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Nutritional value and organoleptic evaluation of mushroom powder fortified Indian recipe : Besan laddu

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ABSTRACT : Mushroom one of nature's greatest wonder foods has already found its place of pride in the kitchens of the educated and the elite all over the world. In India it is yet to be commonly used by all and sundry in everyday meals. Mushrooms are highly nutritive, low calorie food with good quality protein, vitamins and minerals which are of paramount importance in the present age. Mushrooms are an important natural source of foods and medicines. A wide range of activities including antitumour, cardio-vascular are reported in mushrooms. Because of having high fibre, low fat and low starch, edible mushrooms have been considered to be ideal food for obese persons and for diabetics. They are also known to possess promising, cardio-vascular, hypercholesterolemia, antimicrobial, hepato-protective and anticancer effects. Biochemical analysis of prepared product revealed that T_4 (20%) mushroom (oyster mushroom) fortified laddus contained high amount of protein and fibre, low fat and carbohydrate than control sample and organoleptic evaluation of prepared laddus revealed that T_3 (15%) fortification of mushroom powder in besan laddus was liked very much. The fortified laddus had better quality with respect to nutritive value and organoleptic acceptability.

KEY WORDS: Mushroom, Nutritive value, Organoleptic acceptability

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Mushrooms have been recognized as most loved vegetarian food, rich in nutrition, particularly protein. With their flavour, texture, nutritional value, very high productivity per unit area and time, less dependence on land and ability to grow on a variety of residual agricultural wastes, mushrooms have rightly been identified as a food source to fight malnutrition in developing countries (Dutta, 2007). Both wild and cultivated mushrooms have been consumed by humans for their nutritional and medicinal benefits. Nutritionally, mushrooms are low in energy and fat but high in protein, carbohydrate and dietary fibre. Mushrooms contain a variety of minerals and trace elements such as potassium and copper and vitamins such as riboflavin, niacin and folates. They have been used as food for centuries because of their unique taste (Cheung, 2010). The dried oyster mushroom (*Pleurotus ostreatus*) has energy value 345 Kcal, water content 10.6 per cent, protein 15.7 per cent, fat 2.66 per cent, carbohydrate 64.1 per cent and ash 7.04 per cent. The proteins of mushroom are of high quality and rich in various essential amino acids (Julita and Marek, 2007).

Mushrooms are a common vegetable product that has also been linked to pharmaceutical and medicinal uses. The incorporation of mushroom in ready-to-eat snack foods may be of considerable interest to the food industry in trying to regulate the glycemic response of foods (Brennan *et al*., 2012). Apart from being recognized as a nutritious food, certain mushrooms are also an important source of biologically active compounds with potential additional medicinal value in Chinese medicine. Bioactive secondary metabolites found in mushrooms include phenolic compounds, sterols and tri terpenes. Studies with mushrooms and isolated bioactive constituents have purported many pharmacological effects such as anti-tumour, antioxidant, antiviral, hypocholesterolemic and hypoglycaemic effects. Consumption of mushrooms or mushroom products in our daily diet may provide health benefits (Cheung, 2010). Numerous mushroom-based 'healthy'

products for direct use are available in the market; many patents propose use of medicinal mushrooms and/or their products as additives to food. This seems to be a very convenient and simple method for delivering healthy ingredients to the consumers and, at the same time, enhancing the flavour of the food products.

■ RESEARCH METHODS

Development of products:

Preparation of laddus:

Fortified besan laddus was prepared in which besan (chickpea flour) was replaced by mushroom powder at different rates as 5 per cent,10 per cent,15 per cent and 20 per cent.

Method:

- A shallow bottom pan was placed on gas at medium flame. Entire amount of ghee was melted in the pan.
- Chickpea flour and mushroom powder fried in the fat separately at medium flame by constant stirring using a metal spoon, until appearance of light brown colour and a pleasant smell.
- The pan was removed from gas and allowed to cool at room temperature. The remaining ingredients sugar and chopped dry fruits were added and the contents were thoroughly mixed.
- Small size ball like laddus were made by pressing the mixture in palm. The laddus so made were placed in a plate, covered with a dry cloth and stored in a dry cool place, till further use.

Nutritive value of prepared product :

The prepared samples were analysed for nutritive value as protein, crude fat, carbohydrate, crude fibre and total ash.

