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Status of smoky blight canker of apple in Himachal Pradesh

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Abstract

Smoky blight canker caused by *Botryosphaeria obtusa* is one of the most important diseases of apple causing significant losses in apple production. Enormity of smoky blight in different locations i.e., Sirmaur, Kullu, Mandi, Kinnaur and Shimla district of Himachal Pradesh, located at different altitudes ranging between 900-2500 m above mean sea level (A.M.S.L.), were carried out during normal canker development period i.e., May to December during two consecutive years 2017 and 2018. Smoky blight canker was widespread in Sirmaur, Kullu, Mandi, Kinnaur and Shimla district of Himachal Pradesh and was more prevalent and occurred frequently in almost all apple growing areas surveyed. The incidence of smoky blight was maximum (64.94%) at Charna of Sirmaur district followed by Thunag of Mandi district (63.81%), whereas it was minimum at Pooh (2.16%) followed by Bhavanagar (2.70%) in district Kinnaur. Whereas, percent disease index of smoky blight was maximum at Charna (43.20%) followed by Hariphurdhar (41.00%) in Sirmaur district, while minimum percent disease index was at Bhavanagar (0.10%) followed by Moorang (0.53%). The mean percent disease index in the survey years for smoky blight canker ranged from 0.10 to 43.02 per cent.

Keywords: Smoky blight, canker, apple, Himachal Pradesh, disease incidence, percent disease index

Introduction

Cultivation of the apple (*Malus x domestica* Borkh.) began in Himachal Pradesh in the late nineteenth century. Commercial cultivation of this fruit brought wealth to its growers and was a financial boon to the state, garnering it the moniker as "Apple state of India." Apple cultivation is being performed in 1,12,630 hectares (NHB, 2018). Apple farming is main backbone of farmer families, providing a good living for others working in the business as labourers, transporters, middlemen, retailers, and so on. Himachal Pradesh produced 4,46,570 metric tonnes of apple in 2017-18, with an average productivity rate of 3.96 mt/ha (NHB, 2018). However, in comparison to other parts of the world, the production of apples per unit area in this state is low.

The key obstacles in obtaining the desired production have been the occurrence of various diseases, as well as other factors such as low quality material, insufficient technology, inappropriate inputs, insufficient chilling units, changing climate, and so on. Numerous diseases caused by fungus, bacteria, viruses, and other microorganisms result in immediate and long-term losses. According to Thakur (2008), these diseases cause a 30-40% reduction in total yield. Root rot in the 1960s, which killed 10-15% of apple trees each year (Agarwala, 1961) [2], scab epiphytotics from the late 1980s onwards (Gupta, 1978; Gupta and Sharma, 1995) [3, 4] with reported losses of Rs. 1.5 crores in a single year, 1983, and Marssonina blotch in the late 1990s, which caused havoc by premature defoliation (Sharma and Sharma, 2012) [8] have been a serious area of tension for the state's apple producers.

A simultaneous outbreak of cankers in the state in the 1970s was also noteworthy (Agarwala and Gupta, 1971) [1]. Cankers are localized lesions on a branch or stem that cause the sloughing away of plant tissues and the formation of wounds that increase surface area from season to season. Sharma and Sharma (2012) [8] reported thirteen different cankers from Himachal Pradesh but there is yet no status update on the severity of individual canker associated with canker disease with diverse apple growing locations. An attempt has been made to determine the distribution patterns of smoky blight canker also known as dieback or twig blight, black canker, black rot and New York canker in several apple-growing districts in Himachal Pradesh. Such data could aid in estimating the true status of the disease and the resulting economic impacts.

Furthermore, the distribution trends of smoky blight canker discovered in this survey exercise would inform apple growers about canker resistant types to be transplanted in various altitudes and geographic areas across the state.

Materials and Methods

The apple orchards having minimum ten trees of same age were surveyed in five apple growing districts of Himachal Pradesh i.e., Kinnaur, Kullu, Mandi, Shimla and Sirmaur districts located at different altitudes ranging between 1000-2500 m above mean sea level (A.M.S.L), survey was carried out during normal canker development period i.e., July to December during 2017-18. The disease incidence was recorded by using the formula as follows:

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

The data regarding the percent disease index of smoky blight cankers was recorded with the scale devised by Verma (1991)^[10] as follows:

- 0 = No lesion formation
- 1 = Lesion size of 0.1-5 cm²
- 2 = Lesion size of 5.1- 10 cm²
- 3 = Lesion size of 10.1-30 cm²
- 4 = Lesion size of more than 30 cm²

Percent disease index was calculated as per Mc Kinney (1923)^[6]:

$$\text{Per cent Diseases Index (\%)} = \frac{\text{Sum of all numerical ratings}}{\text{Number of twigs/branches/trunks observed} \times \text{Maximum rating}} \times 100$$

Results and Discussion

The data on pervasiveness of disease were recorded as incidence and percent disease index of canker disease in different age groups of apple orchards and data is presented in bar diagram form. The perusal of data presented in figures, it is evident that the disease was widespread in Sirmaur, Kullu, Mandi, Kinnaur and Shimla district of Himachal Pradesh and

was more prevalent in almost all apple growing areas surveyed.

