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Comparative Analysis of the Proximate Values of Wild and Cultivated Mushrooms Available in the Ghanaian Markets

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The study was designed to find out the proximate values of 120 randomly sampled wild and cultivated mushrooms in the forest-savanna transitional zone of Ghana. The experiment was carried on three (3) different types of mushroom samples which comprised of one cultivated mushroom (Oyster) and two wild mushrooms ('Sasie' and 'Domo') varieties. The mushrooms were analyzed chemically for its Ash content, Crude Protein, Ether Extract and Crude Fibre at the Nutrition Laboratory of the Department of Animal Science, in Kwame Nkrumah University of Science and Technology (KNUST), Kumasi. The results from statistical analysis showed that, there was a significant difference among the means of Crude protein (P=0.05) at 0.001. It was observed that Domo produced the highest mean (30.17). Also, there was a significant difference among the means at P=0.05 of crude fibre and Ash content, with 'Domo mushroom' (wild) having the highest mean (9.54) of crude fibre, followed by Oyster mushroom (Cultivated) with mean of 7.61 and the least mean being produced by the 'Sasie' mushroom (wild). However, there was no significant difference among the means of ether extract at P=0.05. It can be concluded from results of the findings that, the Wild mushrooms 'Domo' and 'Sasie', especially 'Domo' have higher nutritional value than the cultivated variety (Oyster mushroom) and so, there is the need to encourage the proper harvesting, safe handling and marketing of wild mushrooms in glossaries and Ghanaian markets in order to synchronize for dietary requirements of some essential amino acids which are hard to afford or obtain from animal protein sources.

Keywords: Wild Mushrooms, Cultivated Mushrooms, Nutrition and Ghanaian Markets.

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INTRODUCTION

Mushrooms represent one of the world's greatest untapped resources of nutritious food. However, many people are apprehensive about mushrooms as a food source. Ignorance has led many to become skeptical about whether food of fungal origin can hold any great nutritional promise. It seems much education is needed before full advantage can be taken of this readily available, nutritionally rich food source. The high incidence of malnutrition, especially of protein deficiency in developing countries including Ghana is an existing reality and will continue for the foreseeable future. Protein malnutrition will become even more acute since the supply of protein for the diet has not kept pace with population growth (FAO, 1996).

A detailed account of the compositional analyses of cultivated and wild species of edible mushrooms has been reported elsewhere. Bernaś *et al.,* (2006) reported that the wild mushroom were richer sources of protein and had a lower amount of fats than cultivated mushrooms. However, they also have nutritional value and can be useful food supplements, although species vary in their nutritional value. Protein tends to be present in an easily digested form and on a dry weight basis, mushroom normally range between 20% and 40% protein which is better than many legume sources like soybeans and peanuts, and protein-yielding vegetable foods. Mushroom proteins contain all the essential amino acids needed in the human diet and are especially rich in lysine and leucine which are lacked in most staple cereal foods (Sivirakaya *et al*., 2002). The high content of linoleic acids is one of the reasons why mushrooms are considered a health food.

Furthermore, mushrooms contain significant amounts of carbohydrates and fibers as well as vitamins, especially B complex vitamins and some vitamin C, and they appear to be rich in inorganic mineral nutrients. In Africa's rural village communities mushrooms are highly treasured and appreciated as a delicacy. Most people in Ghana include mushrooms in their diet and collect them during the rainy season. Their seasonal supply and limited distribution make them highly valued and therefore; very valuable. Producing cultured mushrooms would overcome their seasonal dependence which most Ghanaians are not aware that mushrooms can be cultivated on agricultural residues, making them available year round (Gbolagade, 2006).

Additionally, it is increasingly being realized that many species of mushrooms are very effective in boosting the body's immune system. Their assessment as food which is based on their proximate analysis has not been adequately studied, explored and documented. The assessment of mushrooms as food based upon its chemical analysis and the relevance of such information to traditional eating habits is therefore of interest. Literature concerning the proximate composition of edible mushrooms from Ghana has only recently been reported and is mostly concentrated on the nutritive value of edible wild mushrooms harvested in natural sites (Obodai, 2002).

Existence of Mushrooms in Nature

Mushrooms have been in existence since creation in its wild form and have been treated as special kind of food. Occasionally, the Romans ate mushroom in a special case and Mexican Indians used hallucinogenic mushroom in religious ceremonies as well as the Americans (some section of them) during the 1960s (Oei, 1996). In medieval Ireland, mushrooms were thought to be umbrellas for leprechauns; the English believed mushrooms should be gathered under a full moon to be edible and ancient Egyptians considered mushroom as the son of gods sent to the earth riding on bolts of thunder (Gholagade, 2006).