Sensory evaluation:

The prepared samples were analysed for organoleptic evaluation by 9-point hedonic scale as taste and flavour, body and texture, colour and appearance and overall acceptability.

Analysis of data

The data obtained in the present investigation were tabulated statistically by using CRD (Completely Randomized Design).

■ RESEARCH FINDINGS AND DISCUSSION

The sample was analysed periodically for nutritive value and organgnoleptic acceptability.

The data of mean score were tabulated and analyzed statistically and results have been presented in Table 1 and Fig. 1.

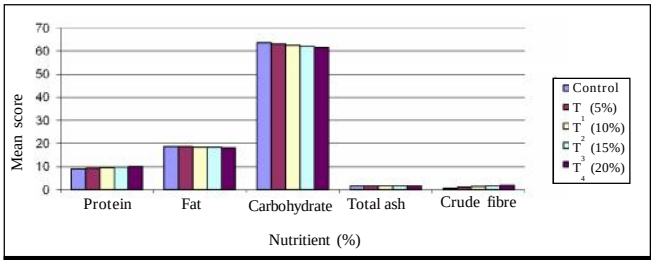

Fig. 1 : Mean score of nutritive value of mushroom fortified besan laddus

Protein profile:

Table 1 shows that mean score of protein content in control sample of laddus was 9.0, while the mean value of protein for T_1(5%), T_2(10%), T_3(15%) and T_4(20%) fortified products were 9.2, 9.4, 9.6 and 9.8, respectively. It was found that T_4(20%) sample was highly significant to control sample at 5 per cent critical difference. The protein content of 20 per cent fortified product was higher than control and other fortified products which reveals that the protein content of products were increased as the level of fortification of mushroom powder was increased in besan laddus.

Fat profile:

It is evident from the Table 1 that the mean score of fat content in control sample was 18.57 whereas the mean score of fat for T_1(5%), T_2(10%), T_3(15%) and T_4(20%) mushroom fortified products were18.47, 18.35, 18.23 and 18.15,

Table 1: Mean score of nutritive value of mushroom powder fortified laddus (in per 100g)

Sr. No.	Study group products	Nutrients				
		Protein (%)	Crude fat (%)	Carbohydrate (%)	Total ash (%)	Crude fibre (%)
1.	Control	9.0	18.57	63.44	1.61	0.63
2.	T_1	9.2	18.47	62.92	1.60	0.96
3.	T_2	9.4	18.35	62.39	1.60	1.28
4.	T_3	9.6	18.23	61.82	1.59	1.60
5.	T_4	9.8	18.15	61.34	1.58	1.93
	Mean	9.4	18.35	62.38	1.59	1.28

Note : T_1 - 5% Level of mushroom powder fortification, T_2 - 10% level of mushroom powder fortification
T_3 - 15% level of mushroom powder fortification, T_4 - 20% level of mushroom powder fortification

respectively. A perusal of data presented in table indicates that the fat content differed significantly in the control and fortified products. The fat content of fortified products was decreased with increase in level of mushroom fortification.

Carbohydrate profile:

Table 1 indicates that the mean score of carbohydrate content in control sample was 63.44 whereas for T_1(5%), T_2(10%), T_3(15%) and T_4(20%) mushroom fortified products were 62.92, 62.39, 61.82 and 61.34, respectively. Table 1 shows that the control and fortified products were significant at the level of 5 per cent critical difference. As the level of fortification of mushroom powder in besan laddus increased, the carbohydrate content of products decreasd in some amount. It means that carbohydrate content of fortified products was lower than control sample.

Crude fibre profile:

It is evident from Table 1 that the mean score of crude fibre content in control sample was 0.63 whereas for T_1(5%), T_2(10%), T_3(15%) and T_4(20%) mushroom fortified products laddus were 0.96, 1.28, 1.60 and 1.93, respectively. Table 1 shows that the crude fibre content of control and fortified samples were significant at 5 per cent critical difference. It means they differed from each other. The fibre content of 20 per cent fortified product was higher than control and other fortified products which reveals that the fibre content of products increased.

Total ash profile:

Table 1 shows that mean score of total ash content in control sample was 1.61, while the mean score of T_1(5%), T_2(10%), T_3(15%) and T_4(20%) mushroom fortified products were 1.60, 1.60, 1.59 and 1.58, respectively. Table indicates that there were slight differences in total ash content between control and fortified products.