The disease incidence of smoky blight was maximum (64.94%) at Charna of Sirmaur district (Fig.7) followed by Thunag of Mandi district (63.81%) (Fig. 9), whereas it was minimum at Pooh (2.16%) followed by Bhavanagar (2.70%) in district Kinnaur (Fig.5). Whereas, percent disease index of smoky blight was maximum at Charna (43.02%) followed by Hariphurdhar (41.00%) in Sirmaur district (Fig. 8), while minimum percent disease index was at Bhavanagar (0.10%) followed by Moorang (0.53%) in district Kinnaur (Fig.6). The mean percent disease index in the survey years for smoky blight canker ranged from 0.10 to 43.02 per cent.

Further perusal of data presented in figures, it is evident that mean incidence of smoky blight canker was maximum (55.37%) in Mandi district (Fig.9) followed by Sirmaur (54.37%) district (Fig.7), whereas it was minimum in Kinnaur (6.24%) district (Fig.5). Similarly, percent disease index of smoky blight canker was maximum at Sirmaur (29.39%) district (Fig.8) followed by Mandi (24.37%) district (Fig.10), while minimum percent disease index was recorded at Kinnaur (1.67%) district (Fig.6).

These findings are in conformity with Kumar *et al.* (2016)^[5] and Agarwala and Gupta (1971)^[1]. Kumar *et al.* (2016)^[5] reported that smoky blight canker prevalence was maximum in district Sirmaur followed by Shimla with 50 and 45 per cent incidence, respectively, however, modest in Kullu (20%) and to a significantly lower level in the districts of Kinnaur (6%) and Lahaul & Spiti (5%). Smoky blight established more in areas of Shimla, Sirmaur and Kullu where temperature remains moderate in summers (April-September) when petal fall occurs (April-May) and minimum of 0-5°C during winters (October-March). Kumar *et al.* (2016)^[5] also attributed that at lower temperature, ascospores germinate very slowly and fail to cause infection especially during petal fall stage. Shimla, Kullu and Sirmaur exhibited maximum temperature above 20 °C during petal fall months had more smoky blight canker than the districts of Kinnaur and Lahaul and Spiti with temperature below 15 °C during the same period.

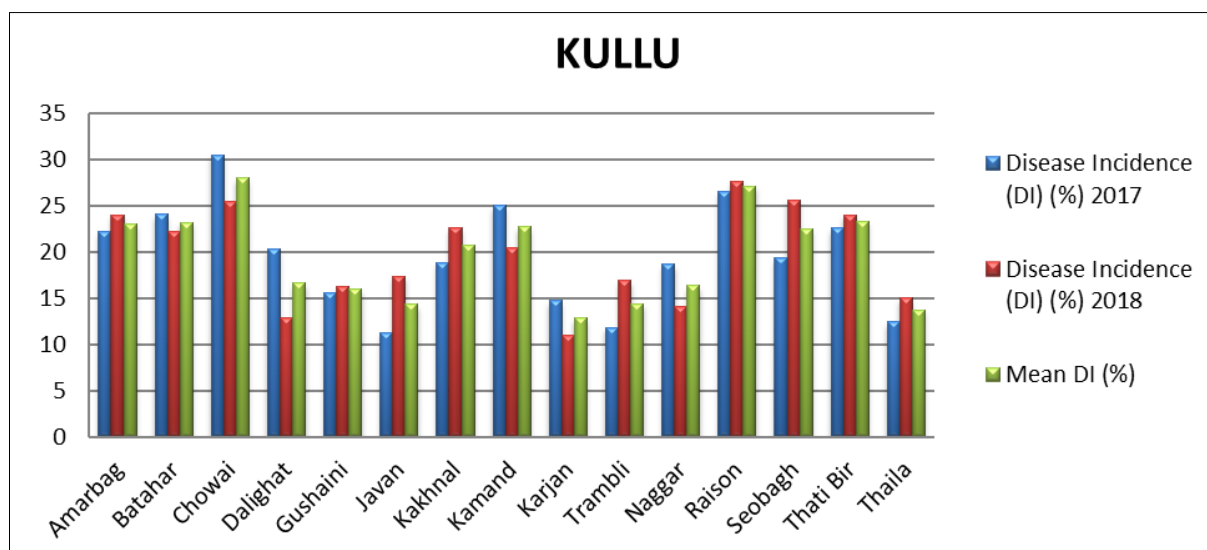


Fig 1: Disease incidence of smoky blight canker (*Botryosphaeria obtusa*) in Kullu district of Himachal Pradesh

