

Edaphic conditions of natural sites of *Morchella* and *Phellorinia*

K.Manikandan*, V.P. Sharma, Satish Kumar, Shwet Kamal and Mahantesh Shirur

Directorate of Mushroom Research, Chambaghat, Solan, HP -173 213

* Corresponding author, E-mail: kavi.k.mani@gmail.com

ABSTRACT

Field surveys were conducted to study the edaphic conditions at the natural sites of *Morchella* and *Phellorinia* sp in parts of Himachal Pradesh and Rajasthan during 2010. Few clusters of *Morchella* were found from the field boundaries of maize in the Solan district of Himachal Pradesh during July. It was found under the microclimatic conditions of pear tree (*Pyrus* sp) in association with moist, fertile, clay loam soil. *Phellorinia* were collected from the sandy tract of Rajasthan during September. *Phellorinia* mushroom requires coarse, well-aerated sandy soil with poor nutrients. Both mushrooms requires specific but opposite edaphic conditions.

Key words: *Morchella*, *Phellorinia*, Edaphic condition, Natural site

Site conditions during natural occurrence and study of biology are prerequisite for domestication of any wild mushroom. Even today many of the economically important wild mushrooms have not been cultivated artificially. *Morchella* and *Phellorinia* mushrooms fall under this category. Researchers across the world are taking more interest in these mushrooms because of their higher market price, nutritional value and medicinal properties (Kaul, 1978). Many workers have assessed the natural site conditions (Kaul *et al.*, 1981; Munjal *et al.*, 1977, Lakhanpal and Shad, 1986) to ascertain the conditions required for cultivation of these mushrooms.

The morel mushroom (*Morchella*) requires specific ecological conditions for its morphogenesis in to appropriate size fruit bodies. *Morchella* is associated with diverse ecological niches such as forest litter, mosses, burnt areas and moist shady areas of higher altitudes (Sharma *et al.*, 1997). Kangra, Mandi, Chamba and Solan districts of Himachal Pradesh are known for morel emergence

during pre (Aug-Oct) and post winter periods (March-May; Sharma *et al.*, 1997). Converse to *Morchella*, *Phellorinia* prefers dry, sandy tract in the lower altitudes. In India, its presence is more common in sandy soils of Rajasthan (Jandaik, 1976). Considering the importance of these two mushrooms and difficulty in their artificial cultivation, an investigation was carried out in parts of Himachal Pradesh and Rajasthan to observe the edaphic conditions of natural sites of these mushrooms.

Surveys were conducted in parts of Solan district of Himachal Pradesh and sandy tracts of Rajasthan (Jaisalmer and Jodhpur districts) during 2010 for the study of *Morchella* and *Phellorinia*. The site features viz., landform, slope, aspect, microclimate, vegetation and others were recorded for each observation. The location of site and altitude was spatially recognized with the help of GPS data. Soil exact below the mushroom emergence site was collected. The collected soils were shade dried and sieved through 2 mm sieve. The processed soil samples were further characterized for

