was used with modifications to incorporate sanitary practices (Figure 4). Fresh milk was hygienically collected at the dairy farm of Gaa Apaara, Oyo State (Figure 3). Temperature of milk was lowered from about 39% to 5±1% in ice cubes and transported in a thermo flask within 2 h. It was sieved with muslin cloth to remove extraneous matter and then pasteurised at 72% for 20 sec.

The milk was cooled to 40°C to enhance the activity of the sodom apple proteinase enzyme. Sodom apple stem (35g to 3 L of milk) was crushed and the juice extracted into a little quantity of the warm milk. The mixture was then heated to about 70% for 20 min. The scum was removed and curd cut to facilitate whey expulsion. At this point, 1%, 2% and 3% concentrations of *A. danielli* extracted were added. A period of 5 min was allowed for absorption of spice after which each sample was drained of its whey in muslin cloth for about 2-3 min.

Storage of Warakanshi

Freshly prepared Warakanshi fortified with 0%, 1%, 2% and 3% *A. Danielli* were stored at ambient (27±2°C) and cold temperatures (7±2°C) for 6 days and observations were made for chemical (Moisture content pH, protein ash peroxide value and sensory properties

Moisture content

Moisture content was estimated gravimetrically using the method described by (AOAC, 2000) 2 g of samples were weighed into pre-

weighed glass petri dishes and dried in a forced air oven (BS 300 Gallenkamp) at 100°C for about 18 h, until constant weight was observed.

Protein

Protein was determined by titrimetric method of AOAC (1984), 0.20 g of the dried samples were measured into digestion tubes. A tablet of selenium catalyst and 10 ml of H₂SO₄ were added into each tube and then digested using kjeldahl-digesting system until the samples became clear. The digested samples were cooled and diluted with distilled water. Sodium Hydroxide solution was then added into each tube after which the samples were distilled into receiving flasks containing 25 ml of mixed indicator (14% boric acid and bromocresol indicator). They were then titrated against 0.01 N Hydrochloric acid solution. A blank titration (digested selenium catalyst and 10 ml of H₂SO₄ in which there was no sample) was similarly carried out and the percentage protein was estimated

Ash

Ash content was estimated gravimetrically using the method described by (AOAC, 2000) 0.2 g of samples were weighed into pre-weighed crucibles in triplicates. These were ignited in furnace for 8 hours at 550°C until light grey ash was obtained. These were then cooled in a desiccator and weighed for percent ash content.

Peroxide value

Peroxide value was determined by titrimetric method of Pearson (1981).

1 g of the sample was weighed into a clean dry boiling tube to which 1 g of powdered potassium iodide and 20 ml mixture of glacial acetic acid and chloroform in the ratio 2:1 were added. The tube was held in boiling water for 30 sec after which the contents were transferred into a 250 ml conical flask containing 20 ml of 5% potassium iodide solution. This was titrated against 0.002 M sodium thiosulphate solution using 1ml of starch as indicator. A blank titration (without any sample) was also made and the results were reported as the number of 0.002 M sodium thiosulphate per gram of sample.

pH

pH was estimated using the method described by (AOAC, 1984) was measured directly using EDT BA 350 pH metre. 5 g of wet sample was weighed and macerated using mortar and pestle and diluted with 5 ml of distilled water. The pH was subsequently measured with electrode standardised using pH 4 and pH 7 buffer solutions.

Sensory evaluation

Sensory evaluation of warakanshi was conducted using a panel of 10 judges who are consumers' of warakanshi at the IAR&T crop utilization centre. The judges scored the samples for colour, aroma, texture, taste and overall acceptability using a 9-point hedonic scale where '9' represented 'like extremely' and '1' represented 'dislike extremely' (Larmond, 1977).

Statistical Analysis

Data obtained from the various analyses were subjected to analysis of variance and means were separated by Duncan Multiple Range Test (Duncan, 1955).

