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Comparative Study on Percentage Bacterial Loads in Over Fermented *Pentaclethra Macrophyllabenth* (Ukpaka) and in Over Riped *Mangifera Indica* (Mango) and their Effect in the Gastrointestinal Systems of the Consumers.

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ABSTRACT

Consuming a well-balanced diet containing abundant fresh fruits and vegetables can ensure overall health. The comparative study on percentage bacterial loads in over fermented *Pentaclethra macrophyllabenth* and over riped *Mangiferaindica* has been studied. The research is geared towards knowing the various bacteria that can occur in over fermented *P.macrophyllabenth* and in over riped*M.indica.* Culture media was used to isolate the organisms contained in *P.macrophyllabenth* and *M.indica*. Other tests used to identify the various organisms are coagulase test, catalase test, and gram staining tests. The result of the bacteriological test showed that staphylococcus aureus, Klebsiella specie bacillus, pseudomonas, streptococcus specie, Escherichia coli, and salmonella were commonly isolated from both fruits, but Micrococcus specie was isolated from *P.macrophyllabenth* but not from *M.indica*. Staphylococcus aureus occurred more in *P.macrophyllabenth* while salmonella organisms occurred highest in *M.indica*. The commonest gastrointestinal disorder reported in consumers of over fermented *P. macrophyllabenth* and *M. indica* is gassy stomach followed by heart burn. It could be deduced from this study that consumption of over fermented *P. macrophyllabenth* and over riped *M. Indica* may not be of good help to the gastrointestinal system.

INTRODUCTION

Fruits and vegetables have been discovered by the early man as additional source of vitamins in their body. Man not only consume fruits, but believe that it contributes to his healing and survival in his environment. Most edible fruits have sweet taste, attractive aroma and quality national properties (Agoura et al, 2015). In Nigeria, the easterners (Ibos) cherish mango fruits (*Mangifera indica*) and African oil bean (*Pentaclethra macrophyllabenth*). The African oil bean is a tropical tree crop, the plant is mostly found in the forest of eastern, western, and central Africa. Grows approximately 6 meters in girth and 21 meters in height (Keay et al, 1969). Although there are several staple foods such as maize, rice, beans, etc; yet there are still great needs to supplement these food products with certain unpopular food which are equally packed with loads of essential vitamins needed for healthy functioning of the body. Of such fruits are *Mangifera indica* (mango) and *Pentaclethra macrophyllabenth* (oil bean).

The African oil bean seed is an excellent source of energy, protein, amino acids, phosphorus, magnesium, irons, vitamins, calcium, manganese and copper (Achinewhu, 1980). It is also an excellent source of phytonutrients such as tannins, alkaloids, flavenoids, steroids, glycosides, and saponins (Ikhuoria et al, 2006). Notwithstanding, the high nutritional contents of the African oil bean seeds, studies revealed that the fermentation process which they undergo before consumption usually eradicates most of these minerals and vitamins such as phosphorus (Enejiugha et al, 2005). The mango is a juicy stone fruits belonging to the genius *Mangifera indica*, consisting of numerous tropical trees which are cultivated mostly for edible fruits (Wikipaedia 2013). *Mangifera indica*; the common mango or India mango is the only mango tree commonly cultivated in many tropical and subtropical regions. It is in India and Burma (Kostermans et al, 1993).

The chemical constituents of *Mangifera indica* are dietary fibre (4.5%), carbohydrate (13%), total fat (1%), vitamins such as vit.A (25.5%), vit.E (7.5%), vit. K (3.5%), vit.B6 (Pyridoxine 10%), niacin (3.5%), proteins (1%), electrolytes e.g. sodium (0%), potassium (3%), and minerals. Fermentation process is the chemical breakdown of a substance by bacteria, yeasts or other microorganisms, typically involving effervescence and the giving off of heat. In Africa, the majority of the fermented foods are produced at household level and hygiene is a major concern (Olasupo et al, 2002, Gbadaga et al, 2008). The problems of occurrence and growth of pathogens in most of these fermented food products cannot be ruled out as the general hygienic conditions of the processors, the equipment used, water and other raw materials cannot be said to be free of potential pathogens.

The occasional presence of pathogenic bacteria capable of causing human infection have been observed, hence our curiosity in this study is to evaluate the percentage load of bacteria in over fermented *Pentaclethra macrophyllabenth* (African oil bean seeds) and in over riped *Mangifera indica* (Mango) and their potentials to invade the gastrointestinal system of man causing various diseases of the gut such as diarrhoea, dysentery, stomach, food poisoning, etc.

