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*RESEARCH PAPER*

# Disease status of Alternaria blotch of apple in Himachal Pradesh, India

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**Abstract :** Apple is one of the most important fruit crops of Himachal Pradesh and the economy of the state primarily depends upon this remunerative crop. *Alternaria alternata* f.sp. *mali* causes huge loss by infecting leaves and fruits. It infects mainly leaves (upto 50 to 60%) but sometimes fruits may also get infected. Leaf spot infection started early in the season which leads to premature defoliation. The fungus causes leaf spots which enlarge in zonate, circular or crescent shaped rings. Every season the crop is suffered from Alternaria leaf blotch in wet climate and has been appearing in moderate to severe form in different apple growing areas of Shimla district of Himachal Pradesh. The disease incidence and disease severity varied between 11.00 to 50.00 per cent and 6.20 to 25.90 per cent, respectively for two consecutive years 2015 and 2016.

**Key Words :** Apple, Blotch, Disease prevalence, Premature leaf fall

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## INTRODUCTION

Apple (*Malus* × *domestica* Borkh.) belongs to family Rosaceae and it is the most important fruit crop grown extensively in temperate regions of the world. Like other horticultural crops apple is also attacked by several pathogens which impair the quality and quantity of the fruit (Grove *et al*., 2003). Huge losses of the crop are incurred mostly by fungal diseases. The major fungal diseases include scab, Alternaria leaf blotch, powdery mildew, collar rot, root rot, sooty blotch, fly speck etc. Among these, Alternaria blotch caused by *Alternaria mali*, prevalent in all apple growing areas of the world is an economically important apple disease. In Himachal Pradesh, the disease was first recorded in the year 1968 in some orchards of Kotgarh area in the Shimla district (Gupta and Agarwala, 1968) and is now affecting more than 78 per cent of orchards in the state and has threatened the apple cultivation by causing premature leaf fall (Sharma *et al*., 2003 and Thakur and Sharma, 2010). In the present paper, results on its prevalence and severity are described.

## MATERIAL AND METHODS

**Disease prevalence and severity:**

Periodic surveys of different apple growing areas in Shimla district of Himachal Pradesh were conducted

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during May to August months in 2015 and 2016 for the collection of leaves infected with Alternaria blotch of apple. The incidence of Alternaria blotch of apple under natural epiphytotic conditions was recorded as under:

$$\text{Disease incidence (\%)} = \frac{\text{Number of plants infected}}{\text{Total number of plants observed}} \times 100$$

To calculate the per cent disease severity of Alternaria leaf spot, randomly collected hundred leaves per tree were selected. Leaf blotch severity was recorded by using the 0-4 scale suggested by Sharma *et al*. (2005).

The per cent disease severity was calculated as per McKinney (1923).

$$\text{Disease severity (\%)} = \frac{\text{Sum of all disease ratings}}{\text{Total number of ratings x Maximum grade}} \times 100$$

## RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Disease prevalence and severity:

Perusal of data (Table 1) revealed that maximum mean disease incidence upto an extent of 50.00 per cent on leaves was recorded in the apple orchards at Summerkot followed by Dilsar (44.50%) whereas, minimum (11.00%) was recorded at Khadrala in district Shimla. Perusal of data presented in Table 2 revealed that maximum mean disease severity on leaves (27.57%)

**Fig. 1: Alternaria blotch symptoms on apple leaves**

**Table 1: Disease incidence of Alternaria leaf blotch of apple at different locations of apple growing district of Himachal Pradesh during 2015 and 2016**

| District | Location | Disease incidence (%) | | Pooled mean |
|---|---|---|---|---|
| | | 2015 | 2016 | |
| Shimla | Kotgarh | 41.00 | 44.00 | 42.50 |
| | Thanedhar | 32.00 | 34.00 | 33.00 |
| | Matiana | 30.00 | 34.00 | 32.00 |
| | Kumarsain | 14.00 | 16.00 | 15.00 |
| | Sarahan | 38.00 | 45.00 | 41.50 |
| | Theog | 31.00 | 38.00 | 34.50 |
| | Baggi | 30.00 | 34.00 | 32.00 |
| | Ratnari | 40.00 | 43.00 | 41.50 |
| | Kotkhai | 20.00 | 24.00 | 22.00 |
| | Chol | 35.00 | 39.00 | 37.00 |
| | Chaithla | 40.00 | 44.00 | 42.00 |
| | Garog | 20.00 | 22.00 | 21.00 |
| | Dilsar | 44.00 | 45.00 | 44.50 |
| | Khadrala | 10.00 | 12.00 | 11.00 |
| | Summerkot | 45.00 | 55.00 | 50.00 |
| | Samala | 38.00 | 42.00 | 40.00 |
| | Jubbal | 27.00 | 32.00 | 29.50 |
| | Matasa | 16.00 | 20.00 | 18.00 |
| | Narkanda | 21.00 | 24.00 | 22.50 |
| | Bhutti | 15.00 | 18.00 | 16.50 |
| | Mean | 29.35 | 33.25 | |

**Table 2: Disease severity of Alternaria leaf blotch of apple at different locations of apple growing district of Himachal Pradesh during 2015 and 2016**

| District | Location | Disease severity (%) | | Pooled mean |
|---|---|---|---|---|
| | | 2015 | 2016 | |
| Shimla | Kotgarh | 22.60 | 20.50 | 21.47 |
| | Thanedhar | 21.60 | 21.95 | 21.07 |
| | Matiana | 18.60 | 18.20 | 17.17 |
| | Kumarsain | 8.40 | 9.50 | 8.85 |
| | Sarahan | 21.20 | 25.13 | 22.16 |
| | Theog | 18.40 | 20.36 | 18.48 |
| | Baggi | 17.00 | 18.40 | 16.95 |
| | Ratnari | 21.40 | 22.74 | 22.12 |
| | Kotkhai | 15.20 | 13.36 | 12.40 |
| | Chol | 16.00 | 20.25 | 19.37 |
| | Chaithla | 24.80 | 28.45 | 27.57 |
| | Garog | 10.20 | 12.10 | 11.17 |
| | Dilsar | 23.00 | 25.01 | 24.24 |
| | Khadrala | 5.20 | 7.30 | 6.20 |
| | Summerkot | 23.80 | 27.30 | 25.90 |
| | Samala | 20.40 | 23.78 | 21.99 |
| | Jubbal | 17.80 | 16.20 | 15.01 |
| | Matasa | 7.8 | 10.20 | 9.20 |
| | Narkanda | 11.60 | 14.46 | 13.50 |
| | Bhutti | 8.20 | 10.20 | 9.35 |
| | Mean | 16.66 | 18.26 | |

was recorded in apple orchards at Chaithla followed by Summerkot (25.90%) whereas, minimum (6.20%) at Khadrala in Shimla district. Gupta and Agarwala (1968) also reported Alternaria blight caused by *Alternaria mali* from Kotgarh area of Shimla district in Himachal Pradesh. Higher disease incidence and intensity in various locations surveyed could be attributed to higher plant density, besides non-disposal of the fallen diseased leaves. The less disease incidence and intensity could be attributed to lesser plant density and better orchard management. The overall variation in disease severity may be because of the variation in various factors like altitude, climate, delayed rains, plant age and management practices. The variation in incidence and intensity of Alternaria leaf blotch disease in various locations have previously been reported by Filajdic and Sutton (1991); Bulajic *et al*. (1996) and Shahzad (2003). Sharma *et al*. (2003) also reported the occurrence of Alternaria leaf spot (*Alternaria alternata*) on apple from some of the fairly managed orchards in Kotkhai and surrounding areas.

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