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Full Length Research Paper

A Study on the Population and Types of Fungiin "Mbuli", a Local Drink in Borno State, Nigeria

Abubakar, A., Nura, M., Auyo, M, I., Sunday, E., and Kutama, A. S.

Department of Biological Sciences, Federal University, Dutse, Nigeria

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A study was carried out to monitor the population and types of fungi found in "Mbuli“ a local drink in Borno State over four weeks period.The result showed that the populations of fungi was higher in first week than in the Subsequent weeks. The reason for this higher population include the abundance of growth substances in the first week than in the subsequent weeks and chemical activities of other microorganism when stored for a long time.The species of fungi found in drink stored in clay pot are Aspergillus nidulan, Aspergillus flavus, Aspergillus niger, penicilliun cyclopium. SP and saccharomaces cerevisiae. The same species of fungi were also found to be present in Mbuli stored in plastic pot.The result therefore showed that the storage material and fungi have effect on storage quality of the drink.

Keywords: Population, Local Drink, Fungiin "Mbuli".

INTRODUCTION

Borno State has an area of about 69,436 Km^2. Itlies roughly between Latitude 11°N and longitude 13°E. It has two seasons - the rainy season and the dry season. Borno State is pluralistic in ethnic composition with rich but diverse historical and cultural heritage. The people of Borno State are fiercely attached to their long and distinguished history and traditions. One of such traditions is the preparation of local foods. Each ethnic group has its way of preparing their food, the type and variety that will suit their needs. Mbuli, a drink is one of these local foods made from cereals.

Mbuli is prepared by the Buras and Baburs, one of the ethnic groups in Borno State. It serves the purpose of a refreshing drink. Mbuli is normally stored in containers and often stored for weeks while the people drink from it daily.Observations of this drink in storage shows the presence of fungal mycelia. Despite this the people continue to drink from it. This work was undertaken to monitor the population of fungi in Mbuli and the types of fungi present. The implications of the presence of such fungi will be discussed.

Mbuli is a local drink popular among the Buras and Baburs in Borno State. It is a drink made from the remains of another popular cereal food called "tuwo" which is made from sorghum or maize. All kinds of food are prone to spoilage (Atlas, 1988) and mbuli is not an exception especially since the storage is not under aseptic conditions,

There is no work reported in literature on the spoilage of mbuli. However, mbuli being made of cereals is prone to spoilage by certain microorganisms and this review is based on the spoilage of cereals in general.

*Corresponding Author's Email: kutamasak@yahoo.com

Cereal grains and flours normally do not spoil easily if properly stored because their moisture content is too low. Frazier and Westhoff (1958) however reported that if these are moistened, spoilage will follow. Since cereal grains and meals ordinarily are not processed to reduce their natural flora of microorganism, they are likely to contain moulds, yeast and bacteria, which will grow if enough moisture is added.

In addition to starch, which is unavailable to many organisms, these grains contain some sugar and available nitrogen compounds, mineral and accessory growth substances necessary for microbial growth (Frazier and Westhoff 1958).

The spoilage organisms which have been recorded on cereal food are moulds and yeasts. The moulds implicated in the spoilage of cereals are Aspergillus spp., Penicillium spp. and Fusarium spp (Frazier and Westhoff, 1958).

Moulds grow on foods, with their fuzzy or cottony appearance, sometimes coloured. They are familiar to everyone and usually a mouldy or mildewed food is considered unfit to eat.While it is true that moulds are concerned in the spoilage of many kinds of foods, some moulds are used in the manufacture of certain foods (Pederson, 1979).

Moulds are multicellular filamentous fungi, whose growths on foods are usually readily recognised by its cottony appearance. The main part of the growth commonly appears white but may be coloured or dark. Coloured spores are typical of mature moulds and give colour to parts or all the mycelia (Frazier and Westhoff, 1958).

Yeasts are those Ascomycetes which are generally not filamentous but unicellular and ovoid or spheroid. Yeast may he useful or harmful in foods. Yeast fermentations are involved in the manufacture of foods like bread, beer, and wine. Yeasts are sometimes grown for enzymes and for food. The yeasts found to spoilt cereal foods are S. cerevisiae, S. carlsbergensis and other related Sacharomyces spp (Frazier and Westhoff, 1958).