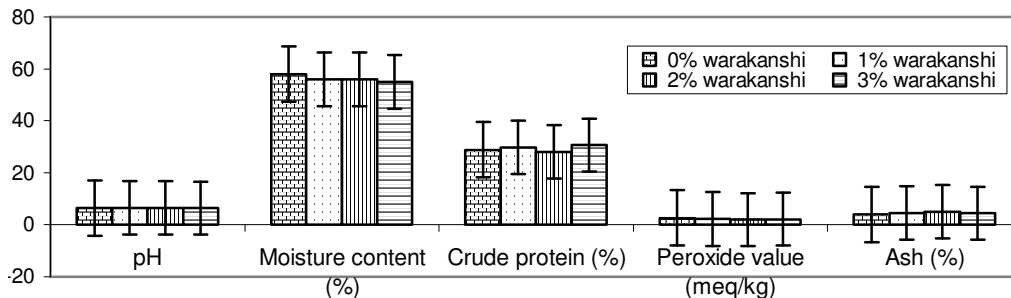


Figure 1a. Effect of *A. Danielli* on the chemical composition of warakanshi stored under ambient temperature at 0 day.

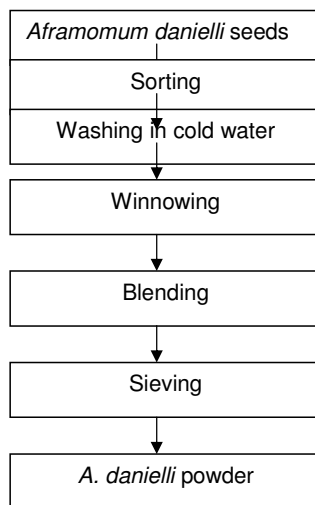


Figure 1b. Preparation of *Aframomum danielli* powder.

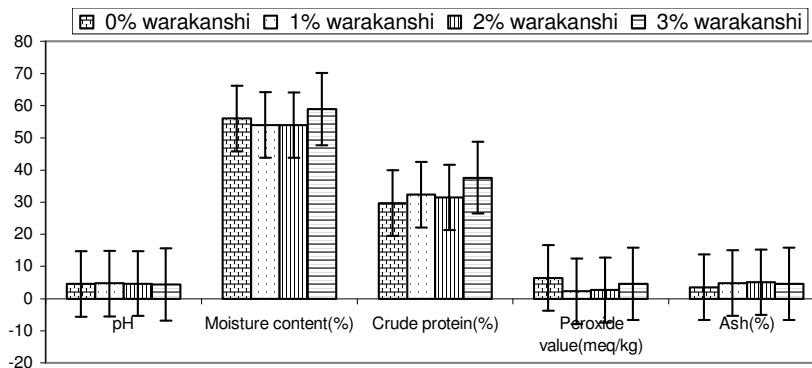


Figure 2. Effect of *A. Danielli* on the chemical composition of warakanshi stored under ambient temperature at 3rd day.

RESULT AND DISCUSSION

Generally, chemical analysis was not done for warakanshi samples stored at ambient temperature beyond 3 days because the samples got spoilt. However in figures 1-5 a decline in pH values was observed for warakanshi

at concentrations up to 3% of *A. danielli* during storage and at both temperature regimes. This drop in pH was more prevalent at ambient temperature and may be due to greater rate of fermentation at this temperature. At cold temperature especially on the 6th day of storage slight increase was detected. This may be due to proteolytic

