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Scientific research and its approach towards the mushroom production and industrial developments

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Abstract
By understanding the problem of any subject or issue, collecting information about new facts or, knowledge, collecting data, comparing hypothesis, developing logical thinking, analyzing, evaluating, and checking facts obtained from a scientific point of view, reaching conclusion, suggestions scientific research is the careful solution of problems with the aim of developing thinking. Scientific research is the accumulation of systematic knowledge in which by collecting new information, it helps in giving new direction and condition to human and society. By collecting information in my research work, I focused on the production of mushrooms and its industrial development. Mushroom has an important position in the world agribusiness, and its commercial cultivation in India was started in 1960 in solan city of Himachal Pradesh under the "Mushroom Farming Development Scheme". In the year 2021- 22, mushroom production was 15.25 million tonnes in the global market and India produced 2 lakh 42 thousand tonnes. Production in India is continuously increasing for 10-12 years. Mushroom is a case crops its industry development can increase the economic power of country. Mushrooms are being uses in the pharmaceuticals, cosmetics, foods nutrition industry. In this industry, cosmetic product, nutrition food product, pharmaceuticals products of mushroom and mushroom extracts are used to make medicines for various diseases. Type of products food as like pickle, jam, bread, noodles, biscuits, soup candy mushroom power, or juice laddu cake and cosmetic product as cream, lotion, ointments, hair products sprays, shampoos, gel, mushroom extract capsule, and other disease medicines product made by industry. Mushrooms are used in Ayurveda and folk medicine in India. The burning of agricultural waste by the farmers reduces the fertility of the soil along with air and environmental pollution. If more and more agricultural waste is used in mushroom cultivation then after cultivation the waste, will be converted into organic manure. Low carbohydrate, fats high protein, fibers, and multivitamins, minerals, cholesterol free, antioxidant only non- animal source of vitamin- D found in mushroom as nutrient with anti- virus, anti-bacterial, anti-fungal, anti-HIV, anti-allergic, anti- diseases, anti-ageing other medicinal properties. Mushroom food fungus gives us all the nutrients balance diet in foods, better health benefits, prevent malnutrition, protection from various diseases, opportunities for self-employment, and economy development, source of batter income.

Keywords: Mushroom industry, Pharmaceuticals, cosmetic, Nutrition, agricultural Waste, Air pollution, agri-business

Introduction
The purpose of scientific research is to discover knowledge and find a systematic way to solve problems. Research is creative or systematic work to increase understanding of an issue or topic and to collect information to increase the store of knowledge. Research is an educational and scientific activity, in which there is an art of collecting data, evaluating, solving problems with the help of comparison of observations, hypotheses, reaching conclusions, developing the thinking of suggestion.

Research expands our knowledge and develops logical thinking and scientific vision, showing the way to solve the problems of human and society. "Research" refers to the systematic method of understanding problems, formulating a hypothesis, collecting facts or data, analyzing facts, and resolving conclusions.

Scientific research is the accumulation of systematic knowledge which is unbiased and systematic and objectivity science studies are proven knowledge. In scientific research logicality, definiteness, objectivity, working relationship, generally the ability to predict are goals of achieving the theoretical method.

In short, scientific research is the formulation of theory with a purposeful systematic approach

To solve a problem with the help of careful scientific inquiry though the knowledge of new facts and the search for true knowledge.

Applying scientific research and its approach, we tried to gather new information through study related to my research works. In my presentation, I am trying to focus on mushroom production utilization and industry development.

Mushroom is a type of edible foods in which almost all types of nutritional elements are presents. They are a storehouse of nutritional and medicinal properties in the form of micro food edible fungus. It contains all the essential nutrients such as carbohydrate, protein, multivitamins, fats, minerals, fibers. Mushrooms are high in antioxidant, vitamin D, protein, fibers, and are a boon as cholesterol- free, immune-boosting, stigma-boosting, anti- disease foods.

Its many species and varieties have different size, colours, aroma, texture, taste some species are also poisonous in this. Therefore, knowing the varieties of edible mushrooms, it should be included in the diets. Consuming mushrooms in the diet helps in the growth and health benefits of the body and prevents various diseases and also solves the problems of malnutrition.

Mushroom helps in smooth functioning of digestive system, brain function, cell formation in the body, heart, respiratory system, nervous system, skin, kidney and fetal developments in pregnancy in our body and keeps various parts of the body healthy and fits.

