

# BIOFOODS - A SIDE HUSTLE

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**Abstract-** Thenceforth the emergence, human being continuously improvising and innovating on different features to make their income more sustainable. Microorganisms have great importance and impact on our life as they are the prime producers of useful natural products. A collection of microorganisms such as bacteria, fungi, and plants produce secondary metabolites, also known as natural products and are employed for the food production as well food ingredients for wine, beer, bakery, and dairy products, meat products, and nutraceuticals. Significant portion of the microbial genome are devoted to production of these food. The most useful products include mushroom, yogurt, Yakut, microgreens, homemade wine, bread, jam, cheese etc. Naturally microorganisms have the ability to carry out fermentation processes, and for thousands of years mankind exploited this for their wellbeing. This study focuses on to the manufacture of mushroom, microgreen, and yogurt. which helps to improve economy, social wellbeing and sustainable development of an individual. This gives a clear idea about the production and marketing of microbial products and get well profit out of it and it is promoted sustained, comprehensive and sustainable economic and decent work for all. A bio-based economy provides significant potential for improving labour supply, education and investment, and thereby for substantially promoting the socio-economic dividend. This improves the sustainable development of economies.

**Key Words:** Microbial food, Mushroom, sustainability, yogurt, secondary metabolites.

## 1. INTRODUCTION:

Mushrooms are one of the most loved foods not only for its exotic taste but also for the benefits with which it comes. It can be consumed in various forms like fresh, pickled, dried, powdered, canned etc. Its farming has picked up a fast pace among contemporary entrepreneurs owing to its nutritional and medicinal benefits and low-cost input with high output. Mushrooms are a fleshy fungi (*Basidiomycota*, *Agaricomycetes*) having a stem, cap and gills underneath the cap Mushrooms are naturally a rich source of Vitamin D as it contains copious amount of "Ergosterol"- a precursor of Vitamin D which when stimulated by sunlight or artificial lightening source converts to Vitamin D.

An ancestral version of yoghurt first developed in Mesopotamia and Egypt around 9000 or 8000 BC, and then expanded throughout northeast Africa, the Middle East, Central Asia, and later the Balkan countries, giving a wide range of 'fermented milks.' Yogurt is a fermented dairy product made from the fermentation of lactic acid by two species of lactic acid bacteria, *Streptococcus thermophilus* and *Lactobacillus delbrueckii subsp. Bulgaricus*. The milk products that undergo extensive biochemical changes as a result of the action of microorganism are consumed in all parts of the world. Of these, yoghurt is so popular that it has assumed different forms e.g., stirred, set and frozen liquid yoghurt. The successful production of yoghurt depends upon the processing techniques i.e., correct selection of starter culture, heat treatment, inoculation and incubation temperature, preservation, handling and propagation of starter cultures that help to standardize and maintain uniformity in the quality of end product.

In the course of 20 years, growing awareness of mass people in healthy meal has encouraged attention in fresh, functional and nutraceutical foods of high end. It is in the favour of micro green crop cultivators, extension experts and scientists to meet coming opportunities for relevant products. Micro greens, commonly termed as 'Vegetable Confetti', are another form of distinction crop, portrayed as soft juvenile greens raised from the seeds of grains, vegetables, or herbs as well as its wild types. Since, in developed countries attraction towards healthy eating, gourmet cooking and indoor gardening has been increased and thereby microgreens have now attained recognition there. This new form of food has a comparatively small life span even in refrigerator and are utilised in very little amounts as garnishes, toppings, or seasonings. Micro greens are identified by various number of colors, tastes, textures and are fresh and tenderly soft vegetables, found from the seeds of abundant varieties (aromatic herbs vegetables, wild edible plants, and herbaceous plants), harvested a few days or weeks after germination during the formation of cotyledons and appearance of the first true leaves. Micro greens have larger concentrations of phenolics, antioxidants, minerals, and vitamins than present in fully developed green or seeds and hence recognized as functional foods consisting of health improving or ailment prevention characteristics apart from their nutritional benefits.

## 2. REVIEW OF LITERATURE:

**Kratika Sharma., 2015** reviewed Mushrooms are easily cultivable in hilly regions due to abundant moisture but can also be grown in artificial environment with proper temperature and humidity control. Varieties must be identified thoroughly as some of them might cause food poisoning or allergy upon consumption. Some of the major varieties consumed in India are Button Mushroom, Shiitake Mushroom, Oyster Mushroom, Paddy Straw Mushroom.