Toxins produced by fungi are collectively termed "mycotoxins" (Nkama, 1989), Neergaard (1977) and Awan(1983) reported that the production of thesemycotoxins depend on the species or strains of fungi,the ecological conditions during their growth, thefood source, temperature and relative humidity of theknown mycotoxins, the most important in relation todirect hazard to health are the aflatoxins (Nkama,1987). The aflatoxins are secondary metabolites produced by Aspergillus flavus and the closely related Aspergillus parasiticus. Penicillium spp are also known to produce mycotoxins (Onions, 1984). Thediseases syndromes that result from the ingestion of mycotoxins are called mycotoxicoses (Coker et al., 1994).

Surveys have shown that the incidence of mycotoxins and the occurrences of mycotoxicoses is not restricted to a particular climatic or geographical area or country (Coker et al., 1984).

MATERIALS AND METHODS

Preparation of Mbuli

Cereal meal (maize) popularly known as “tuwo“ was the material used for the preparation of mbuli. The tuwo was boiled to reduce the natural microflora afterwhich it was allowed to cool. Ten kilograms (10kg) wasthen weighed out and divided into two portions of 5kg. One portion was placed in a clay pot and the otherplaced in a plastic pot. Ten litres (10L) of water wasadded to each pot, covered and stored. Weekly sampleswere taken from the pots and subjected to various analyses.

Estimation of Fungal population

The medium that was used for the estimation of fungal population was potato dextrose agar. The mediumwas prepared by boiling 100g of peeled, diced Irishpotato in 500ml of distilled water for 20-25minutes. The potato was then crushed in a mortar, passed through muslin cloth to get potato extract. To 500ml boiling distilled water, 15g ot agar powder was dissolved slowly after which 20g of dextrose wasadded. This solution was then mixed with the potatoextract and the solution made up to one litre. Themedium was then sterilised in an autoclave at 121^0C for 15 minutes after which it was allowed to cool to 45°C

Preparation of Mbuli Samples

Serial dilution was prepared by taking 1ml of the sample and introducing this into 9ml of sterile distilled water in a test tube. Other serial dilutionswere prepared in a similar manner from the suspensionusing a fresh pipette at each time, the highest dilution being 10^{-3}.

1ml of each suspension was pipetted ontoacidified petri dish and then molten PDA poured overit. The plates were rotated gently to get thoroughmixing of the inoculum and medium. The plates were

then incubated at room temperature for three daysafter which the number of colonies/ml were countedusing a colony counter.

Identification of Fungi Present in Mbuli

PDA was also used for the isolation andidentification of the fungi present in this drink. To a solid PDA plates was added 1ml of the sample whichwas then spread using a sterilised glass rod. The

plates were then incubated at room temperature for 5 days after which the different Colonies observed were sub cultured onto fresh PDA plates to get purecultures. These plates were incubated at roomtemperature for 5 days after which slides were madefor the different colonies by taking small pieces ofmycelium and placing it in a drop of water.

Table 1: Population of fungi (Counts/ml) in mbuli

Types of pot	Colony counts/ml			
	Week1	Week2	Week3	Week4
Clay	3.97×10^4	2.81×10^4	2.06×10^4	1.30×10^4
Plastic	2.97×10^4	2.18×10^4	1.93×10^4	1.03×10^4

Table 2: Types of fungi found in mbuli stored in clay pot

Types of fungi	Storage period (weeks)			
	Week1	Week2	Week3	Week4
Aspergillus nidulan	++	++	+	+
Aspergillus flavus	+	+	+	+
Aspergillus niger	+++	+ + +	+	+
*Penicellium*cyclopium	++	+++	+++	+++
Fusariumsp	++	++	+ +	+
Saccharomyces cerevisiae	++	+++	+++	++ +

\+ = seen occasionally
++ = seen often
+++ = seen very often

Lacto-phenol cotton blue was added, then covered with acoverslip and viewed under high power magnification. The features seen under the microscope were used to identify the fungi with the aid of identification manual by Samson and Van Reenen-Hoekstra (1988).