Historical data indicates mushroom cultivation and consumption throughout the ancient Greek and roman eras, Asian civilizations have been cultivating mushroom specifically the *volvariella* for over 2000 years. However, it was not until the 17th century in France the commercial mushroom growing began. *Agaricus* or the white mushroom was the first variety to be cultivated. The first detail record of mushroom cultivation occurred in A.D.600 during the reign of Louis XIV when Tournefort described a successful method of growing the mushroom *Agaricus bisporus* on manure (Gbolagade, 2006).

The original mushroom "farm" were, and still are located in quarry tunnels near Paris which explains why white mushrooms have long been called "champignons de Paris" by French chiefs. Commercial cultivation of fresh mushrooms began in the U.S. near Philadelphia in the early 20thcentury, eventually centering the town of Kenneth Square and neighboring areas. Today, Pennsylvania leads the USA in production with California being a strong second producer. More than 20 other states in the US now add significantly to the total production of mushrooms (Stamets, 2000).

Classification of Mushrooms

Mushroom belongs to the kingdom fungi. Fungi have a distinct cellular structure like plant, but they lack chlorophyll and therefore unable to use energy from the sun directly via chlorophyll. Thus, fungi are heterotrophic and depend on other organisms for food. They depend on substrates on which they grow for all their nutritional requirements like carbon, nitrogen, water and minerals (Rajarathnam *et al*., 1997).

Most cultivated mushrooms belong to the **basidiomycetes**, which produce spores called **basidiospores**. It has been estimated that our planet harbor about 1.5 million different species of mushroom. But only 64,000 species have been described so far (Oei, 1996).

The Basidiomycota

The **basidiomycota** constitute a large fungal group of many diverse forms including the rusts and smuts that cause plant disease, the mushroom and other large forms such as boletus, puff ball, bracket fungi and yeast-like *Cryptococcusneoformis*. The class **basidiomycetes** are called so, because, meiosis occurs in specialized structures called **basidia** and the resulting spores (basidiospores) are produced outside the **basidium.** This is in contrast to the (other major groups of fungi) **Ascomycota**, where meiosis occurs in an **ascus**, resulting in the development of **ascospores** (Youri, 2003).

Mushrooms can be classified into three basic ecological groups; **mycorrhizal**, **parasitic** and **saprophytic**. Mycorrhizal mushroom forms a mutually dependent, beneficial relationship with the roots of host plants, ranging from trees to grasses. The resident mushroom mycelium increase the plant's ability to absorb nutrients, nitrogenous compounds and essential elements (Chen, 2005).

Mushrooms are classified according to the type of substrate on which they grow. Those which grow purely on cellulose are called the cellulolytic mushrooms and they thrive mainly on cellulose-containing substrate such as rice straw, wheat straw, banana leaves, e.g. *volvariella.*

The lignocellulolytic mushrooms grow on both cellulose and lignin containing substrates. Oyster mushrooms, *Pleurotus* species belong to this category and are thus widely cultivated on a variety of agricultural wastes (Oei, 1991).

Production of food with specific nutritional value

Many mushrooms are known to have nutritional values and are referred to as health food. They are known to have large amount of good protein, vitamins (B1, B2, and C) and minerals and have very low fat content (Chang and Mshigeni, 2001). Edible mushrooms are rich source of nutrients; with protein content of between 19% and 35% (except soybean). Mushrooms further constitute a significant level of vitamins such as thiamine (vitamin B1), riboflavin (vitamin C) as well as potassium, iron, phosphorus, sodium and a lesser amount of calcium and fat content (Juliano et al 1964). There is high content of lignoleic acid, folic acid, nicotinic acids and thus considered as healthy food. (Hiton, 1984). Being low in sodium, mushrooms are highly recommended for persons suffering from kidney and heart troubles (Oei, 1992).

Wild mushroom (*Ganoderma lucidum)* has high crude protein content of 17.6%, it has high fibre content (32.13%), low moisture content and 5.93% total ash content indicating its digestibility and high absorption rate to provide energy requirements for cellular and gastrointestinal functions (Shamaki *et al.*, 2012).

