South Asian Journal of Food Technology and Environment
ISSN 2394-5168 (Print), 5454-6445 (online)

Studies on development and shelf life evaluation of soup powder prepared by incorporation of white button mushroom (*Agaricus bisporus* L.)

Krishan Kumar

Department of Food Technology, Akal College of Agriculture,
Eternal University, Baru Sahib, Distt. Sirmour, H.P.

Abstract

Soup powders are convenient food items and comprised of different ingredients. Mushroom powder was prepared by using microwave dried mushrooms which were pretreated with 0.5% KMS + 0.2% citric acid for 30 minutes before drying to prevent browning. Wheat flour, salt, fat, sugar, onion and garlic powder, dried pieces of mushroom and skimmed milk powder were mixed with mushroom powder in different proportions to formulate three recipes for soup powder and packed in poly propylene pouches (100 gauge) and stored at room temperature (21-35 ºC). For reconstitution 100 g of soup powder was mixed with 650 ml of cold water and this mixture was brought to boil and simmered for 10-15 min. Soup powder was found to contain fat in the range of 5.68-5.84%, proteins 12.46-13.84%, ash 2.89-3.64%, crude fibres 0.88-1.42 % and total carbohydrates 71.82-73.27% on dry weight basis in all recipes. There was gradual but non-significant increase (4.12%) in moisture content of products during storage for 12 months. Overall acceptability values decreased from 7.66 on zero days to 7.13 after 12 months of storage. There was a significant increase in total plate count of all recipes of mushroom soup powder. The mean value for total plate count increased from 0.68 CFU × 10^2/g to 4.19 CFU × 10^2/g after six months and 6.72 CFU × 10^2/g after one year of storage. But TPC was below the hazardous level.

Keywords: Agaricus bisporus, button mushroom, shelf life, soup powder.

Paper cited: Kumar, K. (2015). Studies on development and shelf life evaluation of soup powder prepared by incorporation of white button mushroom (*Agaricus bisporus* L.). *South Asian Journal of Food Technology and Environment*, 1(3&4): 219-224.

Received: 11/09/2015 Revised: 25/09/2015 Accepted 15/10/2015

Introduction

The growing of mushroom (*Agaricus bisporus*) in India started at the beginning of 1962 and has gradually developed with improving composting techniques (Kumar and Sharma, 1997). Fresh mushrooms contain about 85-95% moisture, 3.0% proteins, 4.0% carbohydrates, 0.3-0.4% fat and 1.0% minerals and vitamins (Chandra and Samsher, 2005). Due to high moisture content mushrooms are highly perishable in nature. They keep respiring after harvest and many changes like browning liquefaction, loss of moisture and texture occurs resulting in reduced market value and unacceptability (Amuthan *et al.*, 1999).

Ready to drink dehydrated soup mixtures are convenient food items and consist of different ingredients, mostly corn starch, spices, salt, flavours and flavour enhancers (Hafeel *et al.*, 2013). A 'soup' is a food that is made by combining ingredients such as meat or vegetables in stock or hot/ boiling water until the flavour is extracted forming a broth. Soup is often used to help in the recovery of sickness, particularly if the patient is only able to digest liquids. A soup also acts as an appetizer taken at the beginning of a meal to stimulate the appetite and aid in the flow of digestive juices in the stomach (Singh and Chaudhary, 2015).

During peak season, there is glut of mushrooms in the market but due to its perishable nature, it can be stored for a longer period. Therefore, in order to minimize wastage and maximize its use, an effort has

made for development of mushroom soup powder. The product was evaluated for its shelf-life during storage at ambient conditions for one year at 2 months interval.

Materials and Methods

Mushrooms were dried by involving three methods i.e. sun drying, hot-air-oven-drying and microwave drying after Blanching of 100 g mushroom slices in 400 ml boiling water (100°C) for 3 minutes followed by steeping in 0.5% KMS + 0.2% citric acid for 30 minutes . Microwave oven dried slices were better in texture, colour and flavour than other drying methods and were used for preparing mushroom powder. These slices were grinded to fine powder in a grinder which was further used for preparation of mushroom soup powder.