RESULTS

The results of this study are presented in Table 1. The results show that the population of fungi inboth clay and plastic pots are higher in the firstweek than the population of the subsequent weeks. Thepopulation of the fungi was generally higher in clay pot than in the plastic pot. For instance, the population of fungi in the clay pot in the first week was 3.97×10^4/ml and the population of fungi after 4 weeks was 1.3×10^4/ml while the population in the plastic pot in the first week was 2.97×10^4/ml and 1.03×10^1/ml in the fourth week.

The fungi isolated and identified in mbuli are shown in Tables 2 and 3 and Figures 1 and 2. Table2 represents the fungi that were isolated from the clay pot while Table 3 represents those isolated from Mbulistored in the plastic pot.

Tables 2 and 3 also show the prevalence of the various species of fungi in mbuli as the storage period of the drink increased.

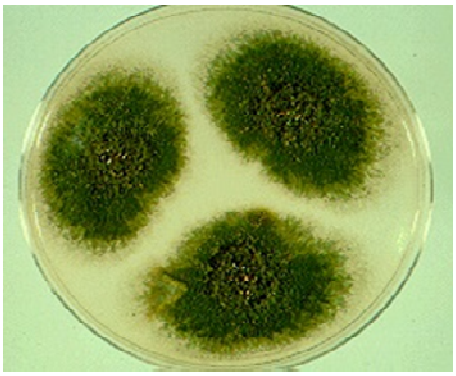
The results show that the same species of fungi were identified from both the clay and plastic pots. These were *Aspergillus nidulans, Aspergillus flavus, Aspergillus niger, Penifillium cyclopium, Fusarium sp.* and *Saccharomyces*

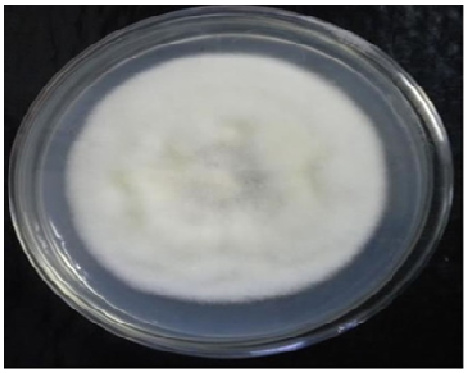
Table 3: Types of fungi found in mbuli stored in plastic pot

Types of fungi	Storage period (weeks)			
	Week1	Week2	Week3	Week4
Aspergillus nidulan	++	++	+	+
Aspergillus flavus	+	+	+	+
Aspergillus niger	+++	+ + +	++	+ +
Penicellium cyclopium	++	+++	+++	+++
Fusariumsp	++	+	+	+
Saccharomyces cerevisiae	++	+++	+++	++ +

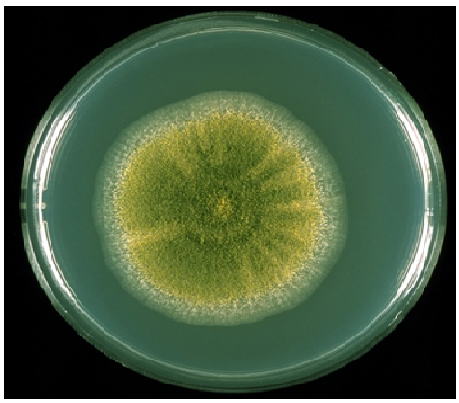
\+ = seen occasionally
++ = seen often
+++ = seen very often

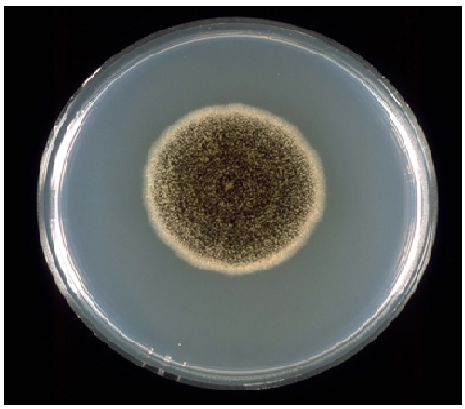
TYPES OF FUNGI FOUND IN MBULI STORED IN BOTH CLAY AND PLASTIC POTS



