MUSHROOMS – ONLY NON-ANIMAL SOURCE OF ESSENTIAL NUTRIENTS

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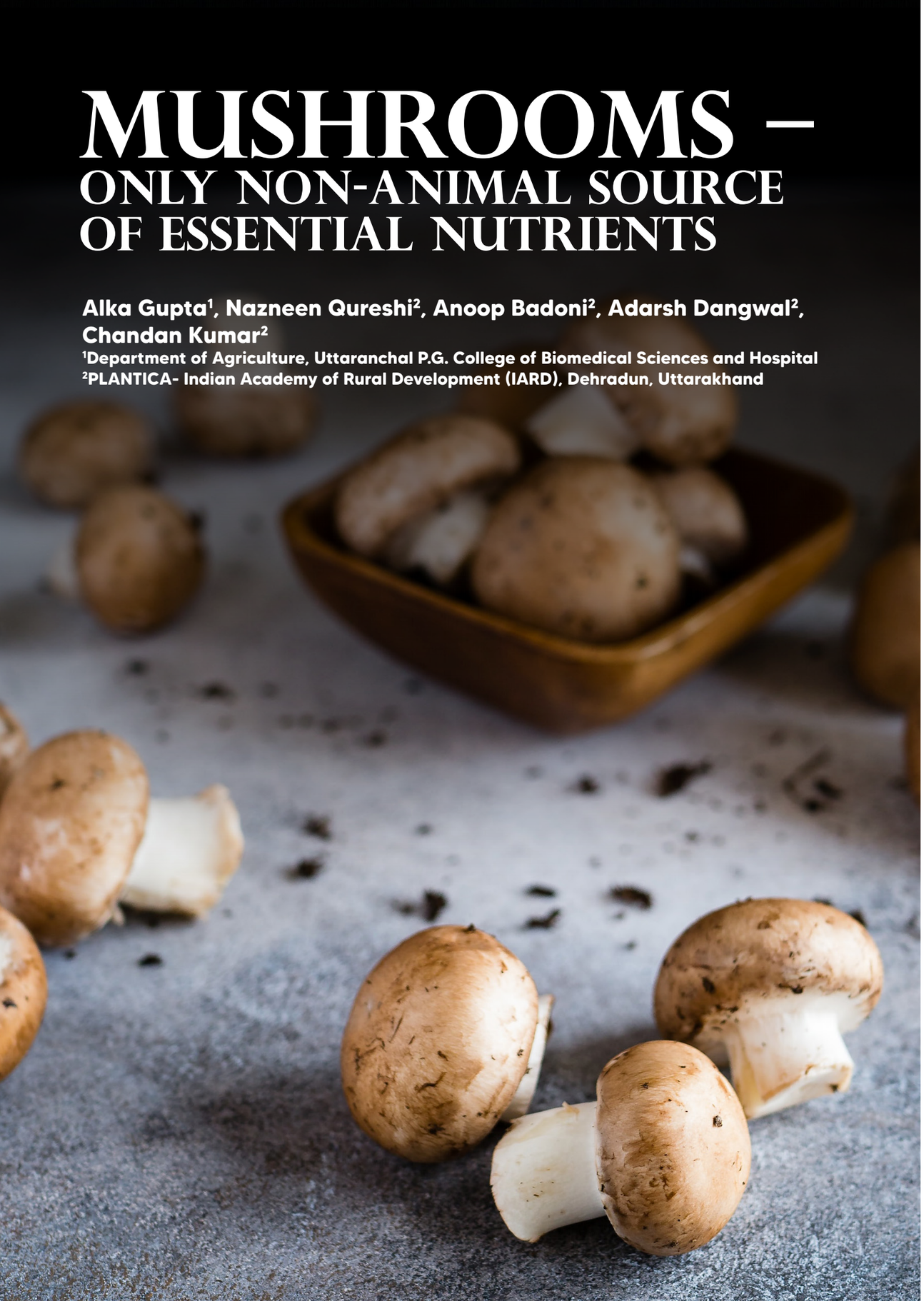

SUMMARY

Mushrooms are the non-animal source to contain one of the critical nutrients for humans First of all, we should know the what are the source of vitamin D, sunlight is the greatest source of vitamin D, the other are Vitamin D supplements which comes from sheep's wool are available in the market or if you want in your diet, it will come from fatty fish, from egg yolks and beef liver. The only non-animal source of Vitamin D, but it has a trick in order to gain its nutrition. The plain button mushrooms contain super high level of Vitamin D, but not when they are kept in shelf, they need to be exposed to the sunlight in order to make it available. Same as the UV light helps our bodies to produce it, same thing happens to mushrooms, it contains esgosterol and when exposed to UV radiation it is converted into Vitamin D. The percentage is decent compare to fresh mushrooms brought from store which has about 1 microgram per 100 grams of Vitamin D, but if sliced and put out in the sun for 15-20 minutes before cooking off then that amount is increased by 10 times to 10 microgram per 100 grams which is about daily requirement in some countries.

VITAMIN D AND DIETARY REQURIMENT

Vitamin D stimulates the synthesis of the calcium transport proteins in the small intestine, enhancing the absorption of dietary calcium and thereby reducing the risk of osteomalacia in adults and rickets in children. Adequate vitamin D is also important for muscle function and reducing the risk of falls in the elderly and may help protect against some cancers, respiratory disease in children, cardiovascular disease, neurodegenerative diseases, and both type 1 and type 2 diabetes, although current evidence for non-skeletal benefits is inconclusive.