MATERIALS AND METHODS

Sample Collection:

The oil bean seeds and mango were bought from a local market around the university centre. The specie were identified and authenticated by a taxonomist in Botany department before being used.

Preparation of Fermented Oil Bean (*Pentaclethra macrophyllabenth*) (Oguwike et al, 2017)

100g of the oil bean seeds were boiled in a litre of tap water for 1hr 30mins after washing them in water. It was filtered, allowed to cool at room temperature. The hard shells were broken and the seeds removed, washed, cut, and sliced. They were then wrapped with washed plantain leaves. They were left for one week to ferment properly; it was allowed to stay another five days to give room for over fermentation.

Preparation of Over Riped Mango (*Mangifera indica*)

Riped mango fruits were plucked from the botanical garden in the university. They were kept in plastic basket then covered with wet sack and allowed to stay for one week to over ripe. Over riped mango have deep yellow colours and soft in such that the juice can be pressed out.

Selection of Consumers for Test

20 males within the range of 10–20 years were selected for this study. They were well informed of the research. They were requested to report any health problem they observed within their gastrointestinal system after 2 days they ate the over fermented *P.macrophyllabenth* and the *M.indica* to the researchers. The control subjects were given good riped mango and good fermented oil bean.

Experimental Design

The culture media for the isolation of the organisms and the wire loops for plating of the samples in the culture media were prepared ascetically. The media prepared following standard bacteriological techniques were blood agar, mackonkey agar, nutrient agar, sabouried agar. For mango fruits, (15 fruits) each of the fruits was rinsed in a beaker containing sterile distilled water followed by ten folds serial dilution. 1ml of the rinsed water sample was ascetically transferred using asterile pipette into 9ml of

sterile distilled water in a test tube to give a 10^{-1} dilution. Serial dilution were made up to 10^{-7} and 1ml of each of the suspension were inoculated into a prepared molten nutrient agar plates, blood agar, mackonkey agar and sabouried agar plates and the inoculums were then incubated at 36°c for 24–48hrs to allow colony formation of bacteria (Aguoru et al, 2015).Pure cultures were prepared from the primary cultures of the bacteria and afterwards gram staining and biochemical characterization were done to identify the different bacteria present in the culture. Wire loop was used to collect samples directly from the over fermented *P.macrophyllabenth* and cultured directly in the agar plates.

Bacteriological Analysis:

Culture tests using blood agar, nutrient agar, mackonkey agar were done by the method described by Baker et al, 1998.

- Catalase and coagulase tests were done using the procedure described by Baker et al, 1998.
- Gram staining tests were carried out using the procedure described by Baker et al, 1998.

Stastistical Analysis:

The results from the laboratory analysis were presented using histograms.

