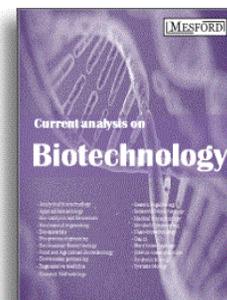


Bacteria And Fungi Found In Markets

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Abstract:

Market are buzzing with microorganisms. These microorganisms participate in the activities that go on in the market. In the market, buying and selling takes place. The air of Nigerian market is filled with various unwanted substances: dust, smoke, microorganisms, droplets from cough, sneezing or sweat. The air quality of some markets in Abia State was accessed microbiologically. Samples were collected using Settle plate method. The total heterotrophic plate count ranged from 38-284 cfu/m²/hr while the fungal plate count ranged from 30-101 cfu/m²/hr. Micrococcus sp., E.coli, Bacillus sp., Pseudomonas sp., Staphylococcus sp., Penicillium sp. and Aspergillus sp. were isolated. The microbial counts for international markets were higher than those of local markets. Also, the counts before market activities started were lower than when market activities were in process. There was no significant difference in the counts at $p \leq 0.05$. The aim of this research was to identify the microorganisms found in markets which could be of public health importance.

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Markets, Bacteria, Fungi, Abia State, Settle plate method, Nigeria.

1. INTRODUCTION

A market is a space in which buyers and sellers meet to carry out transactions involving goods and/or services [1]. A market enables cost pooling between sellers and buyers and eliminates stock and logistical constraints. Markets are the solution to pure player or cross-channel profitability. A market enables a strong brand, a qualified audience or professional know-how to be capitalized upon, bringing together third-party sellers. The products range on a single platform with a view of offering visitors more products, with the best prices, and a quality buying experience. A market enables effective interaction between sellers and product/service buyers and on the same space, with a view to provide the most competitive and comprehensive choice possible in a structured and secure environment.

A market is a location where people regularly gather for the purchase and sale of provisions, livestock and other goods. In Nigeria, a market can be called “Ahia” in Igbo language, “Kasuwar” in Hausa and “Oja” or “Oja iye” in Yoruba language. Some markets operate daily and are said to be permanent markets while others are held once in a week or less

frequent i.e. on specified days such as festival days etc. and are said to be periodic markets. Also, some markets have limited or perishable goods for sales and these are called local markets as most of the sellers and buyers come from distances not too far from the markets. International markets attract individuals from far distances because of the availability of different ranges of products in them. The form that a market adopts depends on its locality’s population, culture, ambient and geographical conditions. The term market covers many types of trading such as market squares, market and food halls, and their different varieties. Markets can be situated both outdoors and indoors [2]. Markets have existed for as long as humans have engaged in trade. In many countries, shopping at a local market is a standard feature of daily life. Given the market’s role in ensuring supplies for a population, markets are often regulated by a central authority.

Airborne particles are a major cause of respiratory ailments of humans, causing allergies, asthma and pathogenic infections of the respiratory tract. During a sneeze, millions of tiny droplets of water and mucus are expelled at about 200 mile per hour (100 meters per second). According to Deacon of the University of Edinburgh, the droplets initially are about 10-100

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micrometers diameter, but they dry rapidly to droplets of nuclei of 1-4 micrometers, containing virus particles or bacteria. For ages, human beings have tried to associate infectious diseases with bad air quality with the famous miasma theory [3]. It is stated that under certain circumstances, ambient air became charged with an “epidemic influence” which in turn became malignant when combined with the emissions of organic decomposition from the earth [4]. The relationship between microbes in the air and infections was first shown by Louis Pasteur, who also stated the germ theory of diseases. Airborne pathogens can cause respiratory ailments, causing allergy, asthma and pathological involvement of respiratory tract. The respiratory tract and other parts of the body are highly effective in trapping airborne particles resulting in serious consequences towards health. Air sampling is used routinely to monitor the populations of airborne particles and to inform the public about the air quality and pollen/spore counts through public broadcasting (weather reports etc.) [5].

1.1. Aims and Objectives

1. To access the microbial air quality of different markets.
2. To determine the bacterial and fungal counts in markets.
3. To compare the microbial counts between local and international markets
4. To compare the microbial load between market days and non-market days.
5. To identify contributing agents that leads to poor quality levels in markets.