In the form of various medicinal properties, it has antiviral, antifungal, anti-bacterial, anti- HIV, anti-allergy, anti- virus, anti- cancer, anti- hypertensive, anti-biotic properties, anti-hyperglycemic, antilipidaemic, activity, which protects against various diseases.

Mushroom production occupies an important position in the agricultural businesses of the world. Mushrooms have been cultivation in the world for thousands of years since ancient times. The history of mushroom is three decades old for India. But commercial cultivation of mushroom was started recently in India in 1960 under the scheme named "Development of mushroom cultivation in Himachal Pradesh".

Commercial cultivation of mushroom was started by Indian farmers in the city of Solan in Himachal Pradesh with the help of German agronomist. The city of solan is known as "Mushroom City of India". Mushroom production has increased continuously for 10-12 years in India. The main mushroom cultivating states in India are Himachal Pradesh, Punjab, Haryana, Karnataka, Andhra Pradesh, Utter Pradesh, Tamil Nadu, Maharashtra, and Bihar. These are the major states producing mushrooms on a commercial scale.

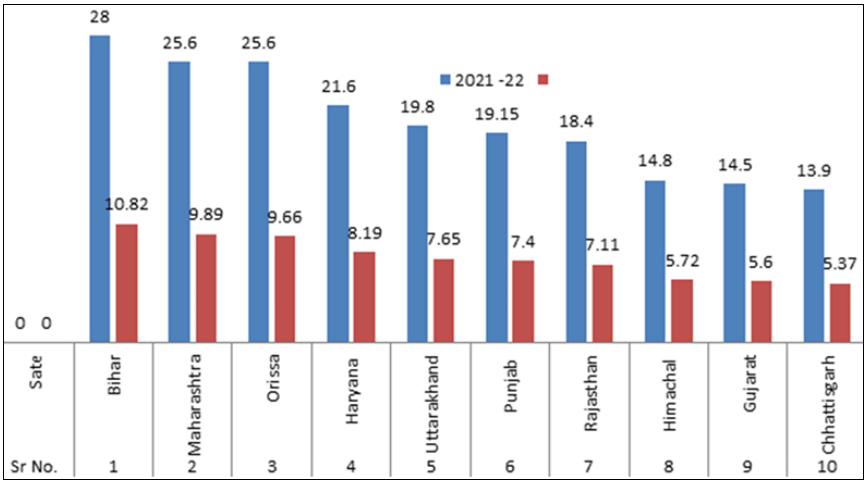
India being an agricultural country, along with cultivation of various types of crops, mushroom cultivation is also done on a large scale. The global market production of mushrooms was 15.25 million tonnes in 2021. In India, the best inclination of farmers towards mushroom cultivation and business has been seen. According to the data of ICAR (Indian Council of Agricultural Research), the total production of mushroom by India was in 2 lakh 42 thousand tonnes in 2021-2022. The total production in 2021-2022 by Bihar state India was 28000 metric tonnes.

Bihar secured first position in the country in mushroom production which is 10.82% of the total mushroom production of the country. Maharashtra got the second position in mushroom production which is 9.86% of the total production, while Odisha stood third which is 9.6% of the total production. Commercial cultivation of mushroom started in Bihar in 1990.

Table 1: Production (In Tonnes) 1 Tonnes = 1000kg

2021 -22			
Sr No.	**Sate**	**Production**	**Share %**
1.	Bihar	28.00	10.82
2.	Maharashtra	25.60	9.89
3.	Orissa	25.60	9.66
4.	Haryana	21.60	8.19
5.	Uttarakhand	19.80	7.65
6.	Punjab	19.15	7.40
7.	Rajasthan	18.40	7.11
8.	Himachal	14.80	5.72
9.	Gujarat	14.50	5.60
10.	Chhattisgarh	13.90	5.37
11.	Tamil Nadu	12.66	4.89
12.	Uttar Pradesh	12.40	4.79
13.	West Bengal	9.50	3.67
14.	Jharkhand	5.02	1.94
15.	Jammu and Kashmir	2.65	1.02
16.	Nagaland	1.64	0.63
17.	Karnataka	1.50	0.58
18.	Madhya Pradesh	1.50	0.58
19.	Assam	1.40	0.54
20.	Tripura	0.12	0.05
21.	Arunachal Pradesh	0.08	0.03
22.	Mizoram	0.07	0.03
23.	Andhra Pradesh	0.05	0.02
24.	Karalla	0.04	0.02
25.	Manipur	0.03	0.01
26.	Meghalaya	0.03	0.01
27.	Sikkim	0.02	0.01
28.	Other	9.75	3.77