**Rajvir Singh et al., 2021** reviewed microbiological characteristics and biochemical and physiochemical changes and Flavour compound production involved in yoghurt production. The growth of lactic acid bacteria in milk causes several modifications in yoghurt that are favourable. The formation of several metabolites (lactic acid, exopolysaccharides, and fragrance compounds), as well as the altering of the texture and nutritional content of the product, are among these changes. Due to the presence of lactic acid

in the product, the flavour of yoghurt is mostly acidic. About a hundred volatile chemicals make up the scent of yoghurt, including carbonyl compounds (acids and esters), alcohols, heterocyclic, and sulphur-containing compounds. Acetaldehyde is the most important flavour ingredient in yoghurt, where it imparts a pleasant fresh and fruity scent.

**Xiao, Lester et al., 2012** reviewed the stock and consumption of micro greens is greatly affected by occurring of culinary trends and selectivity of species depends on maker's discussion with chefs and on customer adaptation with their specific sensory characteristics. Microgreens might be dispersed as new cut items yet in addition while developing on media, to be gathered by end clients. Species related to the families *Brassicaceae*, *Asteraceae*, *Chenopodiaceae*, *Lamiaceae*, *Apiaceae*, *Amarillydaceae*, *Amaranthaceae* and *Cucurbitaceae* are mostly exploited. Bioactive substance is conspicuous in types of rather harsh taste (for example *Brassicaceae*), the variable adequacy of which warrants distinguishing proof of genotypes that may take into account requests for both taste and wellbeing.

**View & Club, 2019** reviewed Microgreens can be obtained from different sorts of seeds. The well-known species are harvested using seeds from the following plant families:

*Brassicaceae* family: Broccoli, cauliflower, watercress, cabbage, arugula and radish

*Asteraceae* family: Endive, lettuce, radicchio, and chicory

*Apiaceae* family: Carrot, dill, celery, and fennel *Amaryllidaceae* family: Onion, leek, and garlic *Amaranthaceae* family: Quinoa swiss chard, amaranth, spinach, and beet

*Cucurbitaceae* family: cucumber, squash and melon Cereals such as rice, oats, wheat, corn and barley, as well as legumes like chickpeas, beans and lentils, are also sometimes grown into micro greens. Micro greens may differ in flavour that can vary from plain to spiced, tangy or even bitter, considering type of green. Basically, their flavour is supposed to be strong and concentrated.

## 2.1 OBJECTIVES:

- i) To strengthen the promotion of mushroom, yogurt and microgreen cultivation by establishing a well-equipped laboratory and offices.
- ii) To increase the production and consumption of mushrooms, yogurt and microgreens.
- iii) To help create new employment opportunities for rural women and the youth through mushroom, yogurt and microgreen cultivation.

## 3. MATERIALS AND METHODS:

### Mushroom cultivation:

The basic requirements for mushroom cultivation are manure/compost, spawns, right temperature and humidity. Favourable growing conditions involve 80%- 90% of relative humidity, ample ventilation, a temperature range of 20-280 C during spawn run and 12-180 C for reproductive growth. Initially for a week temperature must be maintained at  $23 \pm 20$  C and then it can be reduced to  $16 \pm 20$  C for subsequent weeks. The CO<sub>2</sub> concentration should be 0.08-0.15 %. The following steps are to be followed for mushroom cultivation:

### Compost Preparation

The compost (synthetic or natural) used for mushroom growth usually comprises of wheat straws, horse manure, poultry manure, rice bran, gypsum etc. The chopped wheat straws or rice bran are mixed with horse dung, sprinkled with water and are heaped in a pile to allow fermentation. Frequent turnings and watering are done at a specific interval so as to avoid the drying up of compost. Gypsum is sometimes added to the compost to reduce greasiness and allow more aeration. Within 15 to 20 days the compost gets all set to be used as bed, it is then spread onto wooden trays and sowed with spawns.

