Comparative Analysis of Mineral Contents of Different Pleurotus Species Found In Jharkhand

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Abstract: ***Pleurotus is a highly delicate mushroom consumed as a food item heavily grown in Jharkhand. The most important species among them are Pleurotus ostreatus, Pleurotus florida, Pleurotus flabellatus and Pleurotus sajor caju. They are altogether recognized as Oyster mushrooms and are a very good source of food and medicines and hence, some people regard them as 'food of heaven' on earth. Presence of the macro and micro minerals is found in Pleurotus species which opens doors to treat many mineral deficient diseases. In the present study, the estimation of calcium, magnesium, iron and zinc content has been done by different biochemical tests as per their suitability and requirement. Pleurotus florida showed the maximum macro mineral content of calcium and magnesium and; Pleurotus sajor caju showed the maximum micro mineral content of iron and zinc.***

Key Words: Pleurotus spp., Estimation, Content, Minerals- Calcium, Magnesium, Iron and Zinc, Biochemical Tests.

INTRODUCTION

Mushrooms are highly nutritious and fascinating people of all age groups with the goodness of delicacy, taste and nutritional properties. They are centre of attraction in the field of nutrition, medical science and national and international food market[1]. Malnutrition is a problem in developing third world countries. *Pleurotus* mushrooms with their flavor, texture; nutritional value and high productivity per unit area have been identified as an excellent food source to alleviate malnutrition in developing countries[2]. The mineral content of *Pleurotus* mushrooms is due to their ability to take up both major and minor mineral constituents like potassium and zinc. Notable is that *Pleurotus* species have a higher ability than other edible mushrooms to accumulate heavy metals[3] .The sporocarp may even have concentrations of metal exceeding that of the substrate it was grown on. It has been found that *Pleurotus* mushrooms can accumulate cadmium to such high levels as to pose a health threat to humans[4]. It was also found in trails with 13 different genera that some *Pleurotus* species had the best resistance against detrimental effects by heavy metals and they also have exceptional ability by mushrooms to accumulate toxic heavy metals in the mycelium[5] .The aim of this investigation was to analyze the nutritional values of these mushrooms cultivated in Jharkhand, with a goal to find out the benefits of macro and micro mineral contents which make them ideal for health.

I. RESEARCH METHODOLOGY

Estimation of Macro minerals: To perform biochemical tests for the estimation of macro minerals, the required acid extracts were prepared from the dry powder of each of the four species of *Pleurotus* mushrooms which were taken under consideration. For the estimation of macro minerals calcium and magnesium, the acid extracts used were prepared by following the same procedure in which 2g of dry powder of mushroom was dissolved in 2ml of conc. Nitric acid (HNO_3) and heated till all the fumes subsided. It was then cooled. To it 5ml of perchloric acid (HCl_4) was added and then the mixture was boiled for 1min. The resultant mixture was brought to 100ml by the addition of distilled water and this was taken as the acid extract.

Estimation of Calcium: In 1ml of acid extract taken in an evaporating disc, 2.5 ml of distilled water along with 2 drops of sodium hydroxide (NaOH) and a pinch of ammonium purpurate($C_{10}H_5NaO_5S$) was added. It was titrated against EDTA and amount of calcium was estimated with the help of standard curve prepared with known amount of calcium chloride ($CaCl_2$)[6].

Estimation of Magnesium: It was done in the same way as was followed for calcium described above, except that instead of sodium hydroxide (NaOH), ammonium chloride-ammonium hydroxide (NH_4Cl-NH_4OH) was used along with a pinch of Erichrome black –T indicator which was prepared by grinding 100 mg of Erichrome black-T with 10 g of sodium chloride. The standard curve in case of magnesium was prepared with known amount of magnesium sulphate ($MgSO_4$).

Estimation of Micro minerals: For the estimation of micro minerals, the biochemical tests performed are quite different and the acid extracts required are prepared in different ways.

Estimation of Iron: For the estimation of micro mineral- iron, done by biochemical test, again an acid extract was prepared by dissolving 1 mg of ferrous ammonium sulphate [$(NH_4)2Fe(SO_4)_2.6H_2O$] in 100ml of distilled water and to it 5 ml of conc. sulphuric acid (H_2SO_4) was added and heated slowly, warmed and volume was made to 1litre by adding distilled water. This standard solution contains 0.01 mg/ml of iron. Series of test tubes containing different dilutions of iron solutions was then arranged and into each one of the test tubes few drops of 40% NaOH was added, boiled in water bath for one hour, and then finally cooled. 5ml of conc. HCl was added to all the tubes in order to neutralize NaOH in the tubes and the volume was made to 50 ml. 10 ml of the above solution was pippeted out and added to 10 ml of amyl alcohol and 5ml of 20% potassium thiocynate (KSCN). The mixture was shaked and kept for half an hour. The color layer of amyl alcohol was removed and read on colorimeter at 475nm[7].