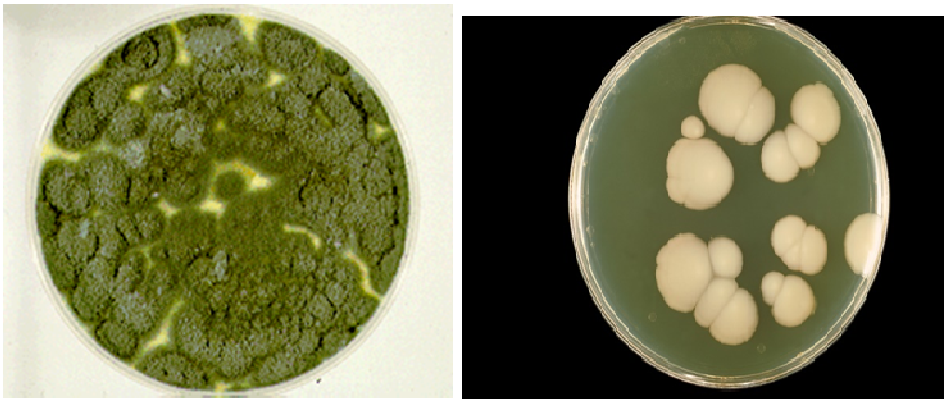


Aspergillus nidulans on PDA *Fusarium sp* on PDA





Aspergillus flavus on PDA *Aspergillus niger* on PDA



Penicilliumcyclopium on PDA Saccharomyces cerevisiae on PDA

cerevisiae, The most predominant of these was *S. cerevisiae* followed by *P. Cyclopium.*

DISCUSSION

The results of this study showed that the population of fungi in mbuli was higher in the first week of storage than in the subsequent weeks in both clay and plastic pot. This may be because in the first week the amount of nutrient present in the drink (sugar, nitrogen compounds, minerals and growth substances) are quite high. However, as the storage period of the drink increased, the nutrients are depleted due to utilisation by the large numbers of fungi arising from multiplication as a result ot the initial abundance of nutrients. Microorganisms have been reported to need suitable nutrients for growth and multiplication (Atlas, 1988).

The reduction in population in subsequent weeks may be due to the following reasons: the depletion of nutrients and other growth substances; the production of secondary metabolites by the various microorganisms which probably affected the growth and multiplication of the organisms present. According to Frazier and Westhoft (1958) bacteria are known to cause acid fermentation in moistened cereal meals it stored for some time in suitable condition. Thus it is probable that in the course of storage of mbuli, bacteria could have brought about a reduction in population more

especially of moulds which are reported to he affected by acidic environment. The prevalence of fungi like yeasts throughout the experimental period is an indication of the tolerance of these fungi to the effect of compounds produced hy bacteria and other microorganisms present in mbuli.

The higher population of fungi in the clay pot in comparison to the plastic pot may he explained by the nature of pots. The clay pot is porous allowing for aeration while the plastic pot is not porous and hence very little air can get in. Oxygen is required by many microorganisms for their growth and survival. Because the plastic pot does not allow for aeration, an anaerobic condition is created within it. Such conditions are not conduicive for the growth of aerobic micro- organisms. Most of the organisms identified in mbuliare aerobic.

The presence of microorganisms in mbuli has health implications. For example, A. flavus and P.cyclopium produce mycotoxins such as aflatoxins, kojiracid, B-nitropropionic acid, aspergillic acid, aspertoxin, flavitoxin and penicillic acid (Onion, 1984). Ingestion of mycotoxins especially aflatoxinsin certain proportion can cause diseases known asmycotoxicoses. In mbuli however, the population of *A. flavus* which are responsible for the production ofaflatoxin was not estimated singly but as theprevalence was not so high, the probability of thepresence of aflatoxin in amounts sufficient to be toxic may also not be quite high.

CONCLUSION

The population of fungi in The plastic pot waslower than that of the clay pot. This shows that theplastic pot is better than the clay pots for the storage of mbuli. Hence this study recommends the use of plastic pots for the storage of mbuli.

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