2. MATERIALS AND METHOD

Samples were taken from different international and local markets in Abia State. The Settle plate method was used with the Petri dishes containing Nutrient or Sabouraud dextrose agar as proposed by the American Public Health Association [6]. These plates contained 20ml of already prepared media and were left open to air for one hour, one meter from the floor and also one meter away from any obstacle to achieve the index of microbial air contamination. This was performed for four months from May to August 2017. The inoculated plates were taken to the laboratory for incubation at 24-48 hours at 36°C to allow the growth of bacteria and for 3-14 days incubation for fungal growth. These plates were carefully wrapped with aluminum foil and masking tape to prevent the drying up of plates. Isolates were characterized and identified to the genus level using biochemical and microscopic characteristics. Microbial counts were taken before and at the start of market activities. All laboratory tests were carried out in aseptic conditions.

3. RESULTS

Total heterotrophic plate count for international markets was from 38-284 cfu/m²/hr and its fungal count was from 31-101 cfu/m²/hr (Fig. 1) while the heterotrophic plate count for

local markets was from 42-96 cfu/m²/hr and its fungal count was from 30-54 cfu/m²/hr (Fig. 2). The mean total viable count of microorganisms from this research is shown in Fig. 3 and the microorganisms were *Micrococcus* sp., *E. coli*, *Bacillus* sp., *Pseudomonas* sp., *Staphylococcus* sp., *Penicillium* sp. and *Aspergillus* sp.

4. DISCUSSION

Rao et al. [7] from their research isolated 8 bacterial and 15 fungal species from a vegetable and cereal market of Vijaywada. Pathak and Verma recorded 11 bacterial species from their study of a vegetable market [8; 9] and Reddy and Shrinivas recorded 20 fungal species from a vegetable market [10]. Naruka and Gaur [9] recorded that Gram-positive cocci and Gram-positive bacilli were dominant in summer while during winter, Gram-negative bacilli predominated. Verma and Pathak [11] [8] recorded similar results during their study. This research records *Aspergillus* sp. as the most occurred fungi. In a research carried out, *Aspergillus* sp. had highest counts and this was followed by *Cladosporium* sp. and *Alternaria* sp. [9; 10]. Grzyb et al. [12] recorded an abundance of bacteria which ranged from 42 to 2300 CFU/m³. They also recorded that Fungi were seldom present and ranged from 30 to 3460 CFU/m³. Also, they found out that Actinomycetes were most uncommon and their quantities ranged from 0 to 140 CFU/m³ but quantities that ranged over 100 CFU/m³ also caused heavy atmospheric air pollution.

In markets poor sanitary measure contributes to buildup and spread of various microorganisms [8]. High population density, heavy traffic and unhygienic conditions in markets may be the main source of microorganisms. Environmental matrices (water, air and surfaces) play a leading role as reservoirs of microorganisms [13]. Through air sampling, it is possible to evaluate microbial contamination in environments at high risk of infection. Although there is much-published research, procedures have not been firmly established and there is still debate on the sampling technique to be used, their frequency of application and even on the usefulness of such checks and controls [14]. In fact, international standards offer different techniques (active or passive sampling) and different kinds of samples thus leaving the choice of system; open [15]. The passive sampling technique was used in this research work where the settle plates containing culture media were exposed to the air for a given time in order to collect biological particles which sediment out and are then incubated. Results are expressed in CFU/m²/hr. Passive sampling was performed to determine the index of microbial air contamination. The index corresponds to the number of colony forming unit counted on the Petri dish according to the 1/1/1 scheme (for 1 hour, 1m above the floor, about 1m away from walls or any major obstacles).

The market is a place where buying and selling takes place. In a typical Nigerian setting, a market can be local or international. Following are the characteristics of a local market: open occasionally, do not sell goods in large quantities (wholesale), sell more of perishable goods, sellers and buyers live not too

