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Standardization of Novel Mushroom Jerky and Consumer Preference

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ABSTRACT: A new product mushroom jerky which us an alternate to meat jerky (a popular snack item in the Western countries), was prepared and its nutritional and sensory qualities were analysed. The cleaned button mushrooms were marinated one hour at ambient temperature and kept in a refrigerated condition (5°C) for 10 hours and dried at 60 °C for 7 hours. Then, it was packed in a polyethylene bag of 150gauge thickness and kept for storage. The proximate analysis like energy, carbohydrate, protein, fat, fibre, calcium and iron and sensory characteristics were was determined. The results indicated that carbohydrates, protein, fat, crude fibre, calcium and iron of chilli treated jerky were 60.13g, 23.73g, 2.16g, 8.33g, 538.19mg, 7.45mg % respectively. In the case of pepper treated mushroom jerky the results were found to be 60.58g, 22.99g, 1.96g, 8.17g, 541.19 mg, 7.55mg% respectively. The scores of mushroom jerkies were 7.95 and 7.50; 7.78 and 7.00; 7.69 and 6.79; 7.69 and 7.00, 7.47 and 7.00 for chilli and pepper treated jerky respectively. The chilli treated mushroom jerky found to be good in taste than the pepper treated one. The statistical data showed that there no significant in between the two marinades. It is concluded that chilli mushroom jerkies can be prepared as an alternate for meat jerky. The nutrient content of the jerkies is also increased due to concentration during drying.

Keywords: Mushroom, button, jerky, nutritional and sensory qualities.

INTRODUCTION

Edible mushrooms once called the “food of the gods” and still treated as a garnish or delicacy can be taken regularly as part of the human diet or be treated as healthy food or as functional food. Mushrooms have been considered as ingredient of gourmet cuisine across the globe; especially for their unique flavor and have been valued by humankind as a culinary wonder. More than 2,000 species of mushrooms exist in nature, but around 25 are widely accepted as food and few are commercially cultivated. Mushrooms are considered as a delicacy with high nutritional and functional value, and they are also accepted as nutraceutical foods; they are of considerable interest because of their organoleptic merit, medicinal properties, and economic significance (Chang and Miles, 2008). The most cultivated mushroom worldwide is *Agaricus bisporus*, followed by *Lentinus edodes*, *Pleurotus* spp., and *Flammulina velutipes*. Mushrooms production continuously increases, China being the biggest producer around the world (Patel and Goyal, 2012). As per the FAO statistics, the most notable increases are occurred in China as its present share in the world production of mushroom is more than 70% (Raut, 2019). The varieties of mushroom cultivated Internationally are button mushroom (31%), Shiitake mushroom (24%), Oyster mushroom (14%), Black ear mushroom (9%), Paddy straw mushroom (8%) and other mushrooms including milky. At present the total mushroom production in India is 0.13 million tons. Tamil Nadu produced for about 10,000 metric tons of mushrooms. As mushrooms being edible fungus can provide several important nutrients. However, wild mushrooms are becoming more important for their nutritional, sensory, and especially pharmacological characteristics (Günç Ergönül *et al*., 2013). It has been reported that *Agaricus bisporous* (button mushroom) contains carbohydrate (46.17g), fibre (20.90g), protein (33.48g), fat (3.10g), ash (5.70g), energy (499kcal). And *Pleurotus ostreatus* (Oyster mushroom) contains carbohydrate (57.60g), fibre (8.70g), protein (30.40g),

fat (2.20g), ash (9.80g) and energy (265 kcal) as per 100g dry weight (Manikandan, 2011).

A large variety of mushrooms have been utilized traditionally in many different cultures for the maintenance of health, as well as in the prevention and treatment of diseases through their immunomodulatory and antineoplastic properties. In the last decade, the interest for pharmaceutical potential of mushrooms has been increased rapidly, and it has been suggested that many mushrooms are like mini-pharmaceutical factories producing compounds with miraculous biological properties (Ferreira *et al*., 2010). Parmar and Kumar (2015) stated that useful for pharmaceutical and food industry as many of the identified constituents of *Pleurotus cornucopiae* (Paulet) are useful in therapeutic as well as for neutraceutical purpose. As mushroom contains high moisture and are delicate in texture, these cannot be stored for more than 24 hours at the ambient conditions of the Tropics. So, mushrooms should be processed. The real value-added product of mushroom in the Indian market is the mushroom soup powder. Technologies for production of some other products like mushroom base biscuits, nuggets, preserves, noodles, papad, candies and readymade mushroom curry have been developed but are yet to be popularized (Wakchaure, 2011). Mushroom value chain and role of value addition have also been done on mushrooms. But ready to eat mushroom products are not available except as bakery stuffed products. Drying is a widely used technology in convenience foods processing. Moisture migration during drying is controlled by the complex internal structure of the food (Singh & Heldman, 2014).

