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Popularization of Mushroom Production Technologies among Small-Scale Farmers in Abia State, Nigeria

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Abstract: *The study sought to investigate popularization of mushroom production technologies among small-scale farmers in Abia State, Nigeria. Structured interview schedule and focus group discussion were used to collect data from a sample of eighty (80) respondents. Frequency and percentage were used for data analysis. Results revealed that 23.0% of the respondents were aware of the new technology and were aware of raw materials, environmental requirements, growth substrate and harvesting techniques for mushroom production. They were growing mushroom mostly for household consumption. Major constraints to practicing use of new technology for mushroom production were pest infestation (77.7%) and shortage of water (70.5%). Efforts are highly needed by extension agencies in popularizing the use of new technology for mushroom production in order to enhance productivity.*

Keywords: *Mushroom, production, technologies, farmers, Abia State, Nigeria*

1. INTRODUCTION

Fungi have been a source of protein in man's diet for centuries (Hammet, 1999). Mushroom is one of the fungi and has properties of both plant and animal. Chang and Miles (2004) defined mushroom as a macro fungus with a distinctive fruiting body which can be either epigeous or hypogenous and large enough to be seen with the naked eye and can be picked with hand. They lack chlorophyll and consequently cannot use solar energy in manufacturing their food. They have been part of fungal diversity for centuries. Their mode of nutrition is by producing a wide range of enzymes that can break down complex substances after which they are able to absorb the soluble substances so formed. This is characteristic of mushrooms (Chang and Miles, 2004). They play a major role with other fungi and bacteria to rid our environment of the litter, logs and wastes that would have clogged our cities and woods. They do this by degrading them hence they are often referred to as decomposers in the ecosystem. Two types of mushroom exists, namely; edible and inedible, with the edible one discovered to be a good source of nutrients especially quality protein. Most edible species are members of the family Agaricaceae and belong to genus Agaricus (Hammet and Chamberlain, 1998). Generally, substrates used in the cultivation of mushrooms are derived mainly from agricultural and industrial wastes. The utilization of such wastes has a direct contribution to solving the global problem of environmental pollution.

There are many substrates for mushroom cultivation. In Nigeria, as in other parts of Africa, these raw materials have not been fully exploited for mushroom cultivation. A close look at the habitat of wild mushrooms indicates that they are normally found on such sites of natural wastes due to senescence (e.g. on leaf litter, fallen logs) or on wastes accumulated on sites of cottage or farm processing of agricultural products. This common observation indicates the potentials of such wastes for the cultivation of mushrooms (Okhuoya, 2000).

In Nigeria, many species of mushrooms are popular and acceptable to the people, which they collect from the wild, either from the forest floor or grassland in the rainy season (April to September). They cook and use them for various soup preparations or are sun-dried or smoked for preservation. Mushroom hunting used to be a popular hobby among the village youths who use it as a source of income. Many edible species have been described and identified in Nigeria (Isikhuemhen and Okhuoya, 1995).

Auricularia auricular is a type of mushroom eaten by many people in rural areas. They are traditionally collected on wet logs in the woods during the rainy season or on logs under shades in the forest. The technology for its commercial production was developed in Asia where its consumption is very popular. Mushrooms are either marketed fresh as soon as harvested or preserved by whatsoever means as quickly as possible. In order to effectively preserve mushrooms, they should be kept cold with storage temperature of 0 - 2˚C within five hours of picking. Sun-drying, especially in the tropics during the dry season, is also another effective method of preservation. It is equally advisable to sundry as soon as harvested.

Drying such mushrooms on a clean metal sheet is preferred. Dried mushrooms have a good flavor thereby imparting a unique taste and aroma to prepared foods. Mushroom can be preserved by cleaning, blanching, canning, sterilization, cooling, labeling and packaging.

Mushroom contains carbohydrates, protein, fat and minerals, all of which contribute to food value. Protein is the major nutrient found in mushroom. Nigeria like most developing countries still struggles to meet the minimum nutrient requirements. Increase in the utilization of food nutrients in the right proportion will lead to high nutritional standards. Agricultural Extension programmes such as ADPs have been responsible in increasing protein, vitamin and mineral intake of rural populace by introducing techniques such as soybean utilization, improved animal husbandry, fish production, among others (Anyanwu, 1990).