Estimation of Zinc: The services of GEO-CHEM Lab. MUMBAI were taken for the purpose. The certificate from the laboratory is attached for ready reference. The amount calculated and provided by the company was taken as authenticated.

II. RESULTS AND DISCUSSION

The results of estimation of calcium, magnesium, iron and zinc content are shown in Table 1, Chart 1; Table 2, Chart 2; Table 3, Chart 3; Table 4, Chart 4, respectively.

It has been found that the **macro minerals** namely **calcium and magnesium** are found in highest amount in ***Pleurotus florida*;** and the **micro minerals** namely **iron and zinc** are found in highest amount in ***Pleurotus sajor caju.***

a) Calcium content:

The results are shown in Table 1 and Chart 1 which are given below:

Sl. No.	*Pleurotus* Species	Amount of Calcium (mg/100gm)
1	*Pleurotus ostreatus*	16.32
2	*Pleurotus florida*	1400
3	*Pleurotus flabellatus*	19.22
4	*Pleurotus sajor caju*	1000

Table 1: Showing amount of calcium present in the four species of *Pleurotus* mushroom in mg/100gm

It has been discovered that amount of total calcium present in *Pleurotus florida* is 1400mg/100g whereas in *Pleurotus sajor caju* it is 1000 mg/100g, *Pleurotus flabellatus* it is 19.22 mg/100g and in *Pleurotus ostreatus*, it is only 16.32 mg/100g. Thus, the content of calcium is highest in *Pleurotus florida* followed by *Pleurotus sajor caju*, *Pleurotus flabellatus* and *Pleurotus ostreatus* in descending serial sequence (chart1).

The results suggest that deficiency of calcium can be alleviated by consuming ***Pleurotus florida*** as food supplement. Calcium is one of those minerals needed for stronger bones. It also helps in maintaining nervous system.

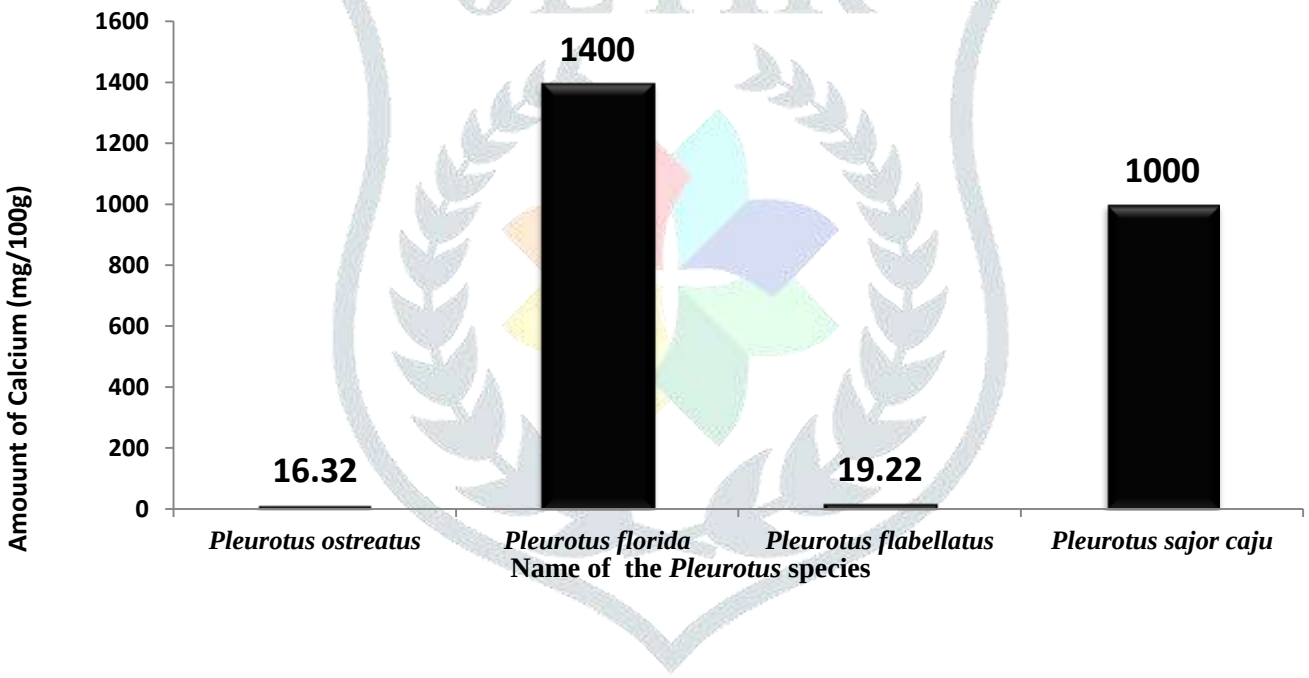

Chart 1- Showing amount of calcium in the four varieties of *Pleurotus* mushroom in mg/100g of dry wt.