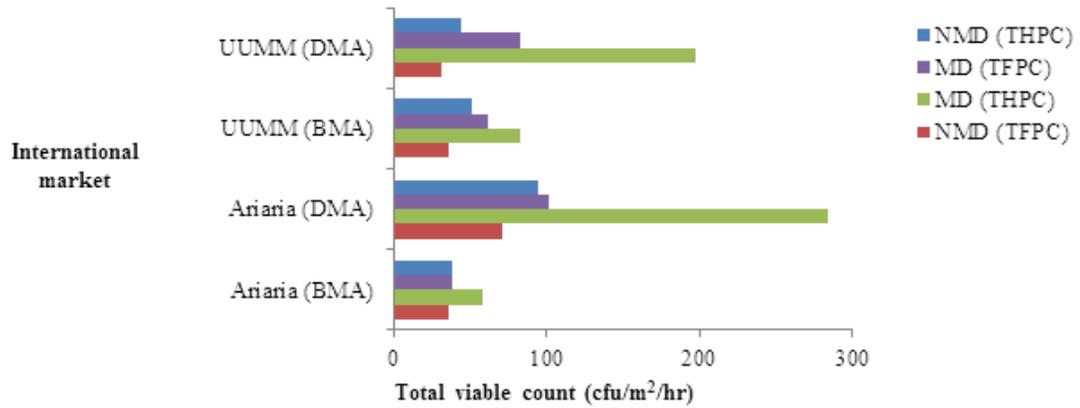


Fig. (1). Bar chart of international markets against total viable counts.

Key:

UUMM (DMA): Ubani Ultra Modern Market (During Market Activities)
 UUMM (BMA): Ubani Ultra Modern Market (Before Market Activities)
 Ariaria (DMA): Ariaria (During Market Activities)
 Ariaria (BMA): Ariaria (Before Market Activities)
 THPC = Total Heterotrophic Plate Count
 TFPC = Total Fungal Plate Count
 NMD = Non- market day
 MD = Market day

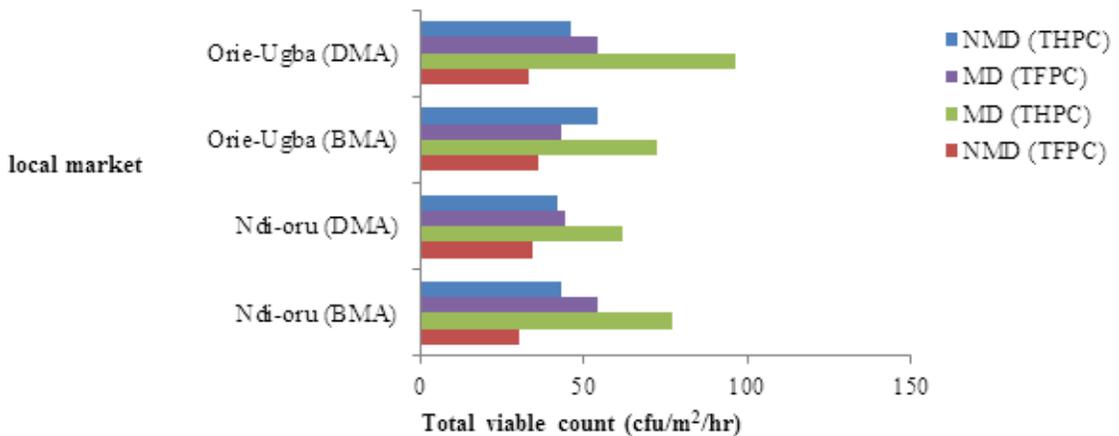


Fig. (2). Bar chart of local markets against total viable counts.

Key:

Ndi-Oru (DMA): Ndi-Oru Market (During Market Activities)
 Ndi-oru (BMA): Ndi-oru Market (Before Market Activities)
 Orie-Ugba (DMA): Orie-Ugba (During Market Activities)
 Orie-Ugba (BMA): Orie-Ugba (Before Market Activities)
 THPC = Total Heterotrophic Plate Count
 TFPC = Total Fungal Plate Count
 NMD = Non- market day
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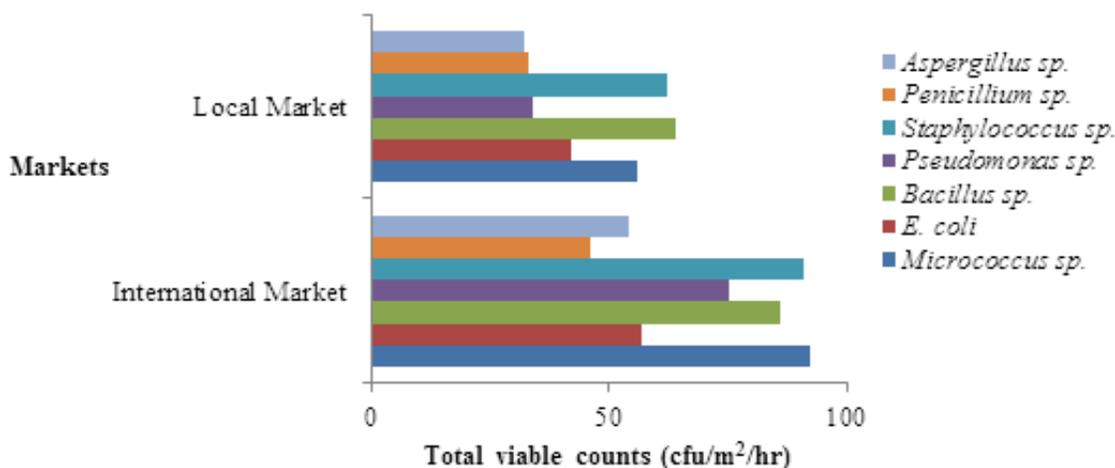