The data of mean score were tabulated and analyzed statistically. Results have been presented in Table 2 and Fig. 2.

Taste and flavour profile:

Table 2 shows that mean score of control sample was 9.0 while the mean value of T_1(5%), T_2(10%), T_3(15%) and T_4(20%) mushroom fortified laddus were 7.6, 8, 8.8 and 6.6, respectively

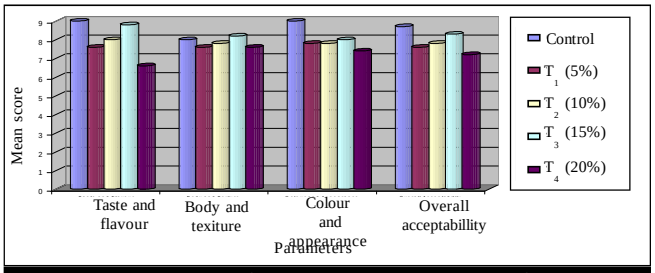

Fig. 2 : Mean score of organoleptic evaluation of mushroom fortified besan laddus

in taste and flavour. Table 2 also shows that the control and fortified samples were significant at the level of 5 per cent in critical difference. T_3(15%) fortified product mean score (8.8) showed better taste and flavour than other fortified products.

Body and texture profile:

It is evident from the Table 2 that mean score of control sample was 8.0 while the mean value of T_1(5%), T_2(10%), T_3(15%) and T_4(20%) mushroom fortified laddus were 7.6, 7.8, 8.2 and 7.6, respectively. Control and fortified products were non-significant at the level of 5 per cent in critical difference. The mean score of T_3(15%) fortified sample was higher (8.2) than others which showed that its body and texture was better than control and others.

Colour and appearance profile:

Mean score of control sample was 9.0 whereas value obtained by T_1(5%), T_2(10%), T_3(15%) and T_4(20%) mushroom fortified laddus were 7.8, 7.8, 8.0 and 7.4, respectively. The control and fortified samples were significant at the level of 5 per cent in critical difference. T_3(15%) fortified product mean score (8.0) showed better taste and flavour than other fortified products.

Overall acceptability profile:

Table 2 shows that the mean score of overall acceptability obtained by organoleptic evaluation between control and fortified sample. The mean score of control sample was 8.7 while the mean value of T_1(5%), T_2(10%), T_3(15%) and T_4(20%) mushroom fortified laddus were 7.6, 7.8, 8.3 and 7.2, respectively.

The result showed that the mean value of overall

Table 2: Mean score of organoleptic acceptability of mushroom fortified besan laddus

Sr. No.	Parameters	Study group products					Mean
		Control	T_1	T_2	T_3	T_4	
1.	Taste and flavour	9.0	7.6	8.0	8.8	6.6	8.0
2.	Body and texture	8.0	7.6	7.8	8.2	7.6	7.84
3.	Colour and appearance	9.0	7.8	7.8	8.0	7.4	8.0
4.	Overall acceptability	8.7	7.6	7.8	8.3	7.2	7.92

Note: T_1 - 5% level of mushroom powder fortification, T_2 - 10% level of mushroom powder fortification
T_3 - 15% level of mushroom powder fortification, T_4 - 20% level of mushroom powder fortification

acceptability of T_3 (15%) fortified product got highest mean score (8.3) than other fortified products. The overall organoleptic acceptability of different samples of laddus showed that 15 per cent mushroom fortified laddus had better sensory characteristic than other fortified samples.

In India different types of laddus are prepared and consumed because of its unique taste and nutritional quality. It is suggested for adults, old persons and children because of good sensory and also nutritional quality.

Conclusion:

The nutrient analysis of laddoos revealed that the nutritive value of product can be increased with fortification of mushroom at different increasing levels. Organoleptic acceptability of fortified laddus was analysed by panel members and it was concluded that T_3 (15%) mushroom fortified laddus had better sensory characteristics than other fortified samples. So, it is concluded that prepared mushrooms fortified besan laddoos are considered as healthy food because they are good in calories and fat and rich in proteins and dietary fibres and in sensory qualities. So, it is prescribed for growing children, pregnant and lactating women, old persons also for vegetarian which require high protein diet and also recommended for diabetic, obese, heart patients who require less amount of fat.

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