b) Magnesium content:

The quantity of magnesium present in the four species of *Pleurotus* studied is given in Table 2 and Chart 2 which are given below:

Sl. No.	*Pleurotus* Species	Amount of Magnesium (mg/100gm)
1	*Pleurotus ostreatus*	15.79
2	*Pleurotus florida*	1680
3	*Pleurotus flabellatus*	19.20
4	*Pleurotus sajor caju*	1440

Table 2: Showing amount of magnesium present in the four species of *Pleurotus* mushroom in mg/100gm of dry weight.

It has been discovered that amount of total magnesium present in *Pleurotus florida* is 1680mg/100g whereas in *Pleurotus sajor caju* it is 1440 mg/100g, *Pleurotus flabellatus* it is 19.20 mg/100g and in *Pleurotus ostreatus*, it is only 15.79 mg/100g. It is clear that it is in least amount in *Pleurotus ostreatus*. Interestingly, the magnesium content followed the same trend as that of calcium in different *Pleurotus* species (chart2).

The results also indicate that ***Pleurotus florida*** can be used as food supplement to balance magnesium content in the diet. Magnesium, as is commonly known, is a critical co-factor in more than 300 enzyme reactions. It plays role in chronic cardiovascular disease, heart, diabetes, asthma and chronic fatigue syndrome.

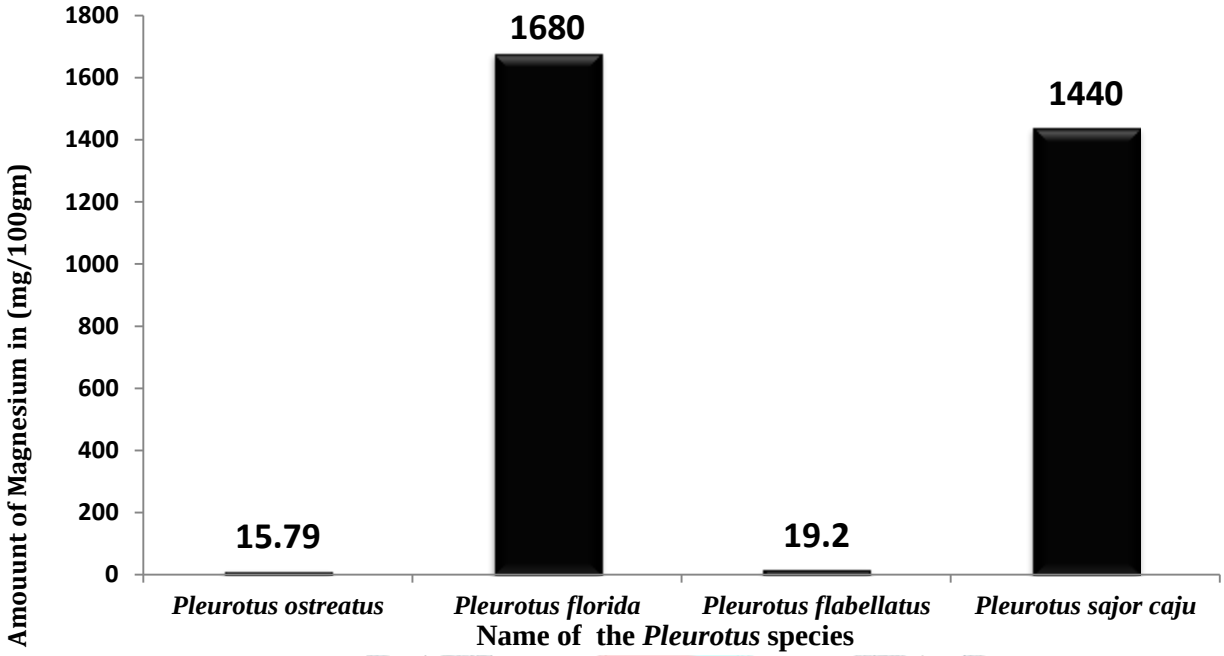

Chart 4-- Showing amount of magnesium in the four varieties of *Pleurotus* mushroom in mg/100g of dry wt.

c) Iron content:

The result showing the content of iron in the four species of *Pleurotus* mushroom studied are given in Table 3 and Chart3:

Sl. No.	*Pleurotus* Species	Amount of Iron (mg/100gm)
1.	*Pleurotus ostreatus*	23.10
2.	*Pleurotus florida*	103
3.	*Pleurotus flabellatus*	15.86
4.	*Pleurotus sajor caju*	116.40

Table 3: Showing amount of iron present in the four species of *Pleurotus* mushroom in mg/100gm of dry weight.