Table 1. Edaphic conditions of the natural sites of Morchella and Phellorinia

| Parameter | Sites of Morchella | | Sites of Phellorinia | | | | | | |
|--------------------------|------------------------|------------------|----------------------|-------------------------|-------------------------|--------------------|-------------------|-------------------|--|
| | I | II | I | II | III | IV | V | VI | |
| | Site parameters | | | | | | | | |
| Latitude | 26° 28' 38" | 26° 28' 38" | 26° 55' 41" | 27° 32' 53" | 26° 17' 02" | 27° 38' 41" | 27° 48' 31" | 27° 00' 16" | |
| Longitude | 72° 39' 19" | 72° 39' 18" | 70° 58' 31" | 70° 27' 36" | 72° 23' 55" | 70° 27' 32" | 70° 20' 21" | 71° 21' 14" | |
| Weather | Cool, moist | Cool, moist | Warm, dry | Warm, dry | Warm, dry | Warm, dry | Warm, dry | Warm, dry | |
| Altitude (m) | 1350 | 1350 | 231 | 135 | 252 | 155 | 105 | 195 | |
| Association | Pear tree, Weeds | Pear tree, Weeds | Dry land Weeds | Leptadenia pyrotechnica | Calligonum polygonoides | Haloxylon recurvum | Lasiurus sindicus | Til, Moong, Bajra | |
| | Soil parameters | | | | | | | | |
| Texture | Clay loam | Clay loam | Sandy | Sandy | Sandy | Sandy | Loamy sand | Loamy sand | |
| BD (Mg/m ³) | 1.33 | 1.34 | 1.54 | 1.54 | 1.52 | 1.51 | 1.46 | 1.48 | |
| WHC (%) | 37.29 | 37.13 | 20.03 | 19.88 | 22.95 | 20.67 | 24.77 | 24.04 | |
| OC (%) | 0.64 | 0.72 | 0.041 | 0.032 | 0.032 | 0.058 | 0.074 | 0.092 | |
| pH | 7.82 | 7.86 | 9.20 | 9.50 | 9.10 | 9.30 | 9.30 | 9.20 | |
| EC (dS m ⁻¹) | 0.76 | 0.81 | 0.07 | 0.04 | 0.03 | 0.06 | 0.05 | 0.04 | |
| Avl. N (kg/ha) | 364.50 | 336.50 | 108.00 | 84.30 | 48.05 | 84.30 | 120.25 | 120.25 | |
| Avl. P (kg/ha) | 15.04 | 9.82 | 3.39 | 2.90 | 1.69 | 3.20 | 1.96 | 2.49 | |
| Avl. K (kg/ha) | 486.40 | 624.40 | 60.80 | 41.30 | 52.20 | 48.80 | 69.40 | 81.60 | |

* BD – Bulk density, WHC – Water holding capacity, OC – Organic carbon, EC – Electrical conductivity

physico-chemical properties as per the recommended scientific methodology (Jackson, 1973).

Site conditions : The site conditions of natural occurrence of *Morchella* and *Phellorinia* are presented in Table 1. *Morchella* was collected from agricultural field bunds, around the periphery of Solan city of Himachal Pradesh at an altitude of 1350 m. *Morchella* requires undisturbed natural conditions but very rarely linked with agricultural ecosystem (Lakhanpal and Shad, 1986). Morels were collected from undisturbed field boundaries of agricultural fields. The fruit bodies were collected under pear (*Pyrus* sp) tree in the western aspects of the undulating hilly lands (slope >33%). The shady location, higher altitude and western aspect gave the idea that *Morchella* specifically requires less sunlight and cool climate. The morel specimen was collected during July.

The presence of *Phellorinia* was regularly recorded from warm, arid, sandy regions of Rajasthan especially from Jodhpur and Jaisalmer districts. It is mostly found on the lower altitudinal sandy plains. This mushroom was present in all aspects. Within the arid ecosystem, *Phellorinia* prefers shady microclimate such as under the bushes of dry land weeds. This might be providing requisite climatic conditions such as soil moisture to the growing fruit bodies of this mushroom.

Soil conditions : The laboratory analysis of soils confirmed that the soil of *Morchella* site was clay loam in texture having good water holding capacity, porosity and high clay proportion. The steep slope and undulating landform nullify the probability of water logging. The soil reaction was slightly alkaline (pH 7.82) and soluble salts were low ($EC < 1 \text{ dS m}^{-1}$). The present findings are in conformity with the findings of Lakhanpal and Shad, (1986) and Munjal *et al.*, (1977), who also reported that neutral to alkaline soils were suitable for *Morchella*. The organic carbon and fertility status of the soil was higher. Sharma *et al.* (2001) have also reported that soils rich in

organic matter and nitrogen are suitable for fructification of *Morchella*. Compared to nitrogen and phosphorous, these soils were rich in potassium. Similarly Kaul *et al.* (1981) reported that potassium, calcium and phosphorous were relatively higher in the soil of morel sites.

Phellorinia occurs in infertile, sandy soils. The organic matter content of the soils was very poor. The soil reaction of the site was strongly alkaline, whereas soluble salts content was very low. *Phellorinia* needs better aeration and well-drained soil conditions. The organic matter content of the soil was very low (0.041%). The soil fertility status was poor in terms of macronutrients (NPK) level.

The study indicated that *Morchella* and *Phellorinia* require dissimilar edaphic conditions. Soil physical parameters viz., clay, water holding capacity and physico-chemical properties such as electrical conductivity and organic carbon were high in the morel growing sites as compared to that of *Phellorinia*. All macronutrients (NPK) exhibited strong affinity with morels among which potassium had high value than others.

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