Morchella esculenta (Guchhi): Need for scientific intervention for its cultivation in Central Himalaya

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Morchella esculenta is an important mushroom belonging to the family Helvellaceae and is locally known as Guchhi. It is found in the forest between 1800 and 3600 masl and is locally sold to middlemen and traders at Rs 5000 per kg. It is cooked as food and used in medicine and health care system by the traditional societies and also considered important for clinical use. It is noticed that the local people set the ground on fire assuming that such a practice will improve its yield but it may have negative impact on forest biodiversity and ecosystem services. Therefore, the present article suggests that in-depth scientific studies are required on this precious species to provide package of practices for its large-scale cultivation.

MORCHELLA esculenta (Helvellaceae) is an economically important wild species. In the higher-altitude villages of Central Himalaya it is locally known as 'Guchhi'. Though *Morchella* as a genus is fairly easy to recognize, species differentiation within the genus is a difficult task. Six species, namely *Morchella esculenta*, *M. conica*, *M. deliciosa*, *M. angusticeps*, *M. arassipes* and *M. hybrida* (*M. semilibera*) have been reported from India[1]. The fruit bodies of all the species of the genus are edible and are mainly used as a flavouring in soups and gravies. *M. esculenta* is an expensive product because of its rich nutritional value coupled with a unique flavour.

The local people cook ascocarps (the fruiting body) 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 traditional hill societies isolated by linguistic, cultural and terrain barriers[2,3]. While the Bhotiya tribes studied in the present case (Central Himalaya) use a decoction of *M. esculenta* by boiling the fruiting bodies in water, local communities in the Kullu District of Himachal Pradesh (western Himalaya) boil it in milk[2]. Mushroom metabolites are also used as adaptogens and immunostimulants, and now are considered to be one of the most useful antitumour agents for clinical use[4,5].

This fungus grows naturally on the forest floor rich in humus. If the food supply is sufficient, it collectively forms a compact mycelium on the surface soil. The ascocarp appears above the soil soon after the rains (Figure 1 *a*). However, the habitats are often distinguished by the dominance of tree species, viz. *Rhododendron arboreum*, *R. lepidotum*, *Taxus baccata*, *Pinus wallichiana*, *Cedrus deodara*, *Betula utilis*, *Cupressus juniperus*, and important medicinal and aromatic plants, viz. *Podophyllum hexandrum*, *Dactylorrhyiza hatagirea*, *Picrorhiza kurrooa*, *Rheum emodi*, *Pleurospermum angelicoides*, *Angelica glauca*, *Arnebia benthamii*, *Saussurea costus*, *Megacarpea polyandra*, *Selinum wallichianum*, *Nardostachys jatamansi*, *Aconitum* species and *Polygonatum* spp. 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 *Morchella* yield. There is a need for scientific evaluation of ecological and economic implications of such traditional practices. While repeated fire is known to adversely affect the health of the ecosystem, its impact on *Morchella* yield remains an unexplored area.

A field study was carried out in Niti valley, particularly in Tapovan, Joshimath and its adjacent areas in about 40 villages inhabited by 1600 families located in the higher Himalayan region. Almost all families are actively involved in *Morchella* collection during April and May. Usually they spent about 10–12 h every day for this activity, since it is time-consuming and arduous

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work. On an average a person may collect about 200–300 (2–3 kg on fresh-weight basis) of *Morchella* fruit bodies daily. One kg of *Morchella* may consist of about 100 plants on fresh-weight basis. The *Morchella* ascocarp collected was 6 to 8.5 cm in height and 4.5 to 7.5 cm in diameter. The tribals usually uproot these fungal bodies at any stage of their growth to earn more money (Figure 1 *b*). Local people tag ascocarps and hang them for 15 to 20 days in a room for drying (Figure 1 *c*).

An average family of 3–5 persons may collect 1.5 kg of *Morchella* (on air dry-weight basis) every year and sell them at a rate of Rs 5000 per kg, enabling an annual income of Rs 7500. Middlemen earn 35–40% of the total profit.

Interviews with the middlemen revealed a variety of *Morchella*-based recipes prepared in three-star or five-star hotels. Some pharmaceutical companies were also engaged in purchasing *Morchella* from the traders. Though villagers earn a good amount of money from this wild resource, its extraction and the traditional practice of setting the ground on fire may have a negative impact on forest biodiversity and ecosystem services.

Various workers have made significant contribution in the field of mushroom cultivation[6], which has provided employment to thousands of people. No efforts have been made towards cultivation of *M. esculenta*, having a huge economic potential. This species has several-fold higher economic value compared to many important higher Himalayan herbal plants, e.g. *Aconitum heterophyllum* (Rs 500/kg), *Aconitum balfourii* (Rs 80/kg), *N. jatamansi* (Rs 60/kg), *P. kurrooa* (Rs 80/kg), *P. hexandrum* (Rs 60/kg), *D. hatagirea* (Rs 700–1000/kg), *Swertia chirata* (Rs 350/kg) and *A. benthamii* (Rs 80–120/kg). Scientific interventions are needed for cultivation and availability of viable propagule material. However, a concerted effort from mycologists is needed to find suitable micro-cultures, which could be taken to the field, and by agronomists and ecologists to understand the mechanism of resource management. Therefore, sincere efforts are required to undertake detailed systematic, ecological, physiological and genetical studies on *M. esculenta*. The lifecycle of *M. esculenta* may be studied in detail, particularly the mechanism of spore formation, spore dispersal and spore germination. Besides, studies on soil physico-chemical properties must be carried out just below the fruiting-bodies so as to provide the status and quality of soil needed for spore germination. Optimal conditions for the formation, growth and maturation of sclerotia and for the regulation of their production should be determined. Proper identification and cataloguing of plants, which remain in close association with *Morchella* fruit-bodies, are needed. If *M. esculenta* is successfully

Figure 1. ***a***, *Morchella esculenta* in the wild; ***b***, Size variability in *Morchella* collected in the wild; and ***c***, Traditional technique of *Morchella* drying.

cultivated, it will not only improve the socio-economic conditions of the locals of the higher Himalayan region, but will also help conservation of Himalayan biodiversity and ecosystem services.

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MEETINGS/SYMPOSIA/SEMINARS

Indian Environment Congress 2002 (IEC 2002)

Date: 5–6 June 2002
Place: Palakkad

Theme for the IEC 2002 is 'Energy vs environment'. Sub-themes include: Environmental impact of energy generation; Energy conservation and management; Energy generation from waste; Non-conventional and renewable energy resources; Environmental cost of development; Energy efficient technologies for sustainable development; Environmental standards and regulations at national and international levels; Environmental pollution control; Solid waste management; Energy for the future, etc.

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Training programme includes: PCR-based DNA fingerprinting; Radiochemical assay for hormones/peptides; Bioseparation of proteins/peptides and isozymic studies; Plant molecular biology and genetic engineering.

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39th Annual Convention and Meeting on 'Sustainability Science' and 'Environmental geophysics'

Date: 4–6 October 2002
Place: Nagpur

Apart from the special theme, the convention will cover the following topics: Modeling of earth and ocean processes system; Imaging techniques in exploration; New strategies in oil, mineral and groundwater exploration; Studies on deep continental structure; Theoretical and experimental geophysics; Marine geology and geophysics; Atmospheric, space and planetary sciences.

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