### Spawning

Spawns refers to the mycelium carefully propagated on agars or grains. Spawning is a process of sowing or mixing spawns in compost. The spawns are thoroughly mixed with the compost, are covered with newspaper and is watered sufficiently to maintain the moisture. Throughout the cultivation period humidity is kept high to avoid loss of moisture. Gradually they grow into white cottony mycelium growth.

### Casing

Casing is a kind of sterilized soil or dressing containing cow manure which is spread onto the spawn mixed compost. It is applied when the mycelium growth commences on the compost surface. After 15 to 20 days of its application mushroom head or pins start becoming visible on the surface.

### Harvesting

Harvesting is done by plucking them from soil using hands or the heads are chopped off using knife. The harvested mushrooms are then subjected to primary processing.

### Processing

Mushroom are very fragile and have a short shelf life, unless consumed fresh. Initial processing involves washing mushrooms to remove adhering soil or compost and blanching them for few minutes to inactivate the enzymes. In order to prevent discoloration, they are treated with brine, salt or citric acid prior to canning or packaging. The common processing and preservation methods are drying, Freezing, Sterilization, Canning, Pickling.

## 3.1 MATERIALS AND METHODS: YOGURT

### Milk Standardization:

Standardization of fat and protein levels, as well as the addition of sweeteners and stabilizers, are all part of the milk production process. Milk standardization is carried out at 550°C, with additional fat content removed using a centrifugal technique. Non-fat yoghurt has a fat content of 0.01 percent, light fat yoghurt has a fat content of 1-2 percent, and whole fat yoghurt has a fat content

of >3.2 percent. To improve the smoothness of the yoghurt and reduce syneresis, the protein level of the mix can range from 3-5 percent to up to 15%. The most common method is to add milk powder, which is a simpler and more traditional method.

#### **Fermentation Process:**

Heat treatment is an important part of the mixing process. Heat treatment permits spoilage microorganisms and inactive lactoperoxidases in milk to be removed. Heat treatment enhances the texture of yoghurt by permitting whey protein denaturation and interaction with casein, which reduces gel syneresis and increases gel hardness. The combination is normally heated at 90-95°C for 3-7 minutes before cooling down to fermentation temperature in industrial yoghurt manufacturing. Heat treatment is intimately linked to two additional physical treatments: mix deaeration and homogenization. Before homogenization, vacuum deaeration is usually done at 70°C. The mix is homogenized at a high pressure (20-25 MPa) at a temperature near 70°C. For high fat yoghurt, double stage high pressure homogenizers are advised.

#### **Inoculation of mix:**

Yogurt is made on a large scale by inoculating a mix with concentrated starter cultures of the two yoghurt bacteria (*S. Thermophilus* and *L. delbrueckii* subsp. *Bulgaricus*). After mixing, it is either transported to the fermentation tanks (for the production of stirred, sipping, or concentrated yogurt) or immediately to the packaging machine (for the production of fermented yogurt in cups) (for set-type yogurt manufacture).

#### **Fermentation steps**

The most important ones are lactic acid, galactose, acetaldehyde, and exopolysaccharides, which contribute to the yogurt's flavor and texture. The production of extracellular lactic acid causes an acidification of the mixture, resulting in a pH drop from 4.8 to 4.5. Fermentation culture was added in a concentration of around 2%. The fermentation process might take anything from 3 to 20 hours.

### **3.2 MATERIALS AND METHODS: MICROGREENS**

#### **Materials:**

To measure the growth of the micro greens, seeds of *Brassica juncea* L., *Coriandrum sativum* L. and *Trigonella foeniculum-graecum* L. were taken. These seeds were soaked for overnight (minimum of eight hours). Then these seeds were drained and grown in the following two methods to measure the effect of substrate medium on growth.