Initially three recipes were tried for preparation of mushroom soup powder (Table 1.). These trial recipes were designed based on the difference in quantities of ingredients. Salt, wheat flour and spices were pre-dried to lower the final moisture content. Mushroom powder was obtained by grinding of dehydrated mushroom slices. Wheat flour, salt, sugar, onion and garlic powder and skimmed milk powder were mixed with mushroom powder. Fat was melted and mixed thoroughly with the above mixture. Dehydrated mushroom pieces were then added to this mixture. This soup powder was packaged in polypropylene pouches (100 gauge) and heat sealed.

The packaged products were stored at room temperature conditions for periodic evaluation. For reconstitution 100 g of soup powder was mixed with 650 ml of cold water and this mixture was brought to boil and simmered for 10-15 min. Soup powder for different recipes was reconstituted and used for sensory evaluation (Fig. 1).

The organoleptic evaluation was conducted by a semi-trained panel for colour, appearance, aroma, texture and taste. The judges scored quality characteristics of each sample on 9-point hedonic rating scale (Ranganna, 1986). Moisture and Total Viable count was determined as per standard methods of AOAC (1990). The products were analyzed for their physic-chemical, sensory and microbial characteristics up to one year at two months interval. Fat protein, ash and crude fibre was determined as per methods described by Ranganna (1986).

Results and Discussion

Three recipes were designed for preparation of soup powder (Table 1). Data on physico-chemical composition of three recipes of mushroom soup powder is presented in Table 2. Soup powder was found to contain fat in the range of 5.68-5.84%, proteins 12.46-13.86%, ash 2.89-3.64%, crude fibres 0.88-1.42 % and total carbohydrates 71.82-73.27 % on dry weight basis in recipes containing different levels of dehydrated mushroom and skimmed milk powder. Studies on preparation of commercially feasible mixed vegetable soup with nutritive value was done by Prabha *et al.*, (1994) and an acceptable traditional dehydrated lentil soup was formulated by Ereifej (1995). Wadikar and Premavalli (2013) developed a hot water reconstitutable appetizer soup mix from *Coleus aromaticus*. The optimized product had

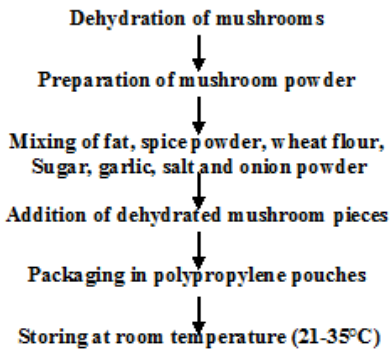

Fig. 1: Preparation of mushroom soup powder

the proximate composition of 19.1% protein, 6.3% fat, 8.3% ash, 5.2% crude fibre and 54.4% carbohydrate (by difference).

Changes in different physico-chemical constituents were determined at 2 months interval up to one year during storage at room temperature (21-35°C). There was gradual but non-significant increase in moisture content of all the recipes during storage for 12 months. Mean value for moisture changed from 4.13 per cent initially to 4.30 per cent after 1 year of storage. There was about 4.12 per cent increase in moisture during storage for one year (Table 3). That may be due to hygroscopic nature of ingredients used in soup preparation. Similar results were obtained in mushroom-whey soup powder during storage (Singh *et al.*, 2003) and in dry soup mix (Hafeel *et al.*, 2013).

Table 1: Details of trial recipes used for preparation of mushroom soup powder

Ingredients (g)	Recipe (A)	Recipe (B)	Recipe (C)
Dehydrated mushroom pieces	5.0	8.0	10
Dehydrated mushroom powder	5.0	7.0	10
Skimmed milk powder	35	30	25
Wheat flour	25	25	25
Fat	20	20	20
Salt	5.5	5.5	5.5
Onion powder	1.5	1.5	1.5
Garlic powder	1.5	1.5	1.5
Sugar	1.5	1.5	1.5
White pepper	0.1	0.1	0.1