The higher nitrogenous component of wild mushroom has made it essential requirement for nucleotides and nucleosides formation in the body, these amino acids, are important components of DNA and RNA that are useful in cellular function and cell differentiation, thus, its mitogenic capacity (Wasser, 2005).

The result from proximate analysis of wild mushroom (*G. lucidum)* showed high content of protein (17.6%) which is higher than reported by Ogbe *et al.* (2008), Carbohydrates (33.13%) and low levels of fat (2.60%) (Shamaki *et al.*, 2012).

The fat concentration in cultivated variety of mushroom (1.54±0.01) was lower than that in the wild one (1.6±0.10), hence the cultivated variety will be more useful in the formulation of weight restriction diets than the wild one (Manjunathan, 2011). The cultivated variety was found to contain higher crude fibre content (14.69±0.08) than the wild one (3.6± 0.04) (Manjunathan, 2011). This is expected considering the fact that the cultivating variety grows on prostrate decaying logs from which they directly obtain nutrients and this could be their source of high fibre content. Also, Fasidi and Kadiri, (1990) and Oei, (1991) found various edible mushrooms have higher crude fibre concentration. Fibres are an essential part of a healthy diet (Oei, 1991) and have an important preventive action in colorectal carcinoma (Miuzino, 1996).

For countries in Africa and the third world in general where meat protein is generally in short supply and prohibitive in cost, consumption of mushroom should receive attention and emphasis (Addae-Kagya, 1997).

Medicinal Properties of Mushroom

There is much evidence of the high therapeutic properties of some species of mushroom. Extensive studies conducted both in Japan and the U.S.A have shown that cultivated mushrooms contain high levels of retene, a chemical substance that suppresses some forms of cancerous growth or tumours, (Binding 1972; Ikokowa *et al.*, 1969). As a result of the polysaccharides found in mushroom, some of the species too can be used in treating various diseases example pleurotus – for treating underweight in children and hypertension.

Oil palm mushroom produces body resistance against infections, diseases whereas woodear mushroom is used for the treatment of vascular scieriosis, weakness after childbirth, uterine bleeding and bleeding piles. Mushrooms are considered to be a good source of digestible proteins. The protein content of edible mushrooms besides being species/strain specific could also vary with the growth substrate. The content of protein varied between 17-28 % on a dry weight basis among the three mushrooms species studied. The highest content of protein was obtained from *Volvariella volvacea* while the lowest was obtained from *Coprinus cinereus*. It is well established that more than half of the total nitrogen in mushrooms is contained in the protein fraction. The actual protein content depends among other things on the composition of the substrate, size of the pileus, harvest time and mushroom species (Obodai, 2002). The crude protein value obtained for *Coprinus cinereus* was close to the range of 20-25% reported previously for Coprinus atramentarius and *Coprinus comatus* (Obodai, 2002). The levels of crude protein obtained for *Pleurotus flabellatus* and *Volvariella volvacea* was similar to the reported value of 22% for *Pleurotus flabellatus* and was within the range of 21-29.5% reported for *Volvariella volvacea* (Obodai, 2002).

The average protein content of cultivated edible mushrooms ranges from 3.5-4% of their fresh weight. Comparing the protein content of these mushrooms with the protein content of some common vegetables and fruits, the protein content of edible mushrooms in general is about twice of that of onion (1.4%), cabbage (1.4%) and potatoes (1.6%), and four to six times that of oranges (1.0%) and apples (0.3%). On a dry weight basis mushrooms normally contain 19-35% crude protein as compared to 7.3% in rice, 12.7% in wheat and 9.4% in corn (maize). Therefore, in terms of the relative amount of crude protein, mushrooms rank above the aforementioned vegetables and cereal foods (Obodai, 2002). Furthermore, mushrooms contain all the essential amino acids for human nutrition. However, the level of some of them is below the FAO/WHO protein standard. The content of lysine is fairly high in mushrooms while cereal protein contains low levels of lysine (FAO, 1991). Consuming mushrooms with cereal products has been recommended for balancing the level of essential amino acids in the diet. Thus, the three indigenous wild edible domesticated mushroom species examined in this study should be regarded as a good source of protein for humans.