RESULTS

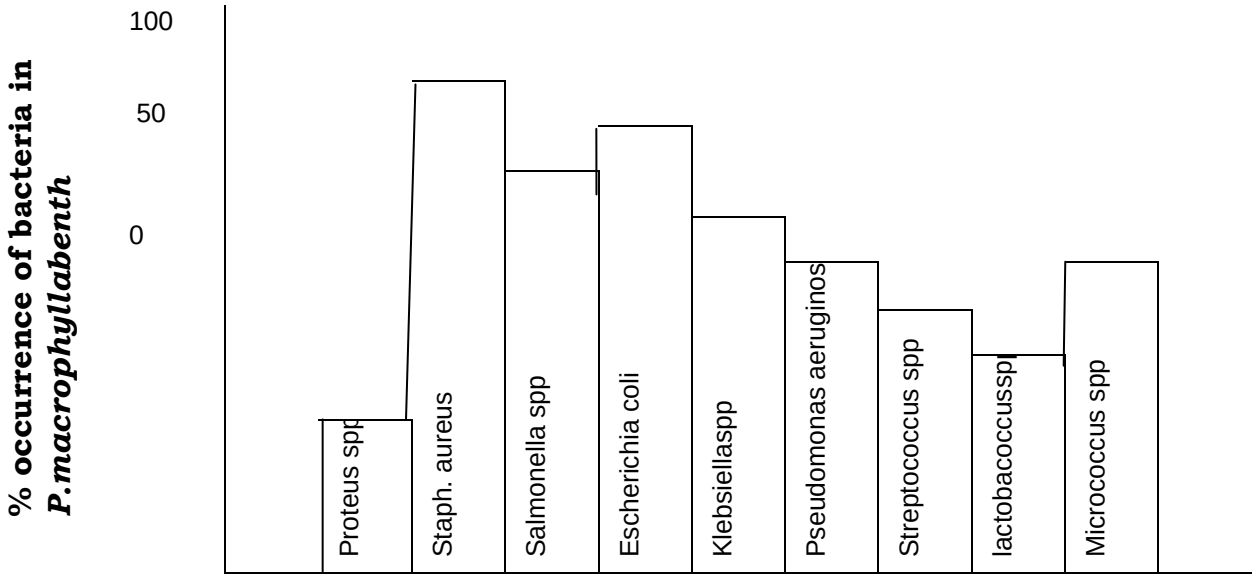

FIGURE 1:Various Bacteria isolated from over fermented *P.macrophyllabenth.*

Figure 1 shows the histogram representing the percentage occurrence of bacteria present in over fermented *P.macrophyllabenth.*

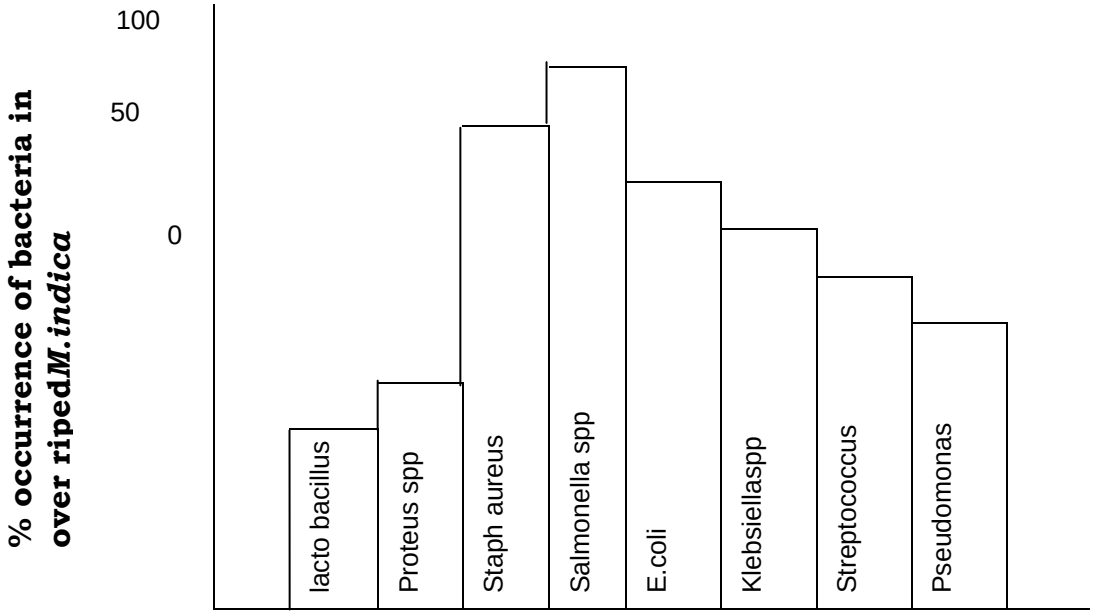

Figure 2 shows the histogram representing the percentage occurrence of bacteria present in over riped *M.indica*.

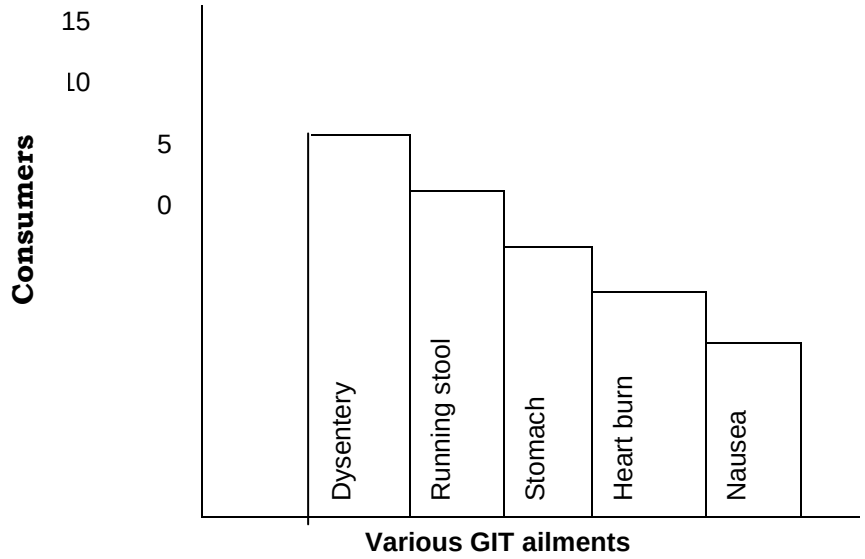

Figure 3 shows the histogram of various GIT ailments complained by consumers of over fermented *P.macrophyllabenth* after 2 days of consumption.