Source: National Horticultural Board (NHB) Year 2021-22



***Source*:** National Horticultural Board (NHB) year 2021 -22

Fig 1: Major mushroom producing in India 2021-22

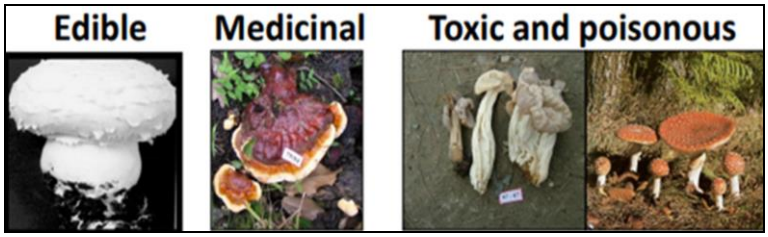


Fig 2: Type of mushrooms

White button mushroom (*Agaricus bisporus*), Oyster mushroom (*Pleurotus* spp.), Milky mushroom (*Calocybe indica*), Paddy straw mushroom (*Volvariella volvacea*), Shiitake (*Lentinula edodes*)

Fig 3: Commercially cultivated mushrooms in India

Fig 4: Commercially cultivated large scale in Bihar

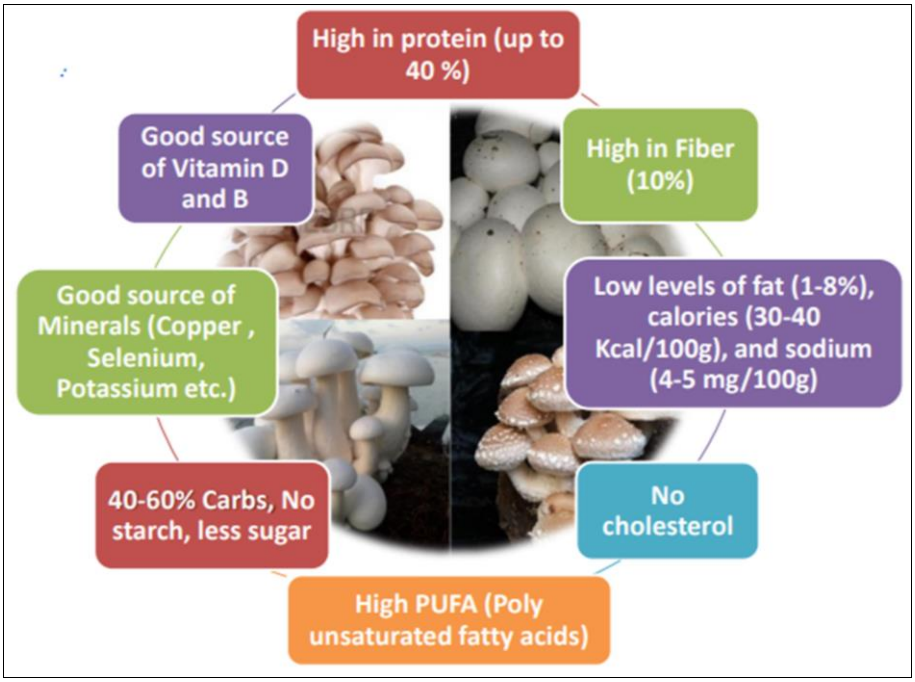


Fig 5: Nutritive value of mushrooms

Cultivation of mushrooms is an indoor activity, after harvesting the ergocalciferol present in it is converted into vitamin D due to exposure to sunlight. Mushroom contain a specific antioxidant called ergothioneine, which is essential for eye, kidney, bone, liver and skin function, and slows down cell maturation by eliminating free radicals present in the body's system by reducing the aging process.

Strength for warriors: Greeks
God's gift: Romans
Health food: Chinese
Sports drinks: US

Fig 6: The word mushrooms

Mushrooms industrial developments in India

Almost all the countries of the world have accepted mushroom as a highly nutritious food. Research work was done on medicinal aspects by the researcher in Asian and other countries. Mushrooms are used in Ayurveda and folk medicine in India. Its production and industrial development can boost the economic power of the country. Mushroom cultivation and trade and export are cash crops. After 1991, under the foreign trade policy for economic reform, mushroom was also added by the Government of India for the development of the industry and 100% export was agreed.

