My research focus

My field of research interest is Mycology/Biotechnology and my main research focus is in the area of Food and Environmental Mycology/Applied Microbiology. In the last 17 years, I have extensively studied biodiversities of several Nigerian higher fungi in the families of Agaricaceae, Lycoperdaceae and Polyporaceae. My research work has identified vegetative growth requirements of Psathyrella atroumbonata, Schizophyllum commune, Lepiota procera, Pleurotus florida and Tricholoma lobayensis which are all edible fungal species indigenous to Nigeria. The reports which are first of its kinds on Nigerian edible fungi have been published in reputable international journals (Fasidi and Jonathan, 1994; Jonathan and Fasidi, 2000, Jonathan and Fasidi, 2001; Jonathan et al., 2003, Jonathan et al., 2011 Jonathan et al., 2013a). Nutritional evaluations of these edible fungi and microorganisms which affect their cultures have been also identified. It was found that Nigerian mushrooms are rich food and their protein values lied between meat and vegetables (Jonathan, 2005a; Jonathan et al., 2006; Jonathan et al, 2008a). Production of enzymes from Nigerian mushrooms have been elucidated (Jonathan and Adeoyo, 2011).

Agro-industrial wastes such as wood wastes, animal dung, cereal straws, con-cob, cotton wastes, paper wastes etc, constitute a major problem to our environment. In the course of my research work, we have been able to isolate and characterize microorganisms which could convert some of these substrates to useful products (wastes to wealth). Wastes such as rice straw, sawdust and cotton wastes have been bio-degraded to substrates which could be used for cultivation of edible fungi and the spent substrates have been fond to be useful as animal feeds. (Jonathan, 2005; Fasola, Gbolagade and Fasidi, 2007; Jonathan et al., 2008a; Jonathan et al., 2010; Jonathan et al., 2011a. This research was carried out in conjunction with other scientists in Animal Science and Forestry Departments.

Fungi and mycotoxin contamination of stored mushrooms, as well as local fermented yam and plantain snacks ‘gbodo’ and ‘elubo ogede’have also been investigated. It was shown that the risk of aflatoxin contamination increases with the length of storage (Jonathan and Esho, 2010, Jonathan et al, 2011b). My research work has also presented detailed reports on antimicrobial profile of the wild higher fungi collected from forest zones of South Western Nigeria. It has been shown that the extracts of these macro fungi could inhibit the growth of some clinically important microorganisms. This indicates that consumption of these edible fungi will naturally(459,837),(823,850) confer prevention against the disease causing microorganisms (Jonathan, 2002; Jonathan and Fasidi, 2003b; Jonathan and Fasidi, 2005c; Jonathan et al 2008b, Jonathan and Awotona, 2010; Olawuyi et al, 2010; Jonathan et al, 2011c).

Ten publications which best reflect contributions to scholarship knowledge in the area of Mycology/Applied Microbiology

A. Fungal biotechnology

vegetative growth of *V. esculenta*, an indigenous edible fungus was fructose followed in order by glucose, cellulose and malt extract while peptone was the best nitrogen source. Incorporation of elements like potassium and zinc into the growth medium also stimulated vegetative growth of this fungus. This information is highly relevant to enhancement of mycelia starter culture which could boost or improve local production of this edible fungus.

2. Jonathan, S. G. and I. O. Fasidi (2001). Studies on phytohormones, vitamins and mineral element requirements of *Lentinus subnudus* and *Schizophyllum commune* from Nigeria. *Food Chemistry*. 75: 303 – 307 (Britain). This paper elucidated the importance of phytohormone 2,4- D at the concentration of 1.0 and 10.0ppm for the optima yield of *Lentinus subnudus* and *Schizophyllum commune* respectively. This article actually shed light on tissue culture and, the physico-chemical conditions which is required for the mycelial growth of these two fungi.

3. Jonathan, S. G., Kigigha, L. T. and Ohimain, E. (2008). Evaluation of the Inhibitory potentials of eight edible higher Nigerian fungi against pathogenic microorganisms. *African Journal of Biomedical Research* 11:195-200 (Nigeria). This paper established the antifungal and antibacterial activities of eight higher fungi (*Fomes lignosus*, *Marasmius jodocodo*, *Pleurotus florida*, *Pleurotus tuber-regium*, *Psathrella atroumbonata*, *Pleurotus giganteus*, *Termitomyces microcarpus* and *Termitomyces robustus*) collected from selected states in the southern part of Nigeria. The results of these investigations showed that these macro-fungi are potential therapeutic drugs. These macro fungi have been recommended to ethno-botanists as alternative to conventional drugs with side effects.

4. Jonathan, S. G. and Adeoyo, R. A. (2011). Evaluation of ten wild Nigerian mushrooms for amylase and cellulose activities. *Mycobiology* 39(2):103-108 (Korea). Amylases and cellulases are important enzymes that could be utilized for various biological activities. Ten different wild Nigerian mushrooms (*Agaricus blazei*, *Agaricus sp.*, *Corilopsis occidentalis*, *Coriolus versicolor*, *Termitomyces clypeatus*, *Termitomyces globulus*, *Pleurotus tuber-regium*, *Podoscypha bolleana*, *Pogonomyces hydoides*, and *Nothopanus hygrophanus*) were assayed for production of these secondary metabolites. The results revealed that most of the tested wild fungi demonstrated very good amylase and cellulase activities. This is a relevant information for the potential production of industrial enzymes.