Table 2: Physico-chemical composition of mushroom soup powder

Parameters	Recipes			Mean	CD at 5%
	A	B	C		
Moisture (%)	3.96	4.16	4.28	4.13	0.147
Fat (%)	5.84	5.76	5.68	5.76	0.172
Proteins (%)	13.86	12.60	12.46	12.97	0.135
Ash (%)	3.64	3.16	2.89	3.23	0.090
Crude fibre (%)	0.88	1.16	1.42	1.15	0.113
Carbohydrates (%) (By difference)	71.82	73.16	73.27	72.75	0.548

Table 3: Changes in moisture content of mushroom soup powder during storage at room temperature conditions

Products/ Recipes	Period of Storage (months)							
	Moisture (%)							
	0	2	4	6	8	10	12	Mean
A	3.96	4.00	4.02	4.05	4.08	4.10	4.13	4.05
B	4.16	4.20	4.22	4.25	4.29	4.33	4.32	4.25

C	4.28	4.32	4.35	4.38	4.41	4.42	4.45	4.37
Mean	4.13	4.17	4.20	4.23	4.26	4.28	4.30	
CD at 5%	Treatment = 0.033 Storage period = 0.051 Treatment × Storage period = 0.088							

Table 4: Mean sensory score for different recipes of mushroom soup powder

Parameters	Recipe A	Recipe B	Recipe C	Mean	CD at 5%
Colour	8.00	7.83	6.90	7.58	0.480
Appearance	8.70	7.50	7.00	7.73	0.541
Aroma	8.83	8.06	6.87	7.92	0.231
Texture	8.50	7.50	7.50	7.83	0.503
Taste	8.70	7.00	6.07	7.26	0.352
Overall acceptability	8.55	7.58	6.87	7.66	0.310

Table 5: Changes in overall sensory score of mushroom soup powder during storage

Products/ Recipes	Storage period (Months)							
	0	2	4	6	8	10	12	Mean
A	8.55	8.50	8.42	8.37	8.27	8.55	8.03	8.33
B	7.58	7.43	7.42	7.27	7.17	7.10	7.03	7.29
C	6.87	6.70	6.67	6.57	6.47	6.38	6.33	6.58
Mean	7.66	7.57	7.50	7.40	7.31	7.21	7.13	
CD at 5%	Treatment = 0.052 Storage period = 0.019 Treatment × Storage period = 0.137							

Table 6: Changes in total plate count (CFU × 10^2/g) of mushroom soup powder during storage

Products/ Recipes	Storage period (Months)							
	0	2	4	6	8	10	12	Mean
A	0.50	1.50	2.50	2.50	3.80	4.20	4.80	3.31
B	0.63	1.60	2.80	4.20	4.80	5.60	6.50	3.73
C	0.90	1.80	3.27	4.57	5.40	6.20	7.80	4.28
Mean	0.68	1.63	2.86	4.19	4.80	5.53	6.72	
CD at 5%	Treatment = 0.231 Storage period = 0.353 Treatment × Storage period = 0.611							

Data on sensory analysis of three recipes of soup powder (A, B and C) is presented in Table 4. There was significant difference in colour, appearance, texture, taste, aroma and overall acceptability of three recipes of mushroom soup powder. The mean values for colour, appearance, texture, taste, aroma and overall acceptability were 7.58, 7.73, 7.83, 7.26, 7.92 and 7.66 respectively. Overall sensory score was highest for recipe A (8.55) followed by recipe B (7.58) and recipe C (6.87). Therefore Recipe A was preferred than other recipes.

Changes in overall sensory score of mushroom soup powder during storage for 12 months are depicted in Table 5. Mean value for organoleptic score was 8.33 for recipe A, 7.29 for recipe B and 6.58 for recipe C. During storage a significant decrease in overall acceptability of mushroom soup powder was observed. Overall acceptability values decreased from 7.66 on zero days to 7.13 after 12 months of storage. Singh *et al.,* (2003) found that the reconstituted mushroom-whey soup was acceptable, with an overall acceptability score of 7.1 on a nine-point hedonic scale, after 8 months of storage of the soup powder at 30 °C when packed in metalized polyester. The soup mix developed by Wadikar and Premavalli (2013) from *Coleus aromaticus* packed in metalized polyester pouches had a shelf life of 6 months at 28 ± 5°C as well as 37°C storage.