Growing domestic and global demand for less land for cultivating has motivated farmer and entrepreneurs, thereby promoting industrial developments. In developing countries such as India, the problem of malnutrition is increasing due to lack of balance diet due to population growth. Mushroom is a storehouse of nutrition, it consumes can solve the problems of malnutrition and can promote income industrial development.

Mushrooms get spoiled quickly due to high moisture content, so there is a need to convert the mushroom into a product so that it remains safe and edible for a long time. There is need of industry for cleaning, drying, grading, packaging, leveling, canning, storage of mushrooms so that the consumer can be supplied at the right price in the market and also promote export development.

Nutraceutical substances and bioactive substances are found in mushrooms that may be useful for the manufacture of new drugs by biological technological processes with biological activity. The polysaccharide compound in mushrooms has been extensively used for treatment of various cancers and other diseases.

Phenolic, selenium, polysaccharides, vitamins and volatile organic compounds present in mushrooms are important for cosmetics due to their excellent anti-wrinkle, skin-whitening and moisturizing properties. Mushroom or extracts are being used for nutritional and cosmetic purposes.

Mushroom cell wall has good moisturizing properties, anti-aging formulations and lactic acid alphahydroxy acid, ceramides used in dermatology as cosmetic preparations to hydrate and smooth dry flaky skin as epidermal hydrating agents.

Mushroom pulp 3, 6, and 9 fatty acids present in it are powerful agents that reduce fine lines and winkles. Mushroom creams, lotions, ointments, serums, oils, extracts capsules are helpful in increasing the elasticity of the skin making the skin renew glowing rapidly.

The polysaccharides present in the mushroom also control melanin, improve the physical and chemical properties of the skin surface and remove blemishes by making the skin most, smooth and soft.

Nutrocometics are considered as nutritional supplements to maintain healthy functioning of skin. Nutricosmetics are known as "Beauty pills", "Beauty from within" and "Oral cosmetics" due to their rich nutrition value. Hair cosmetics formulations include shampoos, conditioners, hair products, sprays, gels, androgenic products for the treatment of bleaching dandruff, which is leading to the growth of the cosmetic industry.

The hair also needs nutrients, due to its deficiency, the hair becomes weak and springs, the minerals and proteins present in the mushroom help in preventing hair fall and dandruff and in the growth of healthy hair.

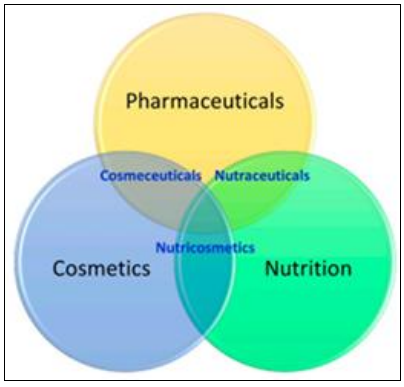
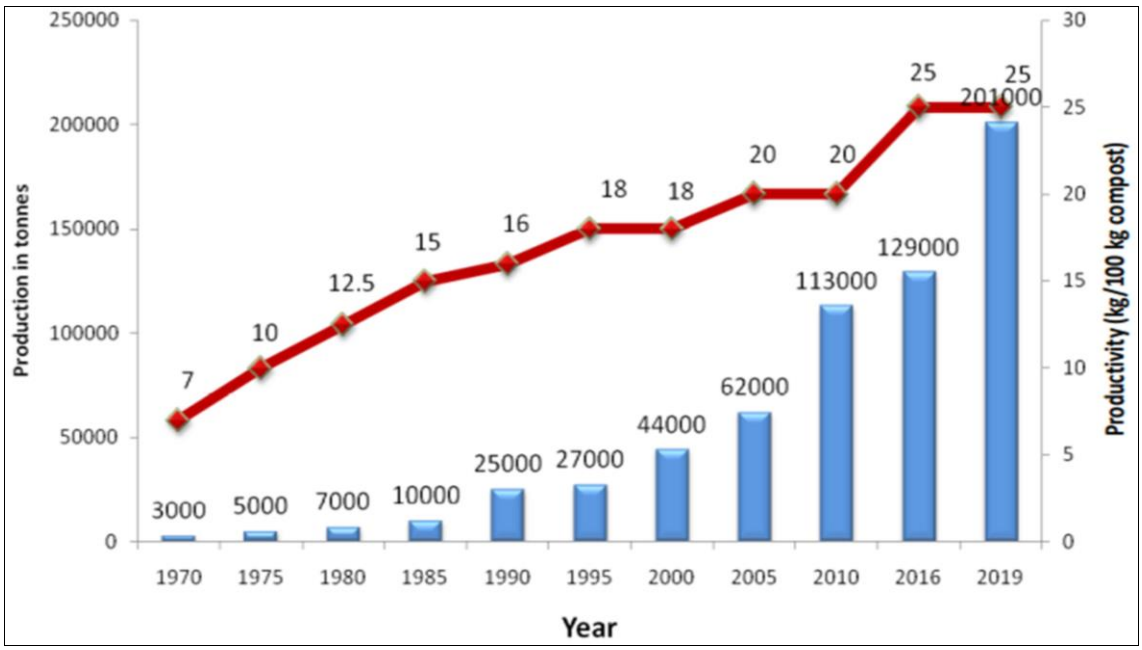