The total fat content found in the commonly cultivated mushrooms generally has been reported to be low, varying between 0.6 and 3.1% of dry weight, and varies further depending upon the cooking method. The fat content in the three mushroom species analysed in this study were also low, ranging from 1% of dry weight for *Coprinus cinereus* to 3.3% for *Volvariella volvacea*. The crude fat content presently reported for *Coprinus cinereus* was lower than the values of 3.1-3.3% previously reported for Coprinus atramentarius and *Coprinus comatus*. The values obtained for the other two species compared favourably with the values of 1.4% and 3.9% reported earlier for cultivated Pleurotus and Volvariella mushroom species, respectively Chang *et al.* (1996). Fat analysis has been variable in mushrooms and factors that might influence fat content have not yet been completely elucidated. However, it appears that fat represents a small part of the mushroom Sadler, (2003). Although mushrooms are low in fat, they do contain essential unsaturated fatty acids, considered essential and significant for human diet and health.

Mushroom Cultivation in Ghana

Mushrooms are popular and widely consumed in most communities in Ghana. Various species found in the forest and countryside of Ghana are *termitomyces* (termite mushroom), *Pleurotus* (oyster mushroom), *pholiota*, *lepiota* (shaggy parasol), *volvariella* (oil palm mushroom) and copriuns (ink cap) grow freely on anthills, tree stumps, farmland etc. In Ghana wild mushroom are always abundant during the rainy season and collected for either home use or for sale (Obodai, 1992).

Characteristics of a good substrate

A good substrate should have a:

i. suitable physical condition that will provide good anchorage for the mushroom and will at the same time maintain good aeration and water holding capacity.

ii. good chemical condition that will release some nutrients from the raw materials of the compost during fermentation and pasteurization.

iii. proper condition for microbial activities that will help improve both the physical and chemical condition for mushroom growth (Chang, 1984).

Economic importance of mushroom production

Wild edible fungi are important for three main reasons: as a source of food and health benefits, source of income and to maintain the health of forests. Commercial productions of mushrooms however have many more benefits.

Justification for the Research and Problem Statement

To the best of our knowledge so far; no nutritive quality data have appeared in the literature on saprophytic edible wild mushrooms cultivated on composted solid sisal decortication residues. Therefore, fundamental knowledge of the nutritive composition of these mushrooms is needed to facilitate effective popularization of mushroom cultivation, processing, marketing and consumption at the grass roots level to enable people to break away from the poverty trap and malnutrition, which is prevalent in most developing countries and Ghana is not an exception. The aim of this study is to look at the comparative analysis of the proximate value on wild and cultivated mushrooms available in the Ghanaian market.

The use of mushroom as human food dates back to time immemorial. Today with the development of better technologies, mushrooms have occupied an important place in habits of people in several parts of the world in which Ghana is not an exception. With all their historical background, it is unfortunate that most consumers lack knowledge about the proximate value of the mushroom they consume as food. Hence, it is necessary that consumers are made to know the value of the mushroom they take in as food. For this reason the researcher seeks to look at mushroom and its proximity.

Objective

The study is focused on the comparative analysis of the proximate value of wild and cultivated mushroom available in the Ghanaian markets.

Problem Justification

Mushrooms are sources of food and delicacy all over the world. They have a high nutritional value almost twice that of any vegetable or fruit. They are rich in vitamins B, C and D and mineral elements (Fasidi *et al*., 1990) and the bioavailability of some elements depend on the level of interactions with various nutrients. It is therefore, imperative to evaluate the proximate value of both wild and cultivated mushrooms we consume in Ghana.

Significance of the Study

It is well envisaged that this study will broaden the researchers' knowledge on the composition and the nutritive value of mushroom and provide relevant data on the comparative nutritive values of wild and cultivated mushrooms in Ghana for consumption and marketing purposes.

MATERIALS AND METHODS

Source of Mushroom

The study considered three common varieties of mushrooms namely; *Volvariella volvacea* (oil palm mushroom), *Coprinus micaceus* and *Pleurotus ostreatus* (oyster mushroom). The first two mushroom varieties are the wild type and the latter is considered a cultivated mushroom. The three mushroom varieties were obtained from the market in their fresh form.

Location of Laboratory Analysis

The laboratory analysis was conducted at the Nutrition Laboratory of the Department of Animal Science, Kwame Nkrumah University of Science and Technology (K.N.U.S.T), Kumasi. Three 120 samples of each type of mushroom were analyzed.

Preparation of Mushrooms for Chemical Analysis

The fresh mushroom varieties bought from the market were refrigerated awaiting chemical analysis. Prior to the chemical analysis on the mushrooms, they were removed from the fridge overnight to allow them to thaw completely in order to obtain their original state.

