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Chemical Composition and Nutritional Value of the Most Widely Used Mushrooms Cultivated in Mekelle Tigray Ethiopia

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Abstract: The basic composition (The total protein, total carbohydrate, total lipid, crude fiber and ash content of each mushroom were studied on dry weight contents were determined in the cultivated mushrooms Agaricus bisporus/white, Agaricus bisporus/brown, Lentinula edodes, and Pleurotus ostreatus and they ranged from 28.38-49.2, 1.54-4.96, 13.2-29.02 and 7.01-17.92, respectively and this shows it has high content of protein and fat fiber and low fat and this good for as alternatives food stuff andtheseresults asserve as the basis of further scientific study into various ways of enhancing the livelihood of particular areas of northern Mekelle through increased mushroom domestication as well as assessing the possible bioactivity of mushrooms against foodcertain human diseases.

Keywords: Mushrooms, Basic Composition, Moisture, Carbohydrates, Dietary Fiber, Fat, Ash, Nitrogen, Protein

1. Introduction

Mushrooms have a great nutritional value since they are quite rich in protein, with an important content of essential amino acids and fiber, and poor in fat. Edible mushrooms also provide a nutritionally significant content of vitamins (B1, B2, B12, C, D and E) (4) Edible mushrooms could be a source of many different nutraceuticals such as unsaturated fatty acids, phenolic compounds, tocopherols, ascorbic acid and carotenoids. Thus, they might be used directly in diet and promote health, taking advantage of the additive and synergistic effects of all the bioactive compounds present (4).

More than 3000 mushrooms are said to be “the main edible species”, of which only 100 are cultivated commercially, and only ten of those on an industrial scale. Their global and economic value isnow staggering, and a primary reason for the increase in consumption is the above mentioned combination of their value as a food as well as their medicinal and nutritional values (5). Production of mushrooms continuously increases over time, being China the biggest producer (more than 1.5 million metric tons in 2007) (7).

The most cultivated mushroom worldwide is Agaricusbisporus, followed by Lentinulaedodes, Pleurotus spp. and Flammulinavelutipes (8). These species require shorter growth time when compared to other edible mushrooms, they demand few environmental controls, and they can be cultivated in a simple and cheap way (10).

In the Tigray region of Ethiopia, there is an abundance of agricultural waste products which is normally discarded. Mushroom cultivation is able to transform this agricultural waste into a nutritious food and offer great opportunities for addressing the region’s food security challenges (Mahe et al., 2009; Mush, 2010). mushroom can be cultivated on a large number of agro-wastes including straw of paddy, wheat, stalk and leaves of maize, millets, cotton, etc. choosing the best substrate is the single most important step in creating a successful mushroom cultivation program. This paper; therefore, presents the investigation ofuse cultivated mushroom as alternative source for diet with low cost and easy availability in the region production.

2. Materials and Methods

Study area

The study was carried out in Mekelle city, the capital city

of Tigray regional state which is located in the South Eastern zone of the region. It is 873 km from the capitalcity of Ethiopia, Addis Ababa. The absolute location of Mekelle city is 130 29' N latitude and 390 28' East longitudes. It is found at an altitude of 2000 to 2200 meters above sea level. The city has seven sub-cities and a total human population of 215,546 of which 104,758 were men and 110,788 were women Central Statistic Authority (CSA, 2008).

Mushroom species

The mushrooms species were obtained in local supermarkets (Mekelle Tigray Ethiopia), where they were stored at 4 ºC, in March and April 2013.Three fruiting bodies per species were sampled. All the samples were dried and reduced to a fine dried powder (20 meshes), mixed to obtain homogenate samples and stored in a desiccators, protected from light, until further analyses.

Nutritional value

The samples were analyzed for chemical composition (moisture, proteins, fat, carbohydrates and ash) using the AOAC procedures (2)

All collected mushroom were dried for the estimation of Ash, Proteins,fibres,fat and total carbohydrates.

Determination of Total Ash [2]: About 3 a gram of sample is weighed in a crucible and as heated in a muffle furnace at 550 degree Celsius for 30 minutes and cooled in desiccators. The ash content was calculated using following equation.

Ash content (g/100 g sample) =weight of the ash x 100

Weight of sample taken

Determination of Total Proteins [2]: To about 0.7 gram of sample in a digestion flask, 1 gram of Copper Sulphate, 10 gram of Potassium sulphate and 20 ml of Sulphuric acid was added. After complete digestion the content is transferred into a vessel. 25 ml of 0.2N Sulphuric acid was pipette out into beaker and distillation was started. The distillate was allowed to collect in Sulphuric acid for a known volume and time. The collected distillate is titrated against 0.2N Sodium Hydroxide using Methyl red as an indicator.