Fig 1: Mushroom uses in pharmaceutical cosmetics nutrition and industry

Mushroom cultivation as a crooked industry, rural development, entrepreneurial, skill and economic status, recycling of agricultural waste and fulfilling nutritional deficiency among the growing population. In the food industry, various types of food products such as many type products of like pickle, jam, bread, noodles, biscuits, soup candy, mushroom Powder or juice laddu, cakes are made using mushrooms. Mushrooms are also used as a medicinal food various diseases.

Medicines for various diseases are manufactured using medicinal mushrooms in the pharmaceutical industry in different countries. Postmenopausal woman can use mushrooms as a therapeutic diet and cosmetic products made from mushroom extracts to have better skin and healthy lustrous hair.

According to the better production capacity of mushroom, the research institute or organization or entrepreneurs for proper information of consumption, industry development and due to non-availability of authentic data of various aspects by the Government of India or institution, information about future industry development, demand and supply without it proper development of the mushroom industry cannot take place.



***Sources*:** Horticulture Mushroom Development Central Upper Meghalaya (Shillong)

Fig 8: Growth of mushroom industry in India

Fig 9: Paddy straw burning in field

About 620 million tonnes of agricultural waste is produced in India every year, of which 50% is produced form rice, wheat, oilseed and 130 million paddy straw, of which only about half is used for animal feed.

Farmers burn the agricultural residues produced by the harvesting of paddy and wheat directly in the field, due to which the amount of carbon dioxide, methane gas, carbon monoxide in the atmosphere increases the air becomes polluted and there is an effect on global warming. If agricultural waste is used in mushroom cultivation, then air pollution can be reduced and after cultivation agricultural waste will be converted into organic manure. The climate suitable for mushroom production and abundance of agricultural waste are conducive for mushroom cultivation in India.

Aims of objective

1. To develop mushroom industries so that mushroom production can be utilized properly.
2. To promote the use of agricultural waste as raw material in mushroom cultivation more and more so that agricultural waste is properly utilized.
3. To prevent burning of agricultural waste so that it can be used in mushroom cultivation, this reduces air pollution and conversion of agricultural waste into organic manure.
4. To remove the problems in mushroom production and consumption so that proper development of the industry can place.
5. To make people aware to increase the demand of mushroom in domestic and international markets so that foreign exchange can be earned.
6. To develop a crooked industry by linking agricultural waste with mushroom cultivation so that agricultural waste can be properly utilized.
7. To motivate the farmers for mushroom cultivation so that maximum employment is created, high income is ensured, self-employment is created, the importance of mushroom cultivation can increase, and industry can be

developed.
8. To draw the attention of the government towards the problems by focusing on mushroom cultivation so that centralized data of production, consumption, industry development can be made available, the problem related to this can be solved.
9. To make people aware of using mushroom products and consuming them in the diet so that good health and disease can be prevented.

Calculation

Therefore, we can say that mushroom cultivation is one of the most important ago-based industries for a developing agricultural country like India. Mushroom utilization industry development in food processing, cosmetics processing, pharmaceutical processing, related schemes covering technology up-gradation, modernization, need for further development. Due to mushroom of industrial development, livelihood security to farmers and labourers, stable regular employment opportunities, income potential in rural and urban areas is still in its infancy, it will develop. Mushroom production and consumption will boost industry development and employment in country. Health benefits, means of income, economic boost, self- employment opportunities, reduction in environmental pollution, protection from various diseases and can prove to be a good source of income to improve the economy of the country.

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