Chemical Analysis on the Mushrooms

The three mushroom varieties were subjected to proximate analysis to determine their proximate composition. The proximate composition involved crude protein, ether extract (crude fat), crude fibre, ash content and moisture content which were determined by methods described by the Association of Official Analytical Chemists (AOAC, 2002).

1 Determination of Moisture Content

The mushrooms were dried in the oven for 72 hours at 60^oC to determine their moisture contents as fresh. The moisture contents were determined to ascertain the shelf lives of the mushroom varieties. The moisture content was computed by the difference in weight before and after drying in the oven and the value expressed in percentage in terms of the initial weight of the sample taken. The dried residue of the mushroom varieties were then milled into uniform particle size and used for the determination of the other proximate values namely; crude protein, ether extract (crude fat), crude fibre and ash contents (total minerals)

2 Determination of Crude Protein

Two (2.0) grams of each of the 100 samples of mushrooms was digested with 25ml of concentrated H_2SO_4 and boiled for about 60mins with intermittent swelling to get every particle digested. After the digestion, the digest was allowed to cool and diluted with 80ml of distilled water. The diluted digest was then subjected to a distillation process by the addition of 40% NaOH and collected over 5% Boric acid with mixed indicator using Khejdahl nitrogen distillation apparatus. The distillate was then titrated against a standard acid of known concentration. The total nitrogen in the mushrooms were computed and the crude protein obtained by multiplying the total nitrogen by 6.25 which is a protein factor. The crude protein was then expressed in percentage.

3 Determination of Ether Extract (Crude Fat)

Two (2.0) grams of each of the grounded mushroom

Table 1. Mean Proximate Values of the Wild mushrooms and Cultivated Mushroom

Treatments	Crude Protein	Ether Extract	Crude Fibre	Ash Content
Domo (Wild)	30.17	1.833	9.54	14.50
Sasie (Wild)	18.60	0.667	7.023	17.33
Osyter (cultivated)	29.23	0.500	7.61	6.17
Mean	26	1.00	8.058	12.67
LSD(0.05)	0.812	NS	0.165	0.925
C.V%	1.4	28.9	0.9	3.20

varieties was weighed into an enveloped filter paper and stapled. Each of the enveloped samples was subjected to a Soxhlet extraction process using petroleum ether as the extraction solvent. An initial weight of the Soxhlet flask was taken before the start of the process after drying in the oven for 30 minutes to obtain a constant weight. The extraction process was left uninterrupted for two hours after which the flask was re-dried in the oven for 30 minutes to expel any of the ether, allowed to cool and re-weighed. The weight of ether extract was then obtained from the difference of the initial and final weight of the flask and the value expressed in percentage in terms of the initial sample weight taken.

4 Determination of Crude Fibre

The determination of crude fibre is dependent on the residue obtained from the ether extraction. Each of the residues obtained from the ether extraction was dried in the oven for 30 minutes at 110^{o}C to expel any of the ether in the residue. The weight of the residual content was then weighed into a Labconco flask and subjected to acid and alkali digestion. The content was firstly digested with dilute H_2SO_4 followed by digestion with dilute NaOH and subsequent washing of the residue with ethanol. The acid digestion and the alkali digestion eliminate the protein portion and the soluble carbohydrate portion of the material which is referred to as nitrogen- free extracts (NFEs) respectively. The residue was then dried in the oven for two hours at 135^{o}C. The residue after drying is composed of mainly the non-digestible carbohydrate which is termed crude fibre and minerals. Hence the ashing of the residue eliminates the organic matter thus the crude fibre of the material leaving the inorganic portion which is the minerals. The crude fibre of the material was therefore, obtained by the difference between the dried residue and the ash. This was expressed in percentage in terms of the initial weight thus the weight after ether extraction.

5 Determination of Ash Content (Total Minerals)

Two (2.0) grams of each of the dried grounded mushroom varieties was weighed into an already weighed crucibles in triplicate which were dried in the oven for 30 minutes to obtain a constant weight. The triplicate crucibles containing the samples were placed in a muffle furnace for two hours at 600^{o}C at constant heat. After the two-hour period, the triplicate crucibles were removed from the furnace, allowed to cool and re-weighed. The weight of ash of the various samples was obtained by subtracting the weight of the empty crucible from the weight of crucible with the ash. The ash content of the various samples was expressed in percentage in terms of the initial weight of the sample taken. The percentage ash values were obtained from averages of the triplicate determinations.

