

MUSHROOM POWDER AS POTENTIAL ADDITIVE TO A NUTRIENT-DENSE FOOD FOR HUMANITARIAN EMERGENCIES: A REVIEW

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Abstract

A humanitarian emergency occurs when certain crisis threatens health, safety or well-being of large vulnerable populations (children, pregnant and nursing women, migrants, displaced people, and wounded individuals) who are incapable to withstand the adverse consequences by themselves. Such crises involved: armed conflicts, epidemics, famine, natural disasters, and other forms of emergencies. Most often, survivors are left in crucial need of life-saving aid, especially nutrient-dense emergency food. This type of food is usually high in carbohydrates and protein content that can alleviate hunger, stress, and are a source of immunity boosters. This review will delve into the potentiality of the edible mushroom powder additive to food products as a source of emergency food. The topics in this review paper are (1) species, abundance and economic value of edible mushrooms, (2) nutritional content of edible mushrooms, (3) innovative methods of processing mushroom powder as emergency food.

Introduction

Many people around the world are affected by natural disasters, internal or cross-boundary conflicts or large-scale economic turmoil. Providing these people with sufficient quantities of safe foods necessary for healthy and sustainable diets at the right time, in the right place, and on a consistent basis, is challenging (Bounie et al., 2020).

The important characteristics of emergency food comprised high-energy, nutritional-, food health and safety, easy to swallow and doesn't cause thirst (Ainehvand et al., 2019).

To fulfill the quality standards of emergency food, the focus is to supply carbohydrates, protein, vitamins, and minerals (Aini et al., 2018).

Edible mushrooms have been extensively used for human nourishment for quite a long time and are acknowledged for their appealing texture, flavor, and medicinal traits. Mushrooms are majority used in flour-based commodities like bread and biscuits, and their powder is being used in several food products, such as muffins, bread, pasta, and snacks to improve the nutritional quality (Yadav & Negi, 2021).

I. Species, Abundance and Economic Value of Edible Mushroom

Commercial cultivation demand and global markets for mushroom are improving. This has led to an increase in the variety of edible mushroom cultivation substantially (Carrasco et al., 2018), and currently, around 30 mushroom species are cultivated commercially (Yadav & Negi, 2021).

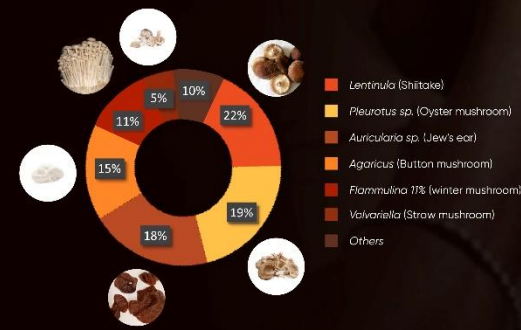


Figure 1. World edible mushroom production (%) by genus (Royse et al., 2017).

II. Nutritional Content of Edible Mushrooms

Emergency food nutritional standard (every 50 grams) according to Zoumas et al. (2002) contains Protein (dry basis) 7.9 – 8.1%; lipids (dry basis) 9.1 – 11.7%; carbohydrates (dry basis) 23 – 35%; and energy minimal 233 kcal.

Mushrooms are rich in proteins (20–25%) and fibres (13–24% dry basis) and contained a lower amount of lipid (4 to 5%), carbohydrate (37 to 48% dry basis) and ash content 8 to 13% (dry basis).

Table 1. Chemical characteristics of bakery products prepared with mushroom powder (Salehi 2019)

Bakery products	Mushroom percent (Flour basis)	Moisture (%)	Fat (%)	Protein (%)	Carbohydrate (%)	Fiber (%)
Bread containing oyster mushroom	15%	17,54	10,10	11,40	58,76	-
Biscuit containing oyster mushroom	12%	1,16	23,08	7,85	66,92	9,84
Biscuit containing Shiitake mushroom	10%	6,54	20,16	10,55	66,06	13,0
Biscuit containing Button mushroom	10%	2,5	14,8	8,4	71,8	1,1

III. Innovative Methods of Processing Mushroom Powder as Emergency Food

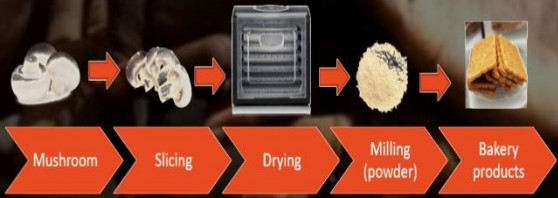


Figure 2. Mushroom powder making and its utilization in bakery products (Salehi 2019).

Drying is one of the significant preservation methods employed for storage of mushrooms and dried mushrooms are valuable ingredients in a variety of bread, cakes, biscuit, sauces and soups. As mushrooms are very sensitive to temperature, choosing the correct drying technique can be the key to a successful operation. Many studies were done to drying of mushroom by different drying methods such as hot air, vacuum heat pump, freeze-drying, infrared (IR)-vacuum, osmotic dehydration, fluidized bed, Infrared (IR) and microwave. IR drying was used before or after freeze-drying of mushroom (shiitake) to decrease in the drying time, to improve the rehydration, and to better protect the aroma compounds and colour. The application of IR drying also helps produce a more porous microstructure in dried shiitake mushrooms. The rise in IR radiation power has a negative effect on the colour change (ΔE) of button mushroom and with increasing IR radiation power, it was increased. Far-IR drying characteristics of mushroom slices were studied results show that the logarithmic model is the most suitable model for IR drying behaviour of thin-layer drying of mushroom slices (Salehi, 2019).

Easy to swallow and does not cause thirsts is also an additional characteristics that must be considered in developing emergency food products. A study on the formulation of flour as emergency food with intermediate moisture food (IME). IME is special type of food stored at ambient temperature and are moist enough to be consumed without rehydration. Water is usually added in the dough and in order to restrict water mobility in the final food product, humectants are added in the formulation. Results showed that there is an increase in emergency food calories after the addition of sorbitol as humectants. Moreover, it does not only effectively lower the A_w to avoid fungal growth but also improve the sensory properties of the product (Aini, et al., 2018).

Remarks

Mushroom powder as additive to food and pharmaceutical industry are being studied. Emergency food prototypes using mushroom powders are very promising and need to be further evaluated. However, the need for ready-to-eat and fresh produce also can be explored as source of nutrient-dense food during emergency situations.

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