Products from dried meat, commonly referred to as ‘‘jerky’’ because of the characteristic appearance of the final products have been sold for many years, primarily in the USA, as snack foods. Apart from the commercial production, the preparation of dried meat snack foods at home has become very popular in recent years. The foods are obtained from appropriately prepared meat material, seasoned and preserved through drying and/or smoking. Jerky type products are characterized by a considerable diversity in the, with different kind of the applied raw materials (beef, pork, poultry, venison, and fish), spices and other functional additives such as e.g. antioxidants and stabilizers, individual technological procedures (comminution, curing, smoking, drying, and packaging) and applied equipment (Hegenbart, 1999) so, similar product can be prepared from mushroom and it’s a new product for the market. Based on these, a study was undertaken to standardize mushroom jerky be with the following objectives

— To standardize mushroom jerky using button mushroom.

— To study its shelf life.

— To study its physio chemical characteristics.

MATERIALS AND METHODS

A. The button mushroom (Agaricus bisporous) used in the study was obtained from the local market, Coimbatore.

B. The raw materials used in the study was also obtained from the local market, Coimbatore and they are tabulated below

C. Preparation of Mushroom Jerky

D. Preparation of Onion Paste

The onions were peeled and then cleaned with water. Then, the onions were sliced into small pieces and grinded into a paste by adding some water.

E. Preparation of Marinade

Table 1: Preparation of Marinade.

S. No.	Ingredients	Method - I	Method - II
		Chilli powder treated jerky	Pepper powder treated jerky
1.	Soy sauce	15g	15g
2.	Vinegar	2.5g	2.5g
3.	Garlic and ginger paste	1g	1g
4.	Chilli powder	1g	-
5.	Pepper powder	-	1g
6.	Cane sugar (brown)	1g	1g
7.	Salt	1g	1g
8.	Corn starch	1g	1g
9.	Onion paste	2g	2g

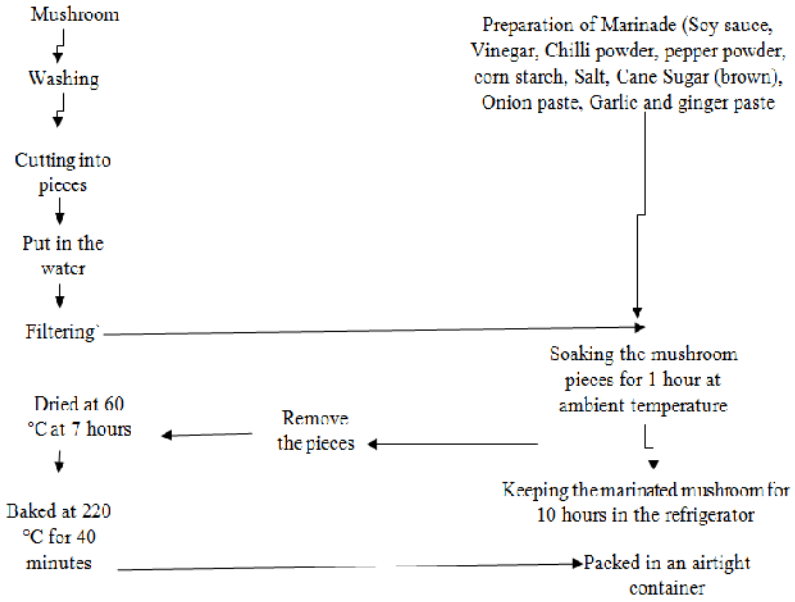
100g of button mushrooms were cleaned, sliced and the marinade solution is poured. In method I, chilli powder was used instead of pepper powder and the only difference in the method II is the use of pepper powder instead of chilli powder. Then the mushroom is left in the marinade for one hour at ambient temperature. The marinated mushrooms were kept in the refrigerator at 5°C for 10 hours. Then dried in the Cabinet Dryer at 60°C for 7 hours. Then, it was taken from the Dryer and packed in a polyethylene bag of 150 gauge thickness and kept for storage.

The proximate analysis like energy, carbohydrate, protein, fat, fibre, calcium and iron were was determined as per the procedure given by Ranganna (2005).

F. Sensory Quality

During the sensory evaluation, appearance, colour, flavour, texture and taste and were judged under daylight and the overall visual quality was evaluated. The sensory qualities were analysed using hedonic scale, which ranged from 9 (extremely acceptable) to 1 (unacceptable) for all, attributes (Watts *et al*., 1989).

MUSHROOM JERKY



Flow chart for the preparation of mushroom jerky.

RESULTS AND DISCUSSIONS

The mushroom jerky was standardised and the results are given below.

A. Proximate analysis of jerky

The nutritive value calculated for mushroom jerky were discussed in the Table 1.

Table 2: Proximate analysis of prepared mushroom jerky.