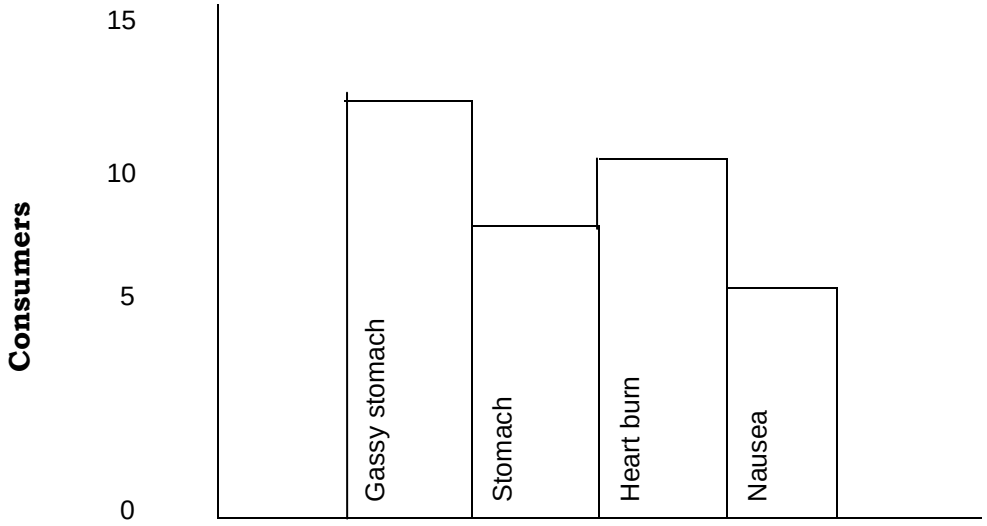

Figure 4 indicates the various GIT ailments reported by consumers of over ripped *Mangifera indica* after 2 days of consumption.

DISSCUSSION

Fruits are good sources of energy-producing nutrients, primarily in the form of carbohydrate. Each fruit contain only a small amount of protein and essentially no fat, with the majority of its nutrients in the form of fructose, a natural and simple sugar found in fruits. The comparative study on percentage bacterial loads in over fermented *P.macrophyllabenth* and in over riped *M.indica* and their effect in the gastro-intestinal system of the consumers has been done. The organisms isolated in over fermented *P.macrophyllabenth* include micrococcus spp., bacillus, staphylococcus aureus, klebsiella specie, streptococcus specie and pseudomonas. The organisms isolated in *M.indica* included all that was isolated in P.macrophyllabenth except that micrococcus organism was not discovered in *M.indica*. The highest percentage organism in cultures of *P.macrophyllabenth*is staphylococcus aureus (80%), (fig. 1) but salmonella spp. occurred highest in *M.indica* (85%) and staph. aureus was next in percentage occurrence (70%) fig. 2. E. coli organism occurred next to staph. aureus in percentage occurrence (68%) among the organisms isolated in *P.macrophyllabenth*. The presence of these pathogenic bacteria in the cultures of *P.macrophyllabenth* and M.indica is of utmost interest in health of the consumers.

The consumption of over riped *M.indica* by consumers in a bid to quench hunger and appetite for fruit can gradually lead to the accumulation of salmonella typhoid and paratyphoid in their gastro-intestinal system and in their large intestines. Salmonella typhi and paratyphi antigens are responsible for typhoid fever in the sufferers and in the carriers. Typhoid fever is spread by victims of typhoid fever and carriers. The signs of typhoid fever take 10-12 days to appear (Gillie 1979) from the time one eats or drinks salmonella germs in ones' food, fruits or water. These signs include fever, headache, pains, cough, stomach ache, constipation, if disease lingers untreated.

Staphylococcus aureus ranked highest in occurrence among the bacteria isolated from *P.macrophyllabenth* (fig. 1). This is a serious health risk (Aguoru, 2015) as the bacteria has the ability to cause a wide variety of infection through toxin production. Thebacteria has been shown to cause food poisoning, boils, cellulitis, running stool etc.

Gassy stomach was seen as the most common gastro-intestinal disorder complained by consumers of both over fermented *P.macrophyllabenth* and over riped *M.indica* (fig. 4). This is followed by heartburn. It could be deduced from this educative research that consumption of over fermented *P.macrophyllabenth* and over ripped *M. indica* may not be of a good benefit to the gastro intestinal system of the consumers.

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