The two main dietary forms of vitamin D are D2, found in fungi and yeast, and D3, found in animals; lesser amounts of vitamin D3 and D4 are also found in fungi. Few foods in the Western diet are a good source of vitamin D, with the best naturally occurring dietary source being oily fish. Some countries have liberal fortification policies, with foods such as milk, margarine, breakfast cereals, and juices, fortified with vitamin D. Sun-dried and UV radiation-exposed mushrooms are a potentially important source of dietary vitamin D (as vitamin D2). Vitamin D-enhanced mushrooms are the only non-animal food product with substantial amounts of bioavailable vitamin D and, as such, have the potential to be a primary source of dietary vitamin D for vegans and vegetarians.

VITAMIN D METABOLISM IN MUSHROOM:

Mushrooms have high concentrations of ergosterol in their cell walls, playing a similar role as cholesterol in animals, i.e., strengthening cell membranes, modulating membrane fluidity, and assisting intracellular transport. The presence of both ergosterol and vitamin D_2 in mushrooms was first reported in the early 1930s.

When exposed to UV radiation, ergosterol in the mushroom cell wall is transformed to pre-vitamin D_2, which is then thermally isomerised in a temperature-dependent process to ergocalciferol, commonly known as vitamin D_2. Through a similar process, pro-vitamin D_4 (22,23-dihydroergosterol) from mushrooms is converted to vitamin D_4.

BIOAVAILABILITY OF VITAMIN D2 FROM MUSHROOMS

mushrooms contain an abundance of ergosterol, which on exposure to UV irradiation is converted to vitamin D2. The present study evaluated the effects UV-C irradiation on vitamin D2 formation and its bioavailability in rats. Fresh button mushrooms were exposed to UV-C irradiation at mean intensities of 0.403, 0.316, and 0.256 mW/cm2 from respective distances of 30, 40, and 50 cm for periods ranging from 2.5 to 60 min. Vitamin D2 and ergosterol were measured by HPLC-MS/MS. The stability and retention of vitamin D2 were assessed including the extent of discoloration during storage at 4 °C or at room temperature. Exposure to UV-C irradiation at 0.403 mW/cm2 intensity from 30 cm distance resulted in a time-dependent increase in vitamin D2 concentrations that was significantly higher than those produced at intensities of 0.316 and 0.256 mW/cm² from distances of 40 and 50 cm, respectively. Furthermore, the concentrations of vitamin D2 produced after exposure to UV-C irradiation doses of 0.125 and 0.25 J/cm2 for, 2.5, 5, and 10 min were 6.6, 15.6, and 23.1 µg/g solids[3], equivalent to 40.6, 95.4, and 141 µg/serving[3], respectively.

ENHANCEMENT OF VITAMIN D COMMERCIAL LEVEL

Mushrooms sold in supermarkets are usually grown in dark, controlled environments indoors, they will contain little if any vitamin D. But some manufacturers expose mushrooms to ultraviolet (UV) light to increase their content of vitamin D, either by natural sunlight or a UV lamp. A substance in mushrooms called ergosterol then produces vitamin D2 (ergocalciferol)4, a form found only found in plants. Vitamin D2 is also added to fortified foods and supplements. The amount of vitamin D mushrooms contain vary. Estimates show that fresh wild mushrooms like chanterelles and morels can contain up to 1200 IU of vitamin D per 3.5-ounce4 serving, whereas mushrooms grown in darkened conditions like white button, shiitake, and oyster contain less than 40 IU4. However, button mushrooms that are exposed to sunlight can produce up to 400 IU vitamin D per3.5-ounce4 serving though the exact amount depends on factors related to their UV exposure such as the time of day, season, latitude, and duration. Mushrooms treated with UV lamps can produce even higher amounts of vitamin D. Even after harvesting, mushrooms can continue to produce vitamin D, whether exposed to UV light from the sun or a lamp.

It is conceivable that UV-B radiation post-harvest (for fresh mushrooms) or post-drying (for dried and powdered mushrooms) could become standard commercial practice. Sunlight, regular UV lamps, and pulsed UV lamps have the capability to raise the vitamin D2 concentrations to nutritional significance, although pulsed UV lamps may be the most cost-efficient method for commercial production of vitamin D-enhanced mushrooms, because of the low exposure time (often in 1–3 seconds) to achieve at least 10 µg/100 g4 FW. There is minimal discoloration in mushrooms after pulsed UV treatment, possibly due to the small exposure time of less than 4 seconds; however, there are many reports of surface discoloration of mushrooms after longer exposures to UV radiation from UV fluorescent lamps. Since consumers may be deterred by mushrooms discoloration pulsed UV treatment is likely to be preferred by commercial growers.

CONCLUSION:

Mushroom consumption is increasing rapidly worldwide, with the production of mushrooms rising. Since mushrooms provide nutritionally relevant amounts of B group vitamins and of the mineral's selenium, potassium, copper, and zinc, they are a nutritious, low energy-dense food, it is greatly consumed all over the world. The plain button mushrooms contain super high level of Vitamin D, but not when they are kept in shelf, they need to be exposed to the sunlight in order to make it available. Vitamin D-enhanced mushrooms contain high concentrations of vitamin D2, which is bioavailable and relatively stable during storage and cooking. Therefore, consumption of vitamin D-enhanced mushrooms could substantially contribute to alleviating the global public health issue of vitamin D deficiency.