Nutrients	Method - I	Method - II
	Chilli incorporated Jerky	Pepper incorporated Jerky
Carbohydrates (g%)	60.13[a]	60.58[a]
Protein (g%)	23.73[b]	22.99[b]
Fat(g%)	2.16[a]	1.96[a]
Crude Fibre (g%)	8.33[b]	8.17[b]
Calcium (mg%)	538.19[a]	541.19[a]
Iron(mg%)	7.45[b]	7.55[b]

Each value represents mean of triplicate. The composition is given as a percentage on dry weight basis per 100 g of edible portion.

The results indicated that carbohydrates, protein, fat, crude fibre, calcium and iron of chilli treated jerky were 60.13g,23.73g, 2.16g, 8.33g, 538.19mg, 7.45mg % respectively. In the case of pepper treated mushroom jerky the results were found to be 60.58g, 22.99g, 1.96g, 8.17g, 541.19mg, 7.55mg% respectively. In this study, the methods did not significantly change the proximate value like carbohydrates, protein, fat, crude fibre, calcium and iron. According to Yang *et al*., (2001), *Pleurotus ostreatus* contained higher protein (23.9%), fat (2.16%) and carbohydrate (61.1%) compared with this study. The protein content of the button mushroom (*Agaricus bisporus)* taken for the study were 22.33g, which contributed much to the overall protein content and also this value was on par with the value studied by (Waktola and Temesgen, 2018) that *Agaricus bisporus* ranged from 32% – 42%. Mushrooms in general has higher protein content than most of other vegetables and most of the wild plants 14.71 to 17.37 % and 15.20 to 18.87% protein in the fruiting bodies of *Lactarius delicious* and *Lactarius sanguiffus* respectively. According to (Mendel, 1898), in *Agaricus bisporus* and *Pleurotus ostreatus*, the content of protein compounds varies from 7.0 – 19.5 g and 11.0g per 100g dry matter. It was found that though a medium temperature of 60°C was used in the oven drying method, it affected the protein content significantly than the other drying methods. Similarly, Arumuganathan *et al*., (2010) reported that temperature in the order of 60°C could result in denaturation of protein leading to a reduction in protein content of oyster mushroom.

Fat values in the present study are about the same as reported by Tolera and Abera (2017). Fat constituent in mushroom is not high when compared with carbohydrates and proteins. Fat content of mushroom is different in different species that 2.04% in *Suillus granulatus* but 3.66% in *Suillus luteus* and 2.32% in *Agaricus campestris* (Waktola and Temesgan 2018).

Mushroom is sliced and dried, it can be made into powders to be used as additive to increase content of dietary fibres in various foods and as a partial substitute for wheat flour in the bakery products or the dried slices are used in soups, biscuits, nuggets and snacks preparation (Zivanovic, 2006). The present study also proven the similar results in fibre. Similar findings were observed with Aishah and Wan Rosli (2013) who studies in dehydrated oyster mushrooms (*Pleurotus sajor caju*).

B. Sensory characteristics of prepared jerky

Through Hedonic scale, the sensory characteristics like appearance, colour, flavour, texture and taste were evaluated and given in the Fig. 1.

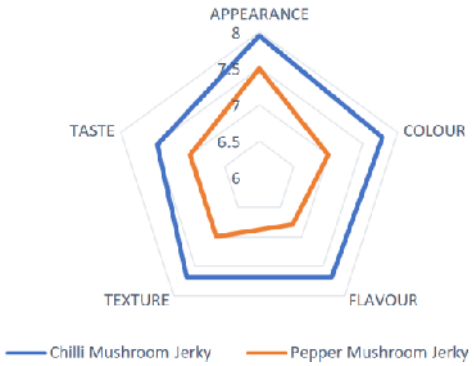


Fig. 1. Estimated mean values sensory attributes of chilli and pepper *Mushroom jerkies.*

The sensory attributes were evaluated like appearance, colour, flavour, texture and taste using 9 -1-point hedonic scale. All parameters were above dislike nor like only. The scores of mushroom jerkies were 7.95 and 7.50; 7.78 and 7.00; 7.69 and 6.79; 7.69and 7.00, 7.47 and 7.00 for chilli and pepper treated jerky respectively. The chilli treated mushroom jerky found to be good in taste than the pepper treated one. The difference between two methods is very meagre. Non-significant change ($p<0.05$) in almost all the parameters and the steps were successfully established in this study to minimise changes in quality attributes. The same was reflected in the mean preference scores of 50 panels which was shown in the Fig. 1. However, treating with marinade increases the sensory attributes and evidences shown by (Grahl *et al.*, 2018) are also on par with the studies.

Chart-I. Mushroom Jerky (chilli).

Chart-II Mushroom jerky (Pepper).

CONCLUSION

Mushrooms can be converted in to value added products and the post harvest spoilage may be prevented. The mushrooms are nutritionally and nutraceutical rich which can prevent many diseases. According to this study, it is suggested that the novel chilli mushroom jerkies can be used as an alternate for meat jerky for vegan people and also a new avenue for a nutri rich snack . The nutrient content of the jerkies is also increased due to concentration during drying.

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