The percentage of Protein was calculated.

%Nitrogen= (titreblank-titire sample)*0.014*1000

Weight of sample

% of Protein = % of Nitrogen x 6.24

Determination of Fat Content [2]: About 10 grams of Mushroom sample was weighed and extracted with Petroleum Ether in an extraction apparatus for 16 hours. The extract was dried, cooled in desiccators and weighed and mass was recorded. The % of fat was determined using an equation

% of Fat = 100(wt. of Soxlhet flask with extracted fat-Wt. of empty Soxlhet flask)

Weight of Sample

Determination of Fiber Content [2]: 5 grams of mushroom sample was extracted using Petroleum ether. The fat free material was transferred in a beaker and 200m1 of dilute sulphuric acid was added and boiled. Whole boiling acid in a flask is connected to reflux condenser and heated for 30 minutes.The flask was removedandfiltered and washed thoroughly with boiling water followed by washing in boiling Sodium Hydroxide and again refluxed for 30 minutes. The contents were filtered and washed with boiling water and finally washed the ethanol.The residues were dried and incinerated in muffle furnaces at 660 degree Celsius and the crucible along with ash was weighed and percentage of fiber was calculated.

% of crude fiber=100(Wt of crucible with before ashing-Wt.of crucible after ashing)

Weight of sample

Determination of Total Carbohydrates [2]:

By difference method (100-total moisture+ total ash + total Moisture + total Protein + total Fat + total fibers) the percentage of carbohydrates was calculated

3. Result and Discussion

The results of the nutritive value of cultivatededible mushrooms are shown in Table 1. The total carbohydrates ,fat, protein ,fiber and Ash contents in of Agaricusbisporous were found to be 28.38g, 2.1 2g, 41.06g, 18.23 and 7.01g, respectively.

Table 1. *Nutritional analysis of cultivated mushrooms (% in grams).*

No. Mushroom	Ash	Fibre	Protein	Fat	Carbohydrate
01Agaricusbisporous	7.01	18.23	41.06	2.12	28.38
02Pleurotus Florida	9.41	23.18	27.83	1.54	32.08
03Russuladelica	17.92	15.42	26.25	5.38	34.88
04Lyophyllumdecastes	14.2	29.02	18.31	2.14	34.36

The mushroom was found to be rich in protein than carbohydrate and very less amount of fat. This result was similar to the previous report [6, 24, 28].The total carbohydrate, fat, protein, fiber and ash in case of Pleurotus Florida was found to be 32.08, 1.54,27.1 2,and 9.41g, respectively. Mushroom is found to be richer in carbohydrate composition than protein and total fat is found to be very less in its composition. This result was similar to the report of Chang and Miles [1], NuhuAlam et al. [21] and ArunIng ale and Anita Ramtek [27] but, the composition of crude fiber is slightly different might be due to the use of different compost for their growth.

In 100g of dried Russuladelica, the carbohydrate, fat, protein, fiber and ash was found to be34.88, 5.38, 26.25, 15.42 and17.92g, respectively. These results were not much similar to the work of MuhsinKonuk et al. [28] where they had reported total fat as 3.15g, ash 8.56 and Protein composition was almost similar. It is known that the chemical composition of mushrooms are affected by a number of factors, namely mushroom strain, composition of growth media, time of harvest, management techniques, handling conditions and preparation of the substrates.

In Lyophyllumdecastes the total carbohydrate, total protein, total fat, crude fiber and ash were found to be 34.36, 2.14, 18.31, 29.02 and 14.2g, respectively. In order to compare the result obtained very less research has been done to our knowledge.

Among all the Agaricusbisporouscontain large amount of protein. Very less amount of fat was noted inPleurotus Florida. Fiber content was maximum in Lyophylluindecastes and ash was found to be more in Russuladelica and least in Agaricusbisporous.

4. Conclusion

In conclusion, the tested mushrooms are protein and fiber rich with low fat content.The ash content and carbohydratecontentwas less than other food from plant and animal origin.Overall, the rich nutritional composition makes cultivated mushrooms very special.So, mushrooms are a promising food that may overcome protein-energy malnutrition problem in the third world. The protein, fiber, mineral, carbohydrates and fat content make them ideal vegetable for diabetic, cancer and heart patients. These nutrients contents made mushroom as a low energy, healthy foodstuff and these mushrooms may also be used as protein supplementary diet.

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