Methods of Statistical Data Analysis

The data obtained was analyzed using the Analysis of variance (ANOVA) method and the means separated by the least significant difference (LSD) to determine which of the treatments has significance effect or difference. The statistical package used for the analysis was (GenStat Version 7.2 (Discovery Edition 3) 2008 VSN International Limited, UK).

RESULTS AND DISCUSSION

Crude Protein

There was a significant different among the means of Crude protein (P=0.05) at 0.001. It was observed that Domo produced the highest mean (30.17), followed by Oyster mushroom with a mean of 29.23, and Sasie with a mean of 18.60 in that order as shown in table 1 above and figure 1 below. This confirms the works of Shamaki *et al*, (2012), who indicated that wild mushrooms (*Ganoderma lucidum)* have higher crude protein content than cultivated ones. However, this result contradicts the findings of Fasisdi and Kadiri, (1990), Manjunathan, (2011) who observed higher protein content in cultivated mushroom, *volvariella spp,* and Ola and Oboh, (2001) who also observed higher crude protein concentration in cultivated mushroom, *Termitomyces robustus* and *Lentinus subnudus.*

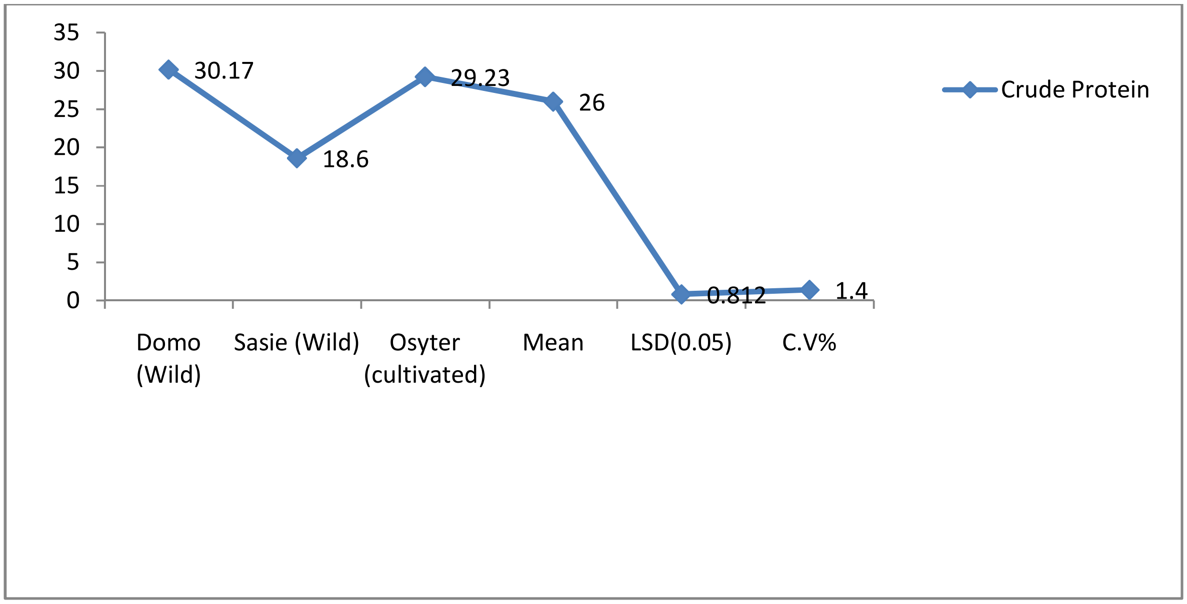

Figure 1. Crude Protein content in the Wild and Cultivated Mushroom Varieties