#### **Methods of cultivation**

Seed germination for raising micro greens requires an optimum soil pH of 6.0 for optimum swelling and germination of seeds. For raising micro greens hydroponically, it also requires a pH of 6.0. Some seeds require soil for germination and for these seeds a denser media is required for shedding the seed coat. Soil in the trays requires proper drainage system. It requires sunlight with low humidity and proper air circulation. Seeds are soaked in water for eight to 12 hours and then drained. Sprouting process occurs in dark or low light. There are two methods were employed to grow the micro greens. In first method to grow the micro greens hydroponically, bottom of the plastic containers was kept covered by unused clean tissue vegetable bags. The seeds were soaked overnight and strained. These seeds were spread over the tissue sheets kept in the containers meant to grow the micro greens. In second method, one-to-three-inch moistened soil was kept and levelled uniformly with mild pressure to grow the soil based micro greens. The pre-soaked seeds were scattered on the top of the soil and pressed gently in to the soil manually by hands. Water was sprinkled one to two times a day to keep the tissue sheet and soil moist. The containers were covered till the seeds were germinated. After sprouting of the seeds, the cover was removed and water was sprinkled every day. Sunlight of three to four hours are required to grow. Harvesting time period of micro greens is different for different species. Larger seeds generally harvested within 7 to 10 days to avoid from getting the stems woody. Optimum time generally varies from one to two weeks. Literature data stated that some can also take six weeks' time to harvest. Harvesting is done by scissors above the soil surface without the roots. Micro greens have very short period of life and thereby fit for consumption for a shorter period than mature leafy greens.

### **4. RESULTS AND DISCUSSION:**

Mushrooms are adaptable fungi which yields lots of nutritional and health benefits. It can be grown on decomposed matter easily with good yield. They are natural source of vitamin D. There are lots of varieties including edible as well as wild. The commonly consumed varieties are Button mushroom (*Agaricus bisporus*), Shiitake mushroom, Oyster mushroom and Paddy Straw mushroom. Mushroom cultivation requires 80-90% relative humidity and temperature range of 16° C - 23° C [13]. The cultivation starts with compost preparation followed by spawning, casing, harvesting and processing. Mushroom being fragile and perishable commodity requires processing after harvesting. The processing can be accomplished in various ways such as drying, dehydration, freeze drying, pickling, freezing, canning, sterilization, direct packaging etc.

Yogurt stands out in competition with deserts like ice cream, mithai, chocolates since it is guilt free indulgence. Moreover, it is a boon to diabetic and its probiotic qualities keep it ahead of all health food. According to a book, Tata strategic management, "India's health and wellness market will be 55000 cr by 2015, growing at a rate of 35 per year". So, yogurt is here to stay, and it is just a matter of time, people will realise that there is more to it than just taste that makes it so popular than other deserts.

A microgreen business has a very fast start up time. Can make first sale within two or three weeks of getting started.

Microgreens can be a value add to any existing business, whether an existing traditional farm or even a non-farm business.

There's not much start-up capital required. Microgreens business up and running for well under \$1,000.

Establishing proper sales channels right away is critical to the success of business. Start by selling at farmers markets and try to get standing orders with chefs to buy around \$50 of microgreens.

## 5. CONCLUSION:

Mushrooms are one of the most popular and versatile gifts of nature. It can be mixed into any food preparations or can be processed to give a new product. A lot of mushroom products are currently available in market such as mushroom pickle, seasonings, beverages, extracts, dried and canned mushrooms, mushroom supplements, cosmetics etc. Apart from the mushroom food products many innovative products are emerging in other industries as well such as mushroom based building materials, medicines, mycelium-based platforms, biodegradable packaging, mycelium-based leather etc. Mushrooms are easy to cultivate, have quick growth and nil carbon emission and waste generation. The fungi is a good source of income generation for the growers and also provides additional benefits through its processing. Hence mushrooms hold a bright future in every aspect owing to its diverse properties.

The growth of micro greens in water medium was found to be relatively more in comparison to the growth in soil. Further work is required to quantify the elemental composition at various stages of micro greens in different growth medium. Micro greens could be an excellent way to provide the families staying in the cities with seasonal fresh organic leafy green vegetables at a low cost. These are easy to grow at home in a confined space. A small space will provide a significant return in terms with variety and nutrients. But before cultivation of micro greens water analysis is required to know the mineral composition as well as heavy metal detection.

To be successful in sustainable business practices often requires entrepreneurship and innovation. This chapter provides an overview of entrepreneurship and innovation as it relates to sustainable (Mushroom, microgreen and yogurt) business. The discussion is most relevant to sustainable businesses focused on offering new products and services in response to improving societal concerns. The importance of this chapter entrepreneurship and innovation also applies to a small person that change how they produce products and services. The latter everyone can use innovative practices and entrepreneurship to establish their brand name and to be market leaders in doing things that create shared value for society and can create companies and also, over time, contribute to changes in practices in their industry.

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