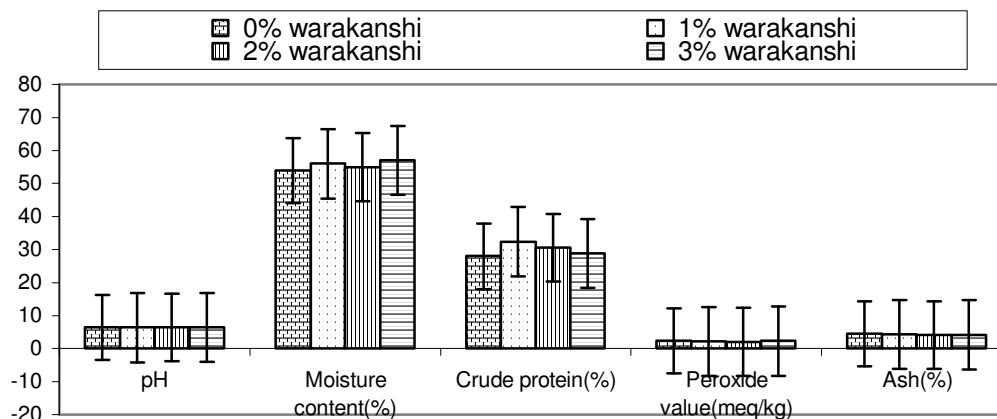


Figure 3a. Effect of *A. Danielli* on the chemical composition of warakanshi stored under cold temperature at 0 day.

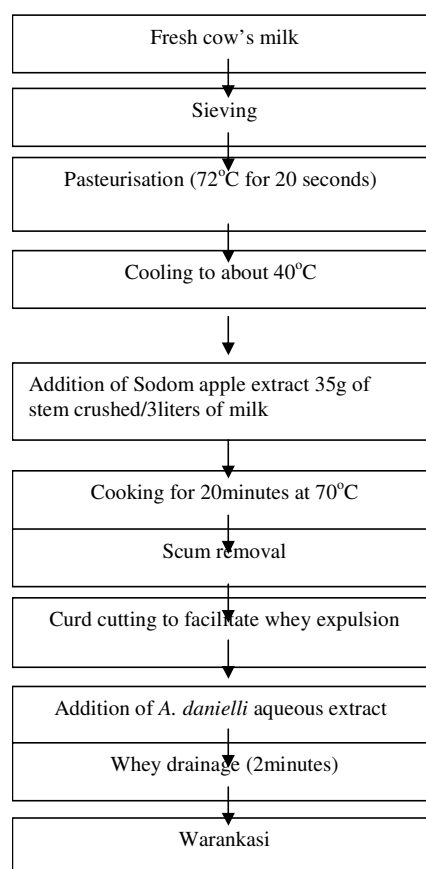


Figure 3b. Preparation of Warankasi from Cowmilk.

changes and breakdown by microorganisms resulting in the formation of basic substances. This finding is similar to that observed by Aworh and Egounlety (1984) in their work with the preservation of West African soft cheese by chemical treatment.

The percentage moisture content of warakanshi varied at both storage temperatures in respective of different concentrations of spice used fluctuations in the moisture content were probably due to the activity of microorganisms and catabolic enzymes produced by them.

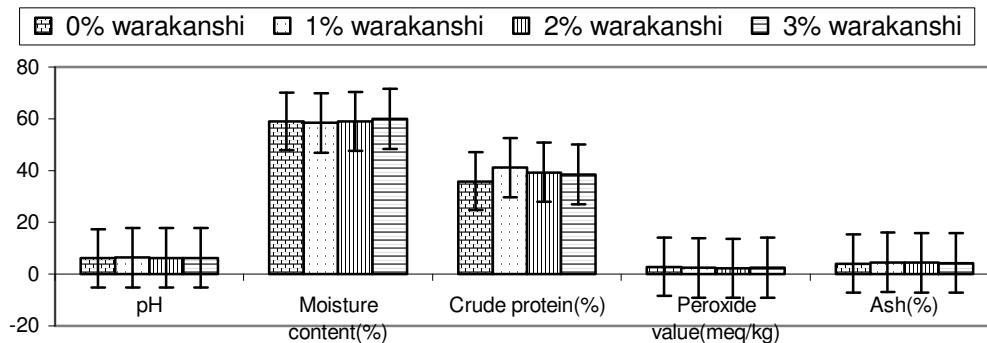


Figure 4. Effect of *A. Danielli* on the chemical composition of warakanshi stored under cold temperature at 3rd day.