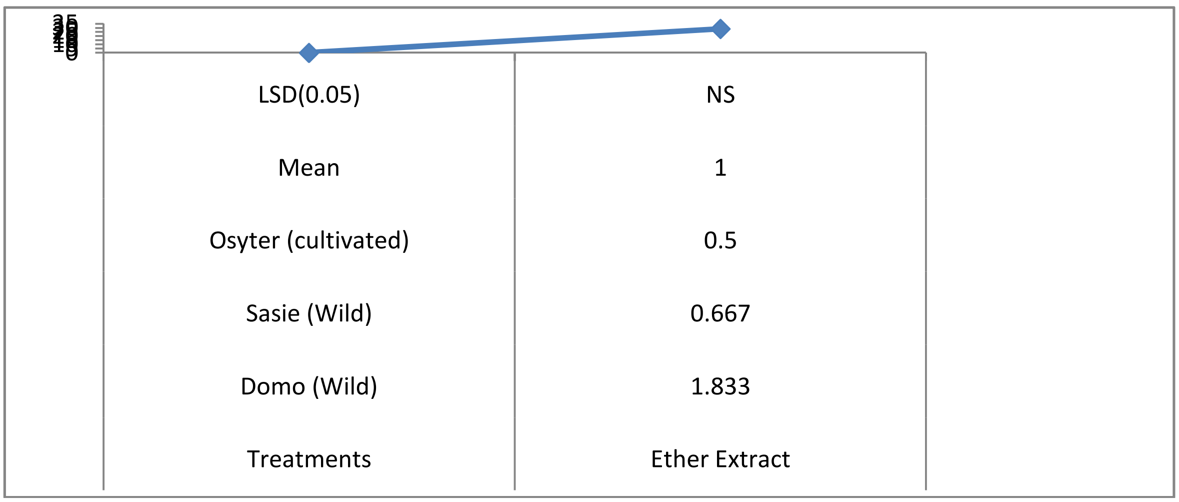

Figure 2. Ether Extract Content in the Wild and Cultivated Mushroom Varieties

Ether Extract

It was observed that the treatments do not have significant (P=0.05) influence on the ether extract. Although, there was no significant difference among the means, Domo produced the highest mean of 1.833, followed by Sasie and Osyter with the means of 0.667 and 0.500 respectively (Figure 2). This indicates that the wild mushroom has yielded higher ether extract than the cultivated one. This result is in line with the research of Manjunathan,(2011) and Shamaki *et al*, (2012), who stated that cultivated mushrooms have lower fats (Ether extract) content than the wild mushroom.

Crude Fibre

There was a significant difference among the means at P=0.05 of crude fibre, with Domo mushroom (wild) having the highest mean (9.54) of crude fibre, followed by Oyster mushroom (Cultivated) with mean of 7.61 and the least mean being produced by Sasie mushroom (wild) (figure 3). This agrees to the study of Ogbonna, (2006), who reported that wild mushrooms largely have high fibre content resulting in high content of roughages as compared to the cultivated varieties. Meanwhile, the result from this study disagrees with the work of Manjunathan, (2011), who said that cultivated