Traditional use of mushrooms as medicine has been long established among different cultures of the world. In the far East countries, especially in China, Japan and Korea, mushrooms have long been revered for their curative attributes (Okhuoya, 2000). In Nigeria, many mushrooms have been used in the treatment of diseases by our people. There is information in our cultures on the use of mushrooms in traditional healing practices as documented by Isikhumhen and Okhuoya, 1995, Akpaja *et al*., 2003, Akpaja *et al.*, (2005), Alabi, 1994, Jonathan and Fasidi, 2005, Jonathan *et al*., 2007, among others. These authors have reported some higher fungi that possess important medicinal ingredients used for treating diseases such as high blood pressure, pneumonia, urinary tract infection, intestinal disorder by Nigerian herbalists. These mushrooms include: *Ganoderma lucidum, Fomes fomentarius, Daldinia concentrica, Calvatia species, Termitomyces species, Lycopendon, polypores, Psathyrella atroumbonata, Schizophyum commune, Corilopsis occidentalis, Auricularia spp.* (Jonathan and Fasidi, 2005).

An anonymous French man in the 17th century evolved a method of treating horse manure and planting it with the spawn of wild mushroom. The earliest description of this method was by de Toumefort, in Paris in 1707 and is remarkably employed today (Oei, 1991). This new technology makes use of indigenous knowledge as indigenous people have developed close and unique connections with lands and environment in which they live.

Until the introduction of this technology, people in the study area never cultivated mushrooms. They harvest them from the wild at the onset of rainy/planting season usually around areas where a tree or log of wood had fallen and already decomposing, invariably unaware of spores finding suitable media to settle, sprout and mature being saprophytic in nature. Figure 1 shows the diagram of mushroom growing in a medium.

Figure 1. *Mushroom growing in a medium at home*

Researchers found that the process can be transformed by domesticating the fruiting body to produce mushrooms in a controlled environment using suitable substrate media (Mizumo, 1999).

The materials used include:

- The fruiting head commonly called *Osu* in Igbo land usually found around decomposing logs of wood or under forest soils with heavy leaf litter. The edible mushroom (*Auriculana auricular*) under study is produced from this;
- Poultry or animal manure (decomposed); and
- Cassava or yam peels (decomposed).

2. METHODS/PROCEDURE

- The cassava peels and poultry manure are thoroughly mixed and put in a jute bag/sack;
- It is tied at the top lightly watered until contents ferment;
- This serves as the substrate media which is spread on an already cleared, airy and shady land area;
- Small pieces of the fruiting head are then sown, scattered on the prepared land- this is called spawning;
- Light watering is required when rainfall is not adequate; and
- Within 3-4 weeks, sprouts emerge and mature mushrooms are harvested.

Mushroom naturally grows in the wild and its production capacity is low and the supply is not regular. Recently, cultivation of mushroom at homes has been introduced thus improving its yields and availability. The new technology is advantageous because it is possible for mushroom to be cultivated throughout the year (in and out of season). It is also cheap and not complicated for the rural farmers to practice. Mushrooms like other cultivated vegetable crops are subject to attack by pests and pathogens. In order to minimize incidence of pests and diseases, adoption of farm sanitation and avoidance of use of infected raw materials and implements are recommended for better results.

This recent method of cultivating mushrooms around homes has not yet been popularized even though few households that have embarked on this have been successful and are reaping the benefits (focus group discussion). It will be ideal to encourage rural farmers to practice this new technology as it will not only improve nutritional needs but serve as a reliable source of income.

Specifically, the study was designed to:

1. describe socio-economic characteristics of the respondents;
2. examine the awareness of the respondents on new technology for mushroom production; and
3. Identify constraints associated with practicing new technology involved in mushroom production.