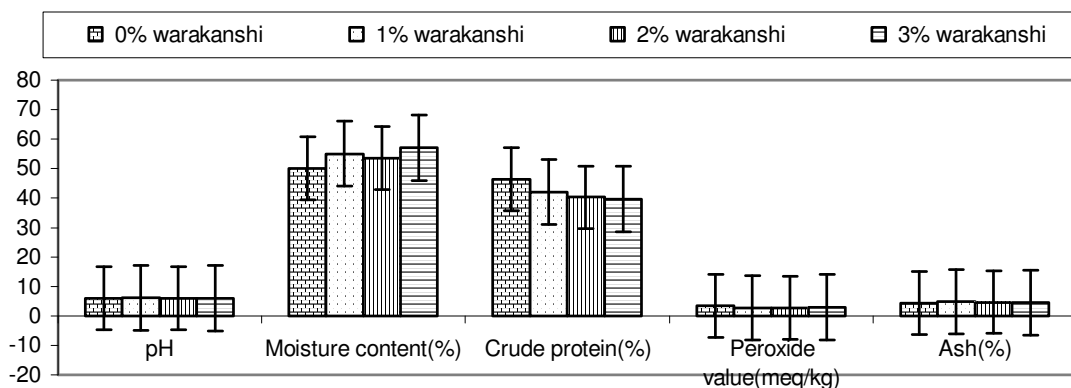


Figure 5. Effect of *A. Danielli* on the chemical composition of warakanshi stored under cold temperature at 6th day.

There was also an increase in the percentage crude protein content of warakanshi samples stored for 3 days at the two temperature regimes. Further storage at low temperature showed a further increase in the crude protein content on the 6th day. However, there was a short drop in protein content of 3% warakanshi from 3rd to 6th day of storage at cold temperature; this may be due to the increased presence of *A. danielli* acting as an antimicrobial agent.

The increase in the protein content of samples may be due to the presence of some microorganisms and/or their enzymes which aid in the synthesis of nitrogenous substances. Though the mechanism by which the increase occurred is not well understood, a number of studies have reported an increase in the protein content of some foods during storage as a result of the biosynthesis activities of *Propionibacterium spp* and *Staphylococcus aureus* (Eka, 1980).

Lipid oxidation was considerably retarded in treated warakanshi samples stored at ambient and cold temperature conditions. Though the peroxide values for all samples increased with storage, an exponential increase was observed for all control samples while there was only

a slight difference in the peroxide values of treated samples, particularly samples treated with 1% and 2% concentrations of spice. In warakanshi at 3% concentration of spice and stored at cold temperature, the peroxide values increased almost as high as that of the control samples. This probably is due to the low antioxidant effect of the spice at the 3% concentration. The antioxidant effectiveness of *A. danielli* was more pronounced at ambient conditions, which further confirms the fact that lipid oxidation is enhanced at high temperature (Fennema, 1996). These observations further confirm the antioxidant effectiveness of the spice at low concentrations as reported by Adegoke et al. (2000a).

Treated samples of warakanshi stored at ambient and cold temperatures increased in ash content throughout the period of storage (Figures 1-5). This may be due to minerals present in the spice and also those produced by microbial activities. After 3 days of storage at ambient and cold temperatures, ash content reduced in the control sample, presumably due to loss of minerals through the whey (Figures 2 and 4). At 6th day of cold storage (Figure 5), there was a reduction in the ash content for all samples, with the least reduction being observed with the

Table 1. Effect of *A. Danielli* on the sensory properties of warakanshi stored for 0 day at ambient temperature ($27\pm 2^{\circ}\text{C}$).

	0% warakanshi	1% warakanshi	2% warakanshi	3% warakanshi
Colour	7.7 ^{ab}	7.8 ^a	7.4 ^b	7.9 ^a
Taste	7.0 ^b	7.5 ^{ab}	7.7 ^a	7.7 ^a
Aroma	7.0 ^b	7.0 ^b	7.1 ^{ab}	7.3 ^a
Texture	7.6 ^{ab}	7.8 ^a	7.3 ^b	7.8 ^a
Overall Acceptability	7.1 ^c	7.5 ^b	7.4 ^{bc}	7.9 ^a

Means in the same row followed by the same letter are not significantly different from each other at $p < 0.05$ according to Duncan multiple range test.

