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Assessment of the microbial qualities of noodles and the accompanying seasonings

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Abstract

The microbial quality of five different brands of noodles (designated as D, G, H, I and M) with their accompanying seasonings commonly marketed and consumed in Nigeria were investigated. The samples were serially diluted and using the pour plate technique least microbial load was obtained by heating samples at 100 °C for 10 min. Sample G had the highest bacterial count of 43.8×10^5 cfu/ml for cold noodles, while sample M had the highest count of 32.0×10^4 cfu/ml for hot noodles. For the seasonings, the total bacterial count varied with sample M having the highest bacterial count of 31.2×10^5 cfu/ml and 40.0×10^5 cfu/ml for hot and cold seasonings respectively while for the chilli, sample D had the highest bacterial count of 36.0×10^5 cfu/ml for cold chilli and sample I had the lowest bacterial count of 28.8×10^5 cfu/ml. The total fungal count of all samples was less than that of the bacterial counts. Microbial analysis showed the presence of *Bacillus*, *Pseudomonas*, *Staphylococcus*, *Aeromonas and Streptococcus. Staphylococcus* sp was the most frequently isolated while the five genera of fungi isolated were *Aspergillus*, *Mucor*, *Penicillum*, *Rhodotorula* and *Candida.* The implications of these findings on the health of the populace were discussed from the microbiological point of view.

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Keywords: Noodles; Microbial load; Populace; Health implications

1. Introduction

Food, a chemically complex matrix, contains sufficient nutrients to support microbial growth. Several factors encourage, prevent, or limit the growth of microorganisms in foods; the most important are water availability, pH, and temperature (Makukutu and Guthrie, 1986; Smith and Fratamico, 1995). Microbial quality is said to be the degree of acceptability of the total number of microbes present in a given food (ICMSF, 2006). It is therefore necessary to include features in the formulation and delivery system that provides as much suitable protection as possible against microbial contamination and spoilage. Elimination of particularly susceptible ingredients and selection of container may individually and collectively contribute significantly to the overall product stability. Microbial food safety is an increasing public health concern worldwide (ICMSF, 2006). Instant noodles are dried or precooked noodles and are often sold with packets of flavoring including seasoning oil. Dried noodles are usually eaten after being cooked or soaked in boiling water for 2–5 min, while precooked noodles can be reheated or eaten straight from the packet. A single serving of instant noodles is high in carbohydrates and fat, but low in fiber, vitamins and minerals (Lee, 2009). Noodle is a type of stable food made from some types of unleavened dough which is rolled flat and cut into one type of variety. While most are long thin stripes, many varieties of noodles are cut into tubes, strings, shells, etc. Depending on the type, noodles may be dried or refrigerated before cooking, and noodles are highly nutritional (Lee, 2009). In Nigeria, Indomie, the most popular instant noodles brand has had a remarkable impact on the Nigerian culinary landscape. Instant noodles are now eaten in most households across the country. By 2008, nine other brands of noodle had appeared on the market which includes Dangote noodles, Golden penny noodles, Mimee Crunch Snack, O! Noodles, etc. According to the World Instant

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Noodle Association, Nigeria was the 13th largest consumer of instant noodles in the world in 2007. Noodles serve as a major source of food for majority of students in higher institutions, young adults and children. It is widely consumed for its 'quick to cook' properties and affordable price (Cooton, 1997). Residue build up in processing plants and equipments also constitute significant sources of microbiological contamination. Spore forming species particularly, may reside in equipments, adversely affecting the quality of end product (Okafor and Omodamiro, 2006). Most of the microbiological studies of pasta products have been focused on the pathogen growth during production rather than on the general microbiological quality (Francis, 2010; Okafor and Omodamiro, 2006). The most recent controversy concerns dioxin and other hormone-like substances that could theoretically be extracted from the packaging and glues used to pack noodles. (Swartzentruber et al., 1982). The results from a study on ready-to-use noodles by Garci et al. (1996) showed that out of a total of 70 samples, 21 (30%) were observed to contain *Pseudomonas.*

The objectives of this study are to determine the pH of five brands of noodles and the accompanying seasonings and chilli powder, to assess the microbial quality of the noodles with their accompanying seasonings and chilli powder, respectively and to isolate and identify the bacteria and fungi present in the noodles and the seasonings.