It has been discovered that amount of total iron present in *Pleurotus sajor caju is* 116.40 mg/100g whereas in *Pleurotus florida* it is 103 mg/100g, *Pleurotus ostreatus* it is 23.10 mg/100g and in *Pleurotus flabellatus* it is only 15.86 mg/100g. It is clear that it is in least amount in *Pleurotus flabellatus*. Also, again the two varieties namely- ***Pleurotus florida*** and ***Pleurotus sajor caju*** possess high quantity of iron instead of the other two which show least amount (chart3).

The result suggests both *Pleurotus sajor caju* and *Pleurotus florida* are good source of iron and they can be used to overcome iron deficiency. Just like calcium and magnesium, iron is also very important for our body. Its deficiency causes anemia, fatigue, dizziness are some of the symptoms of deficiency of iron. Iron also maintains oxygen requirement of our body.

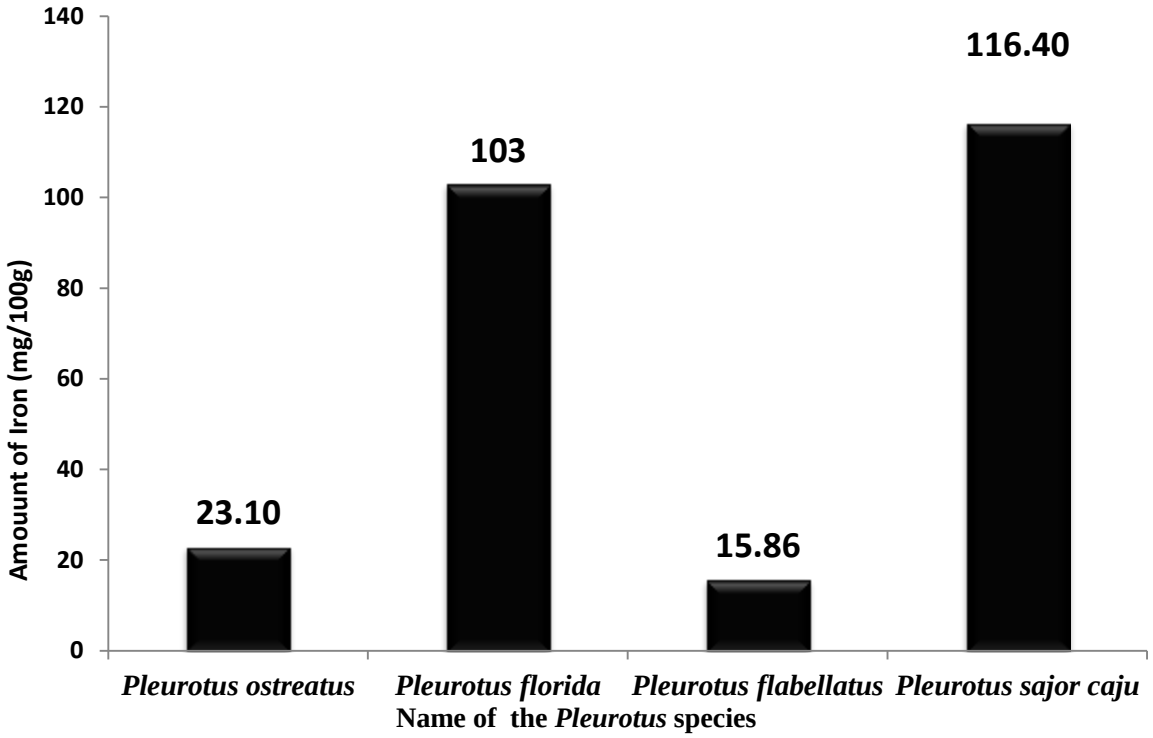

Chart 3: Showing amount of iron present in the four species of *Pleurotus* mushroom in mg/100 g of dry weight.

d) Zinc content:

The result regarding the content of zinc is shown in Table 4 and Chart 4 is shown below:

Sl. No.	*Pleurotus* Species	Amount of Zinc (mg/kg)
1	*Pleurotus ostreatus*	55.76
2	*Pleurotus florida*	53.65
3	*Pleurotus flabellatus*	48.29
4	*Pleurotus sajor caju*	56.24

Table 4: Showing amount of zinc present in the four species of *Pleurotus* mushroom in mg/kg of dry wt.