Table 2. Effect of *A. Danielli* on the sensory properties of warakanshi stored for 0 day at cold temperature ($7\pm 2^{\circ}\text{C}$).

	0% warakanshi	1% warakanshi	2% warakanshi	3% warakanshi
Colour	7.7 ^{ab}	7.9 ^a	7.6 ^b	7.9 ^a
Taste	7.3 ^{bc}	7.5 ^b	7.6 ^{ab}	7.7 ^a
Aroma	7.2 ^{ab}	7.2 ^{ab}	7.1 ^b	7.4 ^a
Texture	7.6 ^b	7.8 ^a	7.4 ^{bc}	7.7 ^{ab}
Overall Acceptability	7.0 ^c	7.5 ^{ab}	7.4 ^b	7.7 ^a

Means in the same row followed by the same letter are not significantly different from each other at $p < 0.05$ according to Duncan multiple range test.

Table 3. Effect of *A. Danielli* on the sensory properties of warakanshi stored for 3 days at cold temperature ($7\pm 2^{\circ}\text{C}$).

	0% warakanshi	1% warakanshi	2% warakanshi	3% warakanshi
Colour	7.4 ^c	7.7 ^{ab}	7.8 ^a	7.6 ^b
Taste	7.7 ^{ab}	8.0 ^a	7.3 ^c	7.7 ^{ab}
Aroma	7.3 ^b	7.5 ^{ab}	7.6 ^a	7.2 ^c
Texture	7.2 ^c	7.4 ^b	6.7 ^d	8.0 ^a
Overall Acceptability	7.4 ^{bc}	7.9 ^a	7.1 ^c	7.5 ^b

Means in the same row followed by the same letter are not significantly different from each other at $p < 0.05$ according to Duncan multiple range test.

Table 4. Effect of *A. Danielli* on the sensory properties of warakanshi stored for 6 days at cold temperature ($7\pm 2^{\circ}\text{C}$).

	0% warakanshi	1% warakanshi	2% warakanshi	3% warakanshi
Colour	7.7 ^a	7.5 ^{ab}	7.3 ^b	7.4 ^b
Taste	7.0 ^b	7.7 ^a	6.6 ^c	6.6 ^c
Aroma	6.4 ^c	7.2 ^a	6.9 ^b	7.0 ^{ab}
Texture	6.0 ^b	6.6 ^a	5.8 ^{bc}	6.6 ^a
Overall Acceptability	7.0 ^{ab}	7.1 ^a	6.8 ^b	7.0 ^{ab}

Means in the same row followed by the same letter are not significantly different from each other at $p < 0.05$ according to Duncan multiple range test.

treated sample with 1% *A. danielli*. This observation suggests the inhibition ability of the spice for microbial activities. Furthermore, since the spice has been reported to contain a number of essential minerals (Adegoke et al., 1998), its contribution to the increase in the ash content during storage may not be overruled.

Sensory evaluation of warankashi stored at ambient temperature (Table 1) at 0 day indicated that 3%

warankashi was best preferred in sensory attributes. However, sensory evaluation was not done on the 3rd day because the samples got spoilt.

In Tables 2-4, 3% warankashi was best preferred at 0 day, while samples of warankashi treated with 1% *A. danielli* were preferred to other sample of warankashi by the 3rd and 6th day of storage at cold temperature in terms of taste, aroma and overall acceptability. Greater prefe-

rence in terms of aroma, taste and overall acceptability was indicated for samples treated with 1% *A. danielli*.

The results show that *A. danielli* when used at 1.0% is more effective as a natural preservative in warankashi and may be used as a natural spice at this level of concentration without objectionable attributes in the sensory properties

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