(II)

ROOT LESIONS AND DISCOLOURATION IN *CHLOROPHYTUM BORIVILLIANUM* UNDER CULTIVATION IN UTTARAKHAND

Introduction

Chlorophytum borivillianum (Sant.), commonly known as 'Safed musli' is an important medicinal plant. Dry roots of the plants are used as a general tonic, an aphrodisiac and to treat general debility (Bhattacharjee, 2001). It is also used in case of impotency and weakness. Large-scale cultivation of this species has been undertaken in the states of Haryana, Punjab, Uttarakhand and Uttar Pradesh besides states of Central India, mainly because of higher market price and demand in the medicinal plants raw material markets. During the surveys for cultivation of medicinal plants in the northern states of India, it was observed that the musli crop suffers from dark spots and scars on root tubers, which makes it difficult to sell. Farmers of Narsan area in Roorkee Tehsil of Haridwar District of Uttarakhand have been facing this problem on a large scale. The present study was, therefore, undertaken to ascertain the cause of the disease and explore the possibilities of its management.

Material and Methods

Field visits to farmer's fields were undertaken and the symptoms of the plants were observed and recorded.

The soil and the root samples of the affected plants were brought to the laboratory in fresh polythene bags for further examination and isolation and identification of causative organisms.

Isolation of Nematodes : Nematodes were isolated from the soil by the nematode extraction method (Manion, 1981) in which soil sample was washed in running water and sieved in 3 different sized sieves.

Isolation of Fungus : Isolation of fungus was done by two methods from the infected roots, one by growing the fungus under moist condition provided in sterilized Petri plates (9 cm dia) containing wads of filter paper. In another method, the root surface was sterilized by 2% sodium hypochlorite solution, washed with sterilized water and fungus was cultured on PDA plates. Pure culture was maintained on PDA slants and identified.

Results and Discussion

The affected plants showed abnormal above-ground stunted growth. The symptoms of nematode attack appeared as the black wounds while symptoms of fungus appeared as purple to violet colour on the surface of the roots (Figs. 1 and 2).

Microscopic evaluation for identification of fungus was done from both the cultures isolated on PDA plates (Figs. 4 and 5) and in moist chamber (Fig. 3). Microconidia from these cultures were measured and found 8-16 x 2-4 μm in size and oval in shape, while the macroconidia

Figs. 1-6

1-2. Violet coloured root lesions on *C. arundinaceum*. 3. Fungal growth in moist chamber from infected root. 4. Culture of *Fusarium solani*. 5. Violet coloured pigmentation produced by *F. solani* in culture. 6. Conidia of *F. solani.*

measured 35-55 x 4-6 μm (Fig. 6). The fungus was identified as *Fusarium solani* (Mart.) Sacc. with the help of monograph by Booth (1971). This is the first report of *Fusarium solani* on *Chlorophytum borivillianum* (Sant.) in India.

The nematode was identified as *Pratylenchus* sp., known to cause root lesions resulting into darkened and discoloured roots (Anon., 2006). The wounds created by the nematodes might have acted as infection courts for this soil borne fungus, *F. solani*, which after establishing caused discoloration. This can be corroborated by the fact that the fungus also produced similar violet coloured pigmentation in the growth medium (Fig. 5). *F. solani* is reported to attack hosts following nematode damage (Booth, 1971). Species of *Pratylenchus* and *Fusarium* have been reported to interact synergistically to cause damage to the roots (Castillo *et al*., 1998).

Management and Control

Although the present authors are in the process of testing various herbal formulations for controlling the fungal and nematode infection and the results are awaited, however, as general management scheme the following actions are advisable :

1. A non-host crop may be grown as a rotation crop in the affected soils.

2. The affected field (s) may be left unplanted for a season or more if feasible, to remove the food used by nematodes. Existing and newly

hatched nematodes will, thus starve leading to reduction of their population. The affected soil should be kept completely weed free otherwise the nematodes will survive using the weeds as hosts.

3. Proper soil working can be effective to bring nematodes to the surface where exposure to the sun will kill them. Application of neem cake fertilizer may also be effective against nematode damage.

4. The infected crop (plants) should be removed immediately and destroyed by burning rather than using them in composting, etc.

5. After taking the crop, if water is allowed to stagnate in the affected beds for some days, the nematode population is decreased considerably.

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