3. MATERIALS AND METHODS

The study was conducted in Amaegbuato- Nkpa community in Bende Local Government Area of Abia State, Nigeria. Abia State is one of the States in Southeast Nigeria. The study area has an estimated area of 2.25 square kilometers with estimated population of 8000 inhabitants. Nkpa is made up of eleven distinct villages namely; Amaediaba, Umuede, Ugwu, Amaohoro, Amaokpo, Amedukwu, Umuegwu, Odua, Nkpaukwa, Okpobia and Eluama. Umuede, Odua, Okpobia and Umuegwu villages make up Amaegbuato autonomous community. The community is bound on the north by Isuikwuato, on the west and south by Ohuhu village and on the east by Umuimenyi settlement.

The inhabitants of the area are mostly farmers known for producing cassava and oil palm. They are also involved in small-scale mushroom production. The population of the study constitutes the inhabitants of four villages in Amaegbuato community. Two villages namely Umuede and Umuegwu were purposively selected based on availability of people involved in practicing new mushroom production technology. Fourty (40) respondents were randomly selected from each of the villages, giving a total of eighty (80) respondents for the study. Structured interview schedule and focus group discussion were used for data collection. Data were analyzed using frequency and percentage

4. RESULTS AND DISCUSSION

4.1. Socio-Economic Characteristics of the Respondents

Entries in Table 1 revealed that 67.0% of the respondents were males, while 33.0% were females. This implies that women in the area were not fully involved in new technology for producing mushroom. The findings agree with Ogbanga (1998) who found that males were favoured more in agricultural extension services than their female counterparts. Consequently, the dissemination of improved agricultural technologies such as mushroom technology as well as other scientific knowledge in farming will not be readily available to rural women. This contravenes a study by Isife (2000) who reported that agricultural extension principle requires full participation of both sexes in extension programmes.

Table 1 shows that majority (59.0%) of the respondents were more than fourty years. This could be attributed to rural-urban migration of youths, leaving the aged in rural areas. This is disadvantageous because improved mushroom technologies may not last long in the hands of the aged people. The younger generation with innovative attitudes should be encouraged and made interested in such lucrative venture by providing improved infrastructural facilities in rural areas.

It was observed in Table 1 that only 3.0% of the respondents had no formal education. This implies that literacy on the part of the farmers will not be a barrier in disseminating mushroom production technology since majority of them was educated.

Results in Table 1 also indicated that majority (68.0%) were married. There is likelihood that those who were married will obtain labour for mushroom production form members of their households. This will definitely have a positive effect in continued practice of the mushroom technology.

It is also evident from Table 1 that majority (78.0%) of the respondents had farming as major occupation, while 10.0% were involved in petty-trading, among others. Oral interview with the herbalists indicated that extracts obtained from mushroom could be used to cure fungi skin infections. This agrees with the findings of Chen (1993) who discovered that mushroom has anti-cancer properties and some of them aid the body immune system. The author also found that high intake of mushroom reduces serum cholesterol, having strong anti-tumor and anti-viral properties.

Table 1. *Percentage distribution of respondents according to socio-economic characteristics (n= 80)*

Variables	Percentage
Gender	
Male	67.0
Female	33.0
Age (years)	
≤20	15.0
21-30	18.0
31-40	18.0
41-50	27.0
>50	32.0
Educational qualification	
No formal education	3.0
Primary school incomplete	18.0
Primary school complete	30.0
Secondary school incomplete	27.0
Secondary school complete	15.0
Tertiary education	7.0
Marital status	
Married	68.0
Single	25.0
Divorced	2.0
Widowed	5.0
Major occupation	
Farming	78.0
Petty-trading	10.0
Artisan	2.0
Public service	5.0
Civil service	3.0
Herbalist	2.0

4.2. Awareness of the Respondents on New Technology and Sources of Information for Mushroom Production

Data in Table 2 indicate that 47.0% of the respondents were not fully aware of new technology for mushroom production, 30.0% were not aware, while 23.0% only were aware. About 23.0% of those who were aware of the new technology indicated that they were aware of raw materials, environmental requirements, growth substrate and harvesting techniques for mushroom production, 23.0% indicated being aware of raw materials only, 19.0% indicated being aware of environmental requirements only, while 3.0% indicated being aware of growth and substrate only. Oghenekaro, Okhuoya and Akpaja (2008) observed that it is possible to cultivate this mushroom on the sawdust of many economic trees processed in our sawmills.