It has been discovered that amount of total zinc present in *Pleurotus sajor caju is* 56.24 mg/kg whereas in *Pleurotus ostreatus*, it is 55.76 mg/kg, in *Pleurotus florida* it is 53.65 mg/kg and finally in *Pleurotus flabellatus* it is only 48.29 mg/kg. It is clear that zinc is in very low quantity no matter what ever is the species. It is in least amount in *Pleurotus flabellatus*. Also, again the three varieties namely- *Pleurotus sajor caju*, *Pleurotus ostreatus* & *Pleurotus florida* show little difference in zinc content (chart 4).

The result also indicates that all the species of *Pleurotus* considered in the present study have more or less equal quantity of zinc present in them. Zinc is a major micro mineral; responsible for maintaining T-cells, important for body immune system. Zinc also interferes with fetus development, nervous system, vision, skin, hair, nail, etc. and also in bone development.

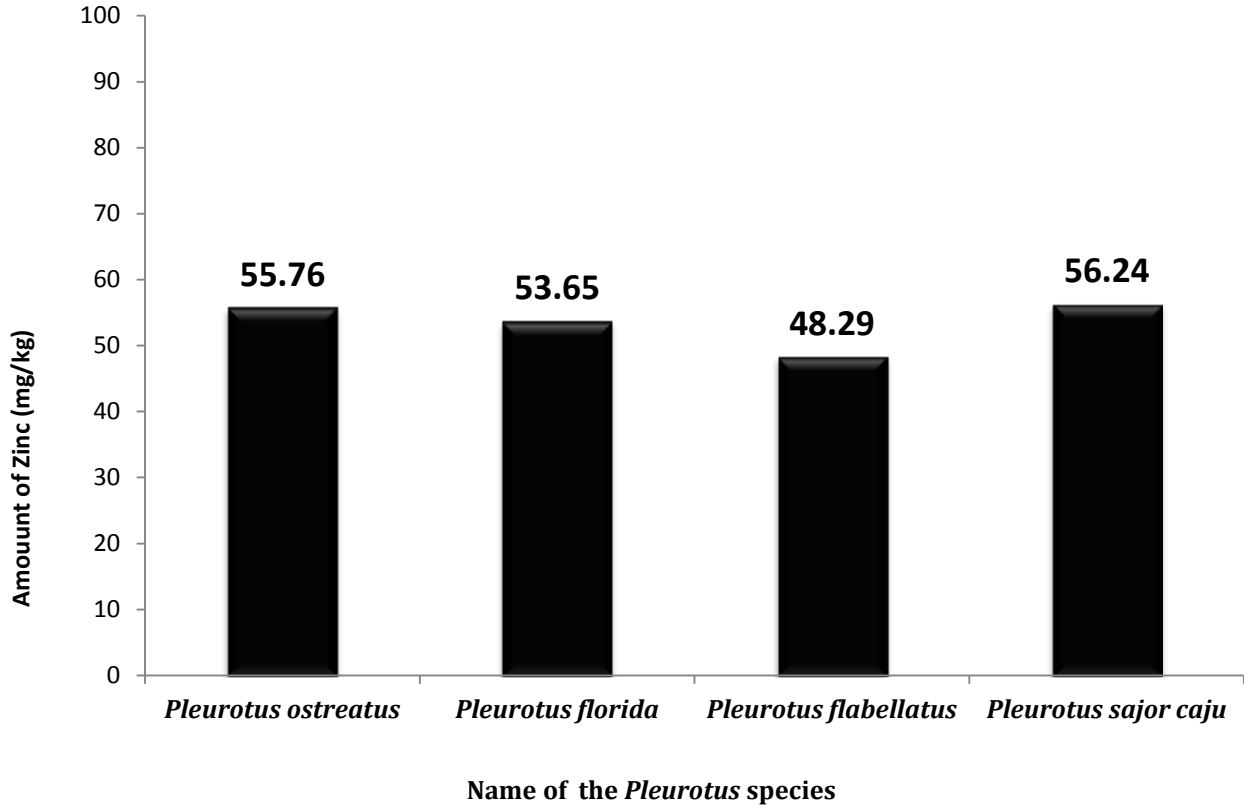

Chart 4: Showing amount of Zinc in the four species of *Pleurotus* species(mg/kg) of dry wt.

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