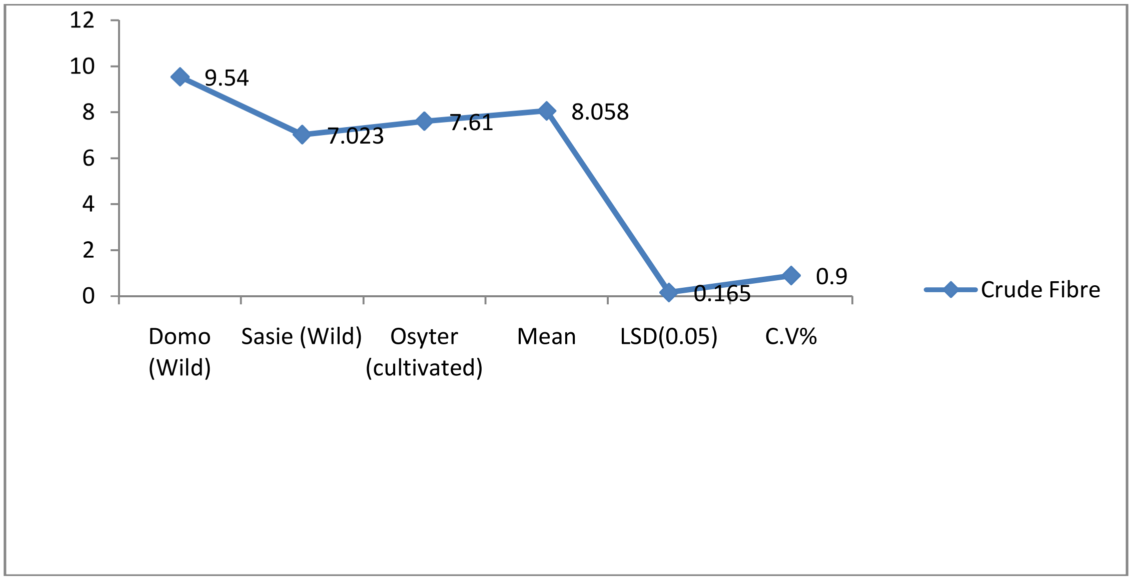

Figure 3. Crude Fibre contents in the Wild and Cultivated Mushrooms

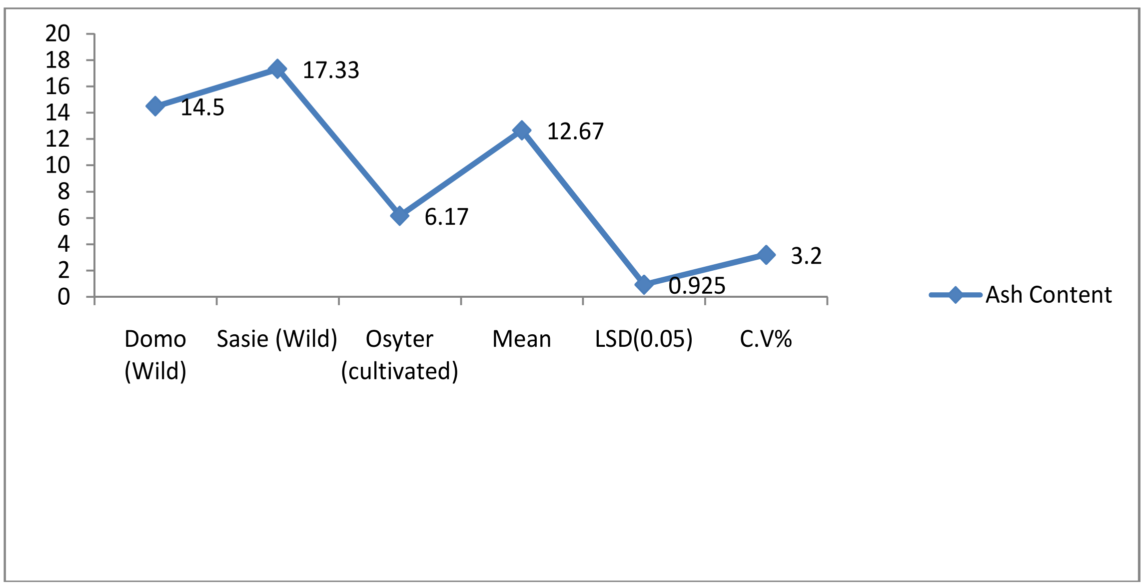

Figure 4. Ash Content in the Wild and Cultivated Mushrooms

mushrooms have higher crude fibre than wild ones due to the fact that, the cultivating variety grows on prostrate decaying logs from which they directly obtain nutrients and this could be their source of high fibre content.

Ash Content

The treatments had a significant difference on Ash content. Sasie mushroom exhibited the highest mean (17.33), followed by Domo with a mean of 14.50 and Oyster mushroom having a mean of 6.17 (figure 4). This follows a normal decreasing trend from treatment 2 to treatment 1 and 3. This finding concord with the works of Shamaki *et al.*, (2012) and Egwin *et al.*, (2011), who indicated that wild mushrooms have higher ash content than the cultivated varieties.

CONCLUSION

It can be concluded from the results that:

1. Wild mushrooms Domo and Sasie, especially Domo have higher crude protein content than the cultivated variety (Oyster mushroom)

2. The wild varieties of mushroom have higher amount of ether extract than the cultivated variety

3. Also, the wild varieties produces higher crude fibre than the cultivated variety

4. With respect to Ash content, wild variety (Sasie) has yielded higher ash content than the cultivated variety.

Therefore, all things being equal the wild mushrooms offers for higher nutritional values in terms of dietary significance and could be promoted in respect of further improvement in terms of safe collection and quality handling techniques. Wild mushrooms further constitute a major delicacy and grocery managers should promote the sale of the product among the list of vegetables that they could market in substantial quantities as much as possible.

RECOMMENDATION

It can be recommended that:

1. Domo should be domesticated due to its high nutritional value in terms of crude protein and crude fibre.
2. Also, due to low ether extract (fats) in oyster mushroom, it is recommended for hypertension patients.
3. The study should be repeated using different varieties of wild mushroom and larger sample sizes from different geographical locations in the country in order to trace the patterns of the effects analyzed in this particular study.
4. Moreover, an analysis of the toxicity and anti-microbial activity of the wild varieties of mushroom (*Domo* and *Sasie*) should be done.

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