The changes in total plate count of mushroom soup powder during storage are presented in Table 6. The data revealed that during storage, there was a significant increase in total plate count of all recipes of mushroom soup powder. The mean value for total plate count increased from 0.68×10^2 cfu /g to 4.19×10^2 cfu /g after six months and 6.72×10^2 cfu /g after one year of storage. That may be due to increase in moisture content of product during storage. The mean value for total microbial count after 12 months of storage was highest for recipe C (4.28×10^2 cfu /g) followed by recipe B (3.73×10^2 cfu /g) and recipe A (3.31×10^2 cfu /g). But TPC was below the hazardous level. Similar results were obtained in dry soup mixes during storage by Hafeel *et al.* (2013).

Conclusion

Highly perishable button mushrooms (*Agaricus bisporus*) were used for preparation of mushroom soup powder. For reconstitution 100 g of soup powder was mixed with 650 ml of cold water and this mixture was brought to boil and simmered for 10-15 min. Recipe A was preferred than other recipes as it scored highest during organoleptic evaluation. Soup powder was found to contain fat in the range of 5.68-5.84%, proteins 12.46-13.86%, ash 2.89-3.64%, crude fibres 0.88-1.42 % and total carbohydrates 71.82-73.27 % on dry weight basis in all recipes. There was slight increase in moisture content of products during storage. This may be due to hygroscopic nature of ingredients used in soup preparation and can be prevented by improving the packaging of product. Overall acceptability values decreased slightly during storage for 12 months but product was still acceptable. There was a significant increase in total plate count of all recipes of mushroom soup powder. That may be due to increase in moisture content of product during storage. But TPC was below the hazardous level. Thus it can be concluded that product was successfully stored at room temperature without any major change in physico-chemical, microbial or organoleptic parameters.

References

1. A.O.A.C. (1990). Official Methods of Analysis (15^{th} ed). Association of

2. Official Analytical Chemists, *Washington, D.C.*
3. Amuthan, G., Visvanathan, R., Kailappan, R., and Sreenarayanan, V.V. (1999). Studies on osmo-air drying of milky mushroom (*Calocybe indica*). *Mushroom Research*, 8(2): 49-52.
4. Chandra, S. and Samsher (2005). Edible mushrooms: An anti-diabetic food additive and their consumption. *Beverage and Food World*, 32(5): 78-79.
5. Ereifej, K.J. (1995). Preparation of acceptable traditional dehydrated lentil soup at small scale. *Journal of Food Science and Technology*, 32(6): 486-488.
6. Hafeel, R.F., Lamali, J.A.I. and Wijerathne, V. (2013). Nutritious Dry Soup Mix with sprouted mung beans and sprouted brown rice. *Annals of Sri Lanka Department of Agriculture*, 15: 227-236.
7. Kumar, S. and Sharma, V.P. (1997). Evaluation of various strains of *Agaricus bisporus* (Lange) Imbach for commercial cultivation under H.P. Conditions. *Mushroom Research*, 6(2): 65-68.
8. Prabha, S., Banerjee, A.K., Saraswat, R.K. and Singh, S. (1994). Studies on preparation of commercially feasible mixed vegetable soup with nutritive value. *Indian Food Packer*, 48(3): 19-24.
9. Ranganna, S. (1986). Handbook of analysis and quality control for fruit and vegetable products, 2nd ed. *Tata McGraw hill Publishing Co. Limited*, New Delhi.
10. Singh, S. (1996). Effect of whey concentration on the quality of whey based mushroom soup powder. *Mushroom Research*, 5: 33-88.
11. Singh, S. and Chaudhary, G. (2015). Quality evaluation of dried vegetables for preparation of soups. *Indian Research Journal* of *Genetics* and *Biotechnology*, 7(2): 241 – 242.
12. Singh, S., Ghosh, S. and Patil, G.R. (2003). Development of a mushroom-whey soup powder. *International Journal of Food Science and Technology*, 38(2): 217-224
13. Wadikar, D. D. and Premavalli, K. S. (2013). Development of a hot water reconstitutable appetizer soup mix from *Coleus aromaticus* using response surface methodology. *International Food Research Journal*, 20(6): 3041-3046.