2. Materials and method

Twelve samples of five brands of noodles with their accompanying seasonings commonly marketed and consumed in Nigeria were purchased randomly from different retail outlets in Ota, Ogun State (located in the South Western region of Nigeria). The sachets were carefully examined to make sure they were intact (no tear or damage) and not expired and brought for analysis in Bells University of Technology, Ota. The brands were coded as M, I, G, D and H, for the purpose of this study.

2.1. pH determination

Five grams each of the noodles was transferred into 20 ml of distilled water. 1 g each of its seasoning and chilli was also dissolved in 9 ml of distilled water (this represents the cold sample). It was then boiled at 100 °C for 10 min (representing the hot sample). The pH was then determined using a pH meter (HANNA Instruments, pH 211, Microprocessor pH meter).

2.2. Cultivation and enumeration of bacteria in noodles, seasoning and chilli

This was done by the serial dilution technique using 1 g of each brand of noodles, seasonings and chilli and aseptically transferring into different bottles containing 9 ml of sterile distilled water (Ikuomola and Eniola, 2010). The mixture was thoroughly stirred for about 5 min (represented as CMN, CIN, CGN, CDN and CHN for the cold sample noodles; CMS, CIS, CGS and CDS for the cold seasonings and CMC, CIC, CGC, CDC and CHC for the cold chilli powder). Sample H only had chilli powder with no accompanying seasoning. The hot samples were obtained by boiling each of the above stated brands at 100 °C for 10 min. These were represented as hot samples; HMN, HIN, HGN, HDN and HHN for the noodles; HMS, HIS, HGS and HDS for the seasonings, while, the chilli powders were coded as HMC, HIC, HGC, HDC and HHC, respectively. The pour plate technique was used to determine the microbial load in each sample. From the first dilution, 1 ml of the sample was pipette into another sterile diluents containing 9 ml to obtain 10^{-2} dilution. The samples were serially diluted up to 10^{-6}. 0.1 ml of appropriate dilution was then inoculated into sterile Petri dishes and molten nutrient agar was added and left to solidify. The samples were in three replicates and incubated at 37 °C for 24 h. The mean counts for triplicate cultures were recorded as the bacterial counts in the sample (Ikuomola and Eniola, 2010).

2.3. Cultivation and enumeration of fungi in noodles, seasoning and chilli

This was carried out on agar plates of potato dextrose agar (PDA) using the pour and spread plate method. This was done by using the serial dilution technique. One gram of each brand of noodles, seasonings and chilli was aseptically transferred into 9 ml of sterile distilled water. This was stirred thoroughly for about 5 min (representing cold sample) and was boiled at 100 °C for 10 min representing hot sample). From the first dilution, 1 ml of the sample was inoculated into another 9 ml. of the sterile diluents, this represented the 10^{-2} dilution. 0.1 ml of this dilution was then transferred into sterile Petri dishes and molten potato dextrose agar was added and left to solidify. Each sample was made into triplicates and incubated at 28 °C for 48 h and colonies formed were counted. The mean counts for triplicate cultures were recorded as the fungal counts in the sample (Arora, 2004).

2.4. Isolation and identification of bacteria and fungi

Pure bacterial isolates were characterized and identified on the basis of their morphological and biochemical characteristics. Gram staining, motility, catalase, coagulase, ,indole, citrate utilization, spore methyl red and Voges Proskaeur tests were carried out. Fungal pure isolates on potato dextrose agar plates were stained with lactophenol cotton blue solution and examined under the microscope. Tests for ascospores and ballistospores were also carried out (Obire et al., 2002; Ogbonna and Igbenije, 2006).

2.5. Statistical analysis

All data collected was analysed for statistical significance using analysis of variance where $p < 0.05$ (Sokal and Rohlf, 1995).

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