B. Environmental Mycology

5. Jonathan, Gbolagade (2006). Bacteria associated with compost used for cultivation of Nigerian edible mushrooms: *Pleurotus tuber-regium* (Fr.) Singer, and *Lentinus squarrosulus* (Berk.) *African Journal of Biotechnology*. 5 (4) 338-34 (Kenya). This paper identified various bacteria species which are responsible for the decomposition of agricultural substrates that could be used for the cultivation of Nigerian edible fungi (*P. tuber-regium* and *L. squarrosulus*). The composted wastes were found to support the growth of these edible fungi than none composted wastes. In the other report [Jonathan, S. G. Lawal, M. M. and Oyetunji, O. J. (2011). Effect of spent mushroom compost(SMC) of *Pleurotus pulmonarius* on growth performance of four Nigerian vegetables. *Mycobiology* (2011);39(3):28-33]. It was shown that SMC could enhance the yield of common Nigerian vegetables.

7. Jonathan, S. G.; Akinfemi, A. and Adenipekun, C. O. (2010). Biodegradation and invitro digestibility of maize husks treated with edible fungi (*Pleurotus tuber-regium* and *Lentinus subnudus*) from Nigeria. *Electronic Journal of Environmental, Agricultural and Food Chemistry (EJEAFche)* 9(4):742-750 (Spain). This paper investigated the treatment of wastes (maize husks) by two white rot fungi (*Pleurotus tuber-regium* and *Lentinus subnudus*). The wastes were actively bio-degraded by test fungi and the end product was found to be good source of improved protein and other relevant nutrients in ruminants diet. This study showed possible ways of converting wastes to wealth.

C. Food Mycology/Microbiology

8. Jonathan, S. G. and Esho, E. O. (2010). Fungi and Aflatoxin detection in two oyster mushrooms *Pleurotus ostreatus* and *Pleurotus pulmonarius* from Nigeria. *Electronic Journal of Environmental, Agricultural and Food Chemistry (EJEAFche)* 9 (11): 1722-1730 (Spain). This paper focused on the detection of biodeteriorating fungi and aflatoxin contamination in *Pleurotus ostreatus* and *Pleurotus pulmonarius* which are two edible oyster mushrooms cultivated in Nigeria. These parameters were evaluated for fresh and stored samples. (at 0, 35, 70, 105 and 140 days). Seven fungi were isolated from the two mushroom samples. *Aspergillus niger* was the most frequently encountered, followed by *Fusarium oxysporum, A. tamarii, A. flavus, Penicillium chrysogenum, P. oxalicum* and *F. compactum* in that order. (P>0.05). The total fungal count in the fresh samples of *P. ostreatus* was 3.0 \times 10^1 (cfu/g) and increased to 1.35 \times 10^4 (cfu/g) after 105 days of storage. It was shown that the longer the storage time, the higher the possibilities of fungal and mycotoxin contamination. Proper storage facilities were suggested to discourage fungal and mycotoxin contamination in stored oyster mushrooms.

9. Jonathan, S. G. and Adeoyo, R. O. (2011). Collection, morphological characterization and nutrient profile of some wild mushrooms from Akoko, Ondo state, Nigeria. *Natural products* 7 (3): 128-136 (India). This article delves into the collection, characterization and identification of common mushrooms from ondo State of South western Nigeria. The studies presented pictorial representation of some common mushrooms from a typical rain forest region of Nigeria. This article will be useful as a guide for mushroom hunters for their identification which eventually may reduce the risk of mushroom poisoning. The results of these investigation as contained in this paper also showed that Nigerian mushrooms are rich food containing protein, dietary fibre, Ca, Mg, K, S, P and Fe. The protein contents of analyzed fungi were found to lie between meat and vegetables. Some of the collected mushrooms are also important medicinally and environmentally.
10. Jonathan, S. G.; Ajayi, I. A. and Omitade, Y. (2011). Nutritional compositions, fungi and aflatoxins detection in stored ‘gbodo’ fermented (*Dioscorea rotundata*) and ‘elubo ogede’ fermented (*Musa parasidiaca*) from south western Nigeria. *African Journal of Food Science* 5 (2): 105-110. (Nigeria). This paper investigated into fungi, aflatoxin detection and food values of locally made gbodo’ (prepared from fermented yam, *Dioscorea rotundata*) and ‘elubo ogede’ (prepared from fermented plantain, *Musa parasidiaca*). The studies revealed that fresh ‘gbodo’ and ‘elubo ogede’ had very low or insignificant fungal and aflatoxin concentration while these food products stored for over six months is statistically high. The health implications of consuming these locally made food products stored for over one year is stressed.