Fig. (3). bar chart of markets against total viable counts.

far away from the markets; for example, Ori-ugba market etc. While international market has an organized set-up with buyers of goods and services coming from different states, local governments and countries; for example, they operate every day and sell items in wholesale quantities and retail and the number of people in this market is very high. This could be one of the reasons why this research work recorded higher counts for international markets than for local markets. The amount of dust is higher in international markets, the number of people found in this market and the various activities that go on. Vehicular emissions, particles from goods moved from warehouses or stores, objects flying, droplets around, burning of wastes, noise from individuals, particles from different machines in operation etc. Vehicular emission remains as a threat to environmental health problem which is expected to increase reasonably as vehicle ownership increase in the world [16]. This study also revealed that the microbial counts were lesser before market activities began. This could be a result of lesser movements or activities carried out in the market.

It was also observed that various individuals in the market came down with sneezing, coughing, redness of the eyes, vomiting, tiredness, headache, nausea and blurry vision. This was as a result of the environment they found themselves as many of the particles raised were taken up by their bodies which; if not controlled, may lead to major diseases. A study confirmed that there is a prevalence of chronic bronchitis and asthma amongst street cleaners exposed to vehicle pollutants in concentrations higher than. World Health Organization recommended guidelines thus leading to a significant increase in respiratory problems [17]. In Nigeria, much attention is given on general industrial pollution in oil industries with little reference on damage of pollution caused by mobile transportation which are also sources of air pollution [18; 19]. Pollution, especially caused by increasing population in market is also ignored. The counts for this study were higher than the standard of 30 cfu/cm²/week of a dairy plant area by American Public Health Association. The microorganisms isolated could be linked to the cause of some respiratory diseases found in individuals. The increase in temperature affected the number of airborne microorganisms as shown in

the difference in the counts before market activities and when market operations began [20].

Exposure to the highest levels of pollution generally occurs in urban areas where air pollution concentrations can build up to unacceptable levels due to the proximity and density of industrial, commercial and mobile source, Ozone can inflame the airways, causing chest pain, coughing, wheezing and shortness of breath and these conditions can be worse in people with existing lung disease, including asthma. Fine particles can harm the cardiovascular system and cause respiratory diseases, sometimes resulting in premature death. Ozone and fine particles also contribute to climate change, which can in turn, create more ground-level ozone (climate change also contributes to heat waves, which increase power demand for air conditioning, resulting in more air pollution [21].

5. CONCLUSION

Its obvious many people think of food sold in markets especially directly by farmers to be fresh, healthy and nutritious. The quality of products sold in the market is usually influenced by their surroundings as a result of a high concentration of air dust and bio aerosols containing various size dust particles which can help to transmit microorganisms. Most markets are located in the city centers neighboring crowded streets with plenty of cars and people [12]. The markets are one of the busiest places in the world. Humans cannot avoid microorganisms as they always come in contact while they are involved in activities.

6. RECOMMENDATION

Sanitary measures should be encouraged by market men and women to ensure a healthy environment. There should be a law that bans indiscriminate burning and disposal of waste in markets during marketing hours, parking of vehicles and against all forms of activities that make the market too dirty so that people will easily locate what they want to buy. The market should be properly organized and this will discourage body contacts and droplets from one individual to another.

Marketmen and women should be properly educated on the dangers of high microbial loads in markets.

I will suggest that when in the market especially at international market, nose masks, glasses or other protective coverings should be worn. The Government of Nigeria should also ensure that the market should be a safe and healthy place to visit and should also see that the market is well spaced for easy movement.

CONFLICT OF INTEREST

There is no conflict of interest.

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