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Pathological and physiological studies of Fusarium wilt pathogen of carnation

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ABSTRACT

Carnation wilt incited by *Fusarium oxysporum* f.sp. *dianthi* is one of the most serious diseases in Himachal Pradesh. The disease prevailed during the cropping seasons (2004-05) with great variation in incidence, 6.70 to 22.54%, being maximum (22.54) and minimum (6.70) in Mandi and Sirmour districts, respectively. Root dip inoculation gave highest incidence with appearance of wilt symptoms within 20 days compared to soil level and root zone inoculations under artificial conditions. The pathogen showed maximum mycelial growth and spore formation on Potato dextrose agar and Richard's solution in solid and liquid media, respectively. However, temperature and hydrogen-ion concentration (pH) were optimum at 25^0C and 5.5, levels.

Key words : Wilt, Carnation, *Fusarium oxysporum*

The pathogen, *Fusarium oxysporum* f.sp. *dianthi* is responsible for inducing wilt in carnation and reported to be a major disease in almost entire of Himachal Pradesh wherever carnation is grown with incidence as high as 79.0% (Katoch, 1999). The losses caused by the disease are manifolds worldwide. In Germany, the estimated disease incidence was about 46 per cent while in Italy and Poland it goes upto 60 (Jacob and Kreb, 1985; Filippi and Baganoli, 1992; Manku and Fruzysiska-Jozwick, 1992). The pathogen infects vascular system and disrupts water and nutrient supply, which causes yellowing, drooping, drying and ultimately wilting of the plants. The infected roots develop light brown colour and get completely detached from the shoots. Keeping in view the severity of the pathogen and importance of the crop, a preliminary study on pathogenicity and physiological factors such as media, temperature and hydrogen-ion concentration affecting the growth and sporulation of *F.oxysporum* f.sp *dianthi* was carried out to know the etiological behaviour and cultural requirement of the causal fungus

MATERIALS AND METHODS

Survey and pathogenicity studies :

Regular surveys for recording the incidence of carnation wilt were carried out during the crop seasons (2004-05 May-Sept.) particularly in peak period of appearance and spread. Six districts of Himachal Pradesh namely Solan, Sirmour, Shimla, Kullu, Mandi and Kangra were surveyed. The incidence was calculated as:

$$\text{Disease Incidence (\%)} = \frac{\text{No.of diseased plants}}{\text{Total no. of plants}} \times 100$$

The isolation of the pathogen was carried out as per the standard procedure from the infected carnation roots in order to conduct the pathogenicity test (McMuller and Stack, 1983). Three inoculation methods, as soil, root zone and root dip were applied for artificial inoculation of the plants. In former, the mass culture of the fungus was prepared on maize grain medium (Dohroo and Sharma, 1984). Freshly prepared fungal culture (50g) was added on upper 2 inches layer of the formalin sterilized garden soil (600g) contained in 4inches dia. plastic pots and mixed by uniform spreading. This was followed by light irrigation (Kataria and Grover, 1976). After one week, three one-month-old rooted cuttings of cultivar "Purple Chopin" were planted in each pot with five replications. Whereas in root zone inoculation, the fungus @20g grown on Maize grain cultures was added surrounding the roots of the planted cuttings after one week of establishment. However, the cuttings of the same cultivar were pre-dipped in the mycelial suspension of the test fungus for 30 minute by mixing the inoculum in sterilized distilled water (500ml). The cuttings and replications remained same as mentioned for the soil inoculation study.

Physiological studies :

The study was undertaken with regards to its cultural and physiological behaviour of the pathogen to find out the suitable medium and optimum conditions for its spread. In all the physiological studies 4mm mycelial discs of 8 days old culture obtained from periphery of the test pathogen were used for inoculating different medium poured in Petriplates and flasks. The solidification of media was achieved by 2% agar while the pH of liquid media was adjusted at 6.0 by using N/10 NaOH or HCl