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BREAKTHROUGH IN DOMESTICATION OF GUCCHI MUSHROOM (*Morchella* spp) IN INDIA

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In the present scenario, mushrooms have become the most sought after nutritious food in the world. They are broadly divided into two classes; ascomycetous and basidiomycetous mushrooms. Basidiomycetous class includes the commonly grown mushrooms such as button mushroom (*Agaricus* spp), oyster mushroom (*Pleurotus* spp), paddy straw mushroom (*Volvariella* mushroom) etc. Whereas, ascomycetous class is dominated by *Morchella*spp (True morels) and tubers. *Morchella* spp. belongs to Ascomycota, Pezizomycetes, Pezizales, Morchellaceae, and Morchella Dill. ex Pers. All species in this genus are edible.

General Nutrition

Morchella mushroom is commonly referred as Gucchi in India and is one of the costliest edible fungi of the world. Gucci is well known for their culinary aspects and gastronomical delights, and excellent flavor. It is used for number of purposes like treating arthritis, anemia, tumor etc., which are mainly attributed to the content of total polysaccharides, glucosamine, vitamin D, antioxidants etc. Apothecia- an ascocarp of morels possess the real economic value. They are primarily exported from India to Europe and the United States of America.

Cultivation Status

Due to difficulties in artificial cultivation of Gucchi mushrooms, the wild morels have become a profitable business. Gucchi is admired by human being from the ancient time. Its

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appearance in the forest areas was correlated with many myths such as magic and thunderstorm etc. but without any scientific basis. Gradually the peoples were attracted by its nutraceutical values of Gucchi and forced them to think about its artificial cultivation. Earlier, Gucchi mushrooms were considered as obligate parasite because of the association of its fruit bodies with plant roots. Thereafter, scientists proved that Gucchi could be mycorrizal as well as saprophytic. Obligate mycorrizal association of Gucchi was considered as the major cause of failure of earlier attempts to cultivate Gucchi mushroom in India and other part of the world. The real success in Gucchi domestication was achieved through scientific intervention in 1882 in France. There it was cultivated outdoor through artificial inoculation. Later on in 1904, its cultivation was claimed on apple compost but couldn't make significant impact. 1982, succeeded for the first time to Gucchi mushroom was produced under artificial conditions for the first in 1982. First detailed studies on the life cycle of Gucchi mushrooms were performed in 1990 to study its various development stages. In continuation to this, few more patents were granted on Gucchi mushroom cultivation till 2012. Recently, in 2019 studies in the USA claimed new technique of outdoor cultivation of Gucchi. However, many doubts still exist on ascomata induction of morels which are certainly required to be clarified.

Availability

So far in India, the morels are collected from their wild habitats in North-Western Himalaya. Fructification of morels may be found under forest trees, in fruit orchards, open grassland, under the shrubs, and rarely in old cemented structures. The best time for the morels collection is spring and summer. However, they may also be found in rainy and autumn seasons occasionally. So far, more about 90 species of genus Morchella have been reported from all over the world. Till date, in India, only six species have been recognized. They are common moreles, delicious morels, conical morels, thick stemmed morel, black morel, and Hybrid morels. In nature, the fresh morel mushroom season is very short, and they are typically found in the markets for only a few weeks, mainly in the spring. In addition, the accumulation of heavy metals in the ascocarps that are picked from natural habitats has been reported.

General Uses

In India, local people cook Gucchi mixed with rice and vegetables and consider it as nutritious as meat or fish. It is also used in health care, and medicinal purposes differ among

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traditional hill societies isolated by linguistic, cultural, and terrain barriers. Tribal peoples use Gucchiby boiling the fruiting bodies in water; local communities in the Kullu District of Himachal Pradesh (western Himalaya) boil it in milk. Mushroom metabolites are also used as adaptogens and immune stimulants and now are considered to be one of the most useful antitumor agents for clinical use. It is noticed that it appears in a large scale during the month of March, and its collection starts between April and June. Local people set the ground on fire every year during October/November, assuming that such a practice will improve Gucchi yield. There is a need for the scientific evaluation of ecological and economic implications of such traditional practices.

Challenges

In India, since the inception of ICAR- Directorate of Mushroom Research, Solan (HP), attempts were made on domestication of Gucchi mushrooms. However, no significant results were obtained out of it. Viewing all the above mentioned facts and recommendations of Research Advisory Committee (RAC), in 2019, ICAR-DMR, Solan resumed its emphasis to explore the possibilities of Morel cultivation in India. Dr. VP Sharma, Director ICAR-DMR, Solan (HP), assigned this challenge to Dr. Anil Kumar, Scientist. An institutional research project entitled "Standardization of cultivation technique for Morchella mushroom" was prepared by Dr. Anil Kumar (Principal Investigator). Investigations were started with strain selection, sclerotial production potential of the strains, mode of nutrition, and standardization of spawn production technique. Cultures of Morchella genus with high sclerotial production potential were selected for our investigations. Substrate preparation technique was standardized for cultivation of Gucchi mushroom. Under continuous rigorous *in vitro* trials on induction of ascoma (fruit bodies) in *Morchella* spp (Gucchi), three small ascomata of 0.5 to 1cm were obtained. Under the first seasonal cultivation trial in 2019, a mature ascoma of a total 13cm length was recorded under greenhouse on 13th April 2020. It was not considered as a success even on getting positive results at the initial stage of experimentation. The major reasons of dissatisfaction were such as less numbers of ascomata and uncertainties about repeatability of the experimental data. Dr. Anil was motivated and encouraged by Dr. VP Sharma, Director ICAR-DMR, Solan (HP), for his valuable breakthrough in the history of Indian mushroom science. Overall, the findings of the first outdoor trial were considered as the positive direction of their experimentation and not as the endpoint of their experiments. With continuous efforts, Dr. Anilsucceeded to induce 215

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ascomata (fruit bodies) in the second research trial under greenhouse in 2021. In this technique, spawn was mainly prepared in forest soil and sown in the soil beds. After the colonization of the subsrtae continuous moisture was provided to the fungus, which resulted into ascomata (fruitbody) formation.

Conclusion

This is for the first time in history that India succeeded in producing fruit bodies (ascomata) of Gucchi mushrooms. As a result of this achievement, India entered in the list of few countries like USA, China, France etc. who successfully attempted to cultivate Gucchi mushroom under artificial conditions. However, still there is a need to improvise our technology before it is transferred to the farm communities. Hopefully, in the next 2-3 years, it will be transferred to the farmers. In India, the average per Kg cost of true morels may vary from Rs. 10000 to 30000. In the future, the Gucchi mushroom will revolutionize the Indian mushroom industry and help in the upliftment of farmers.

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