A greater percentage (35.5%) of the respondents got aware of new production technology through neighbors, 20.0% were aware through friends, while 12.5% were through extension agents. This implies that the respondents got information about new technology for mushroom production through informal sources. It shows that extension services in area of new technology for mushroom production are not given adequate attention and wide coverage. This has resulted in poor dissemination/ popularization of appropriate technology needed for mushroom production. Okhuoya (2008) reported that mushroom substrates are made from different materials derived mainly from agricultural and industrial wastes.

Table 2. *Distribution of respondents based on knowledge of new technology for mushroom production (n= 80)*

Awareness	Percentage
Aware	23.0
Not aware	30.0
Partially aware	47.0
Aspects of technology known	
Raw materials	23.0
Environmental requirements	19.0
Growth and substrate	3.0
Harvesting	2.0
All of the above	23.0
Sources of awareness	
Extension agents	12.5
Neighbors	37.5
Friends	20.0

4.3. Reasons for Growing and Consuming Mushroom

Results in Table 3 show that majority (100.0%) of the respondents grow mushroom for household consumption, 25.0% were growing it for household consumption, it produces high yield, easy to produce, ensures all season availability and it is highly medicinal. About 33.0% consume mushroom because it tastes nice, 30.0% consume it because others eat it, 25.0% consume it because it serves as food, while 12.0% consume it because it is highly nutritious. This indicates that mushroom serves as food for most households. If production of mushroom is given adequate attention it will help to increase nutrient content of most meals consumed by households.

Table 3. *Percentage distribution of respondents according to reasons for growing and consuming mushroom (n= 80)*

Variable	Percentage
Reasons for growing mushroom*	
Household consumption	100
Produces high yield	17.5
Easy to practice	12.5
Ensures all season availability	15.0
It is highly medicinal	10.0
All of the above	25.0
Reasons for consuming mushroom	
Serves as food	25.0
Tastes nice	33.0
Highly nutritious	12.0
Others eat it	30.0

***Multiple responses*

4.4. Constraints to Practicing New Technology in Mushroom Production

Table 4 indicates that the major constraint to practicing new technology in mushroom production is pest infestation (77.7%). Others include: shortage of water (70.5%), inappropriate timing of harvesting period (33.3%), inadequate knowledge of environmental requirements (21.0%) and difficulty in preparing substrate (11.1%). This implies that pest attack and shortage of water are very serious factors limiting effective practicing of new technology in mushroom production. Efforts are needed by the government in providing subsidy on pesticides in order to make them affordable and available for use by the respondents. Adequate supply of water is also necessary in order to enhance production of mushroom using the new technology.

Table 4. *Percentage distribution of respondents according to constraints to practicing new technology in mushroom production (n= 80)*

Constraints	Percentage
Difficulty in preparing substrate	11.1
Pest attack	77.7
Inappropriate timing of harvesting period	33.3
Inadequate knowledge of environmental requirements	21.0
Shortage of water	70.5

5. CONCLUSION AND RECOMMENDATIONS

Majority of the respondents were males, aged and had farming as a major occupation. They were not fully aware of the new technology for mushroom production. Extension agents have not created adequate awareness on the new technology for growing mushroom in the area. This has made the production to be practiced at a subsistence level, resulting in low returns. Mushroom is mostly grown as food for household consumption, though it is highly medicinal its use in this case is yet to be given wide publicity. The major constraint to practicing new technology in mushroom production was pest attack. Adequate provisions in terms of supplying necessary pesticides should be made in order to guard against losses from pest infestation. Efforts of extension agencies are needed in ensuring that the new technology for production of mushroom is given adequate awareness. This will in turn involve many people thus boosting productivity.

Since mushrooms can have a profound positive impact on our environment and health, it is therefore imperative for us to commence their exploitation for wealth creation as well as their roles in health care delivery. It is pertinent for one to say that the potentials in mushrooms have not been sufficiently exploited by the industrial sector in Nigeria. This has a lot to contribute to the economy of our great country when given adequate attention.

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