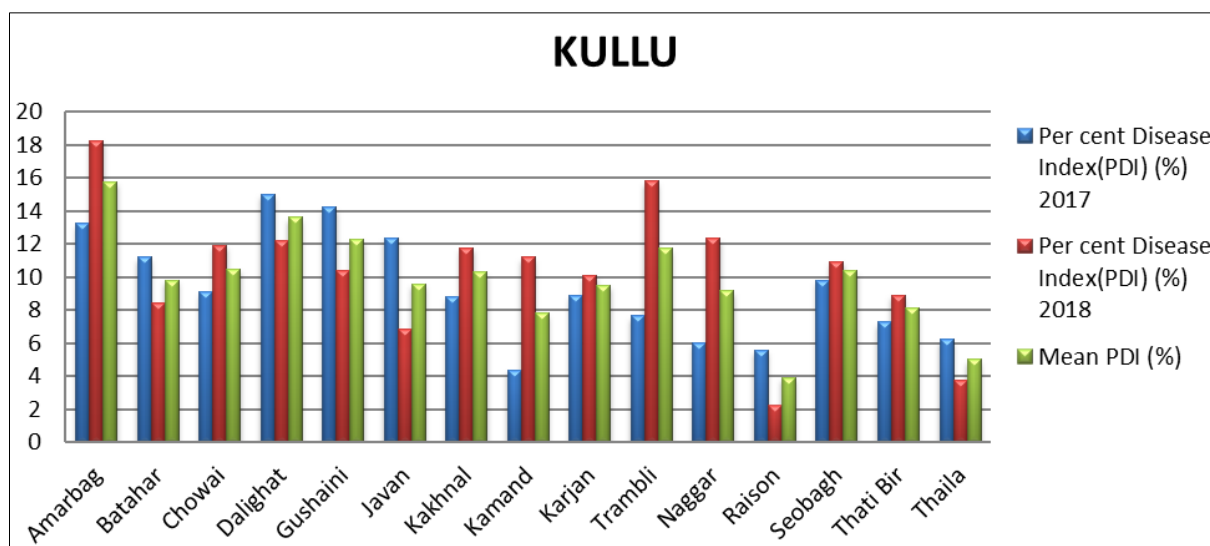


Fig 2: Per cent disease index of smoky blight canker (*Botryosphaeria obtusa*) in Kullu district of Himachal Pradesh

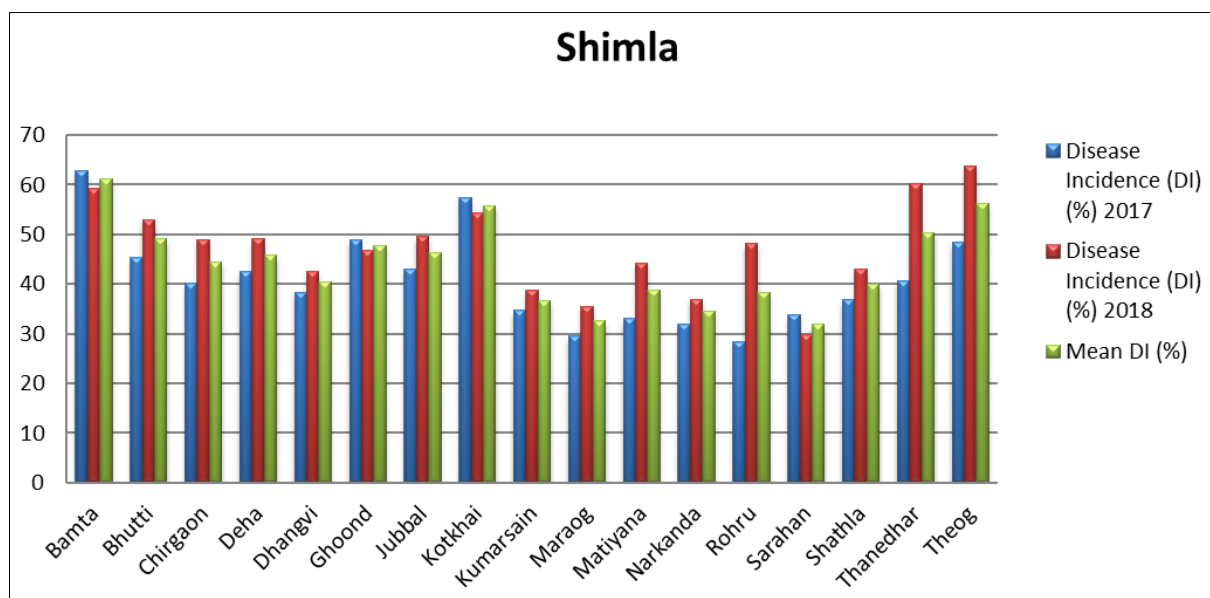


Fig 3: Disease incidence of smoky blight canker (*Botryosphaeria obtusa*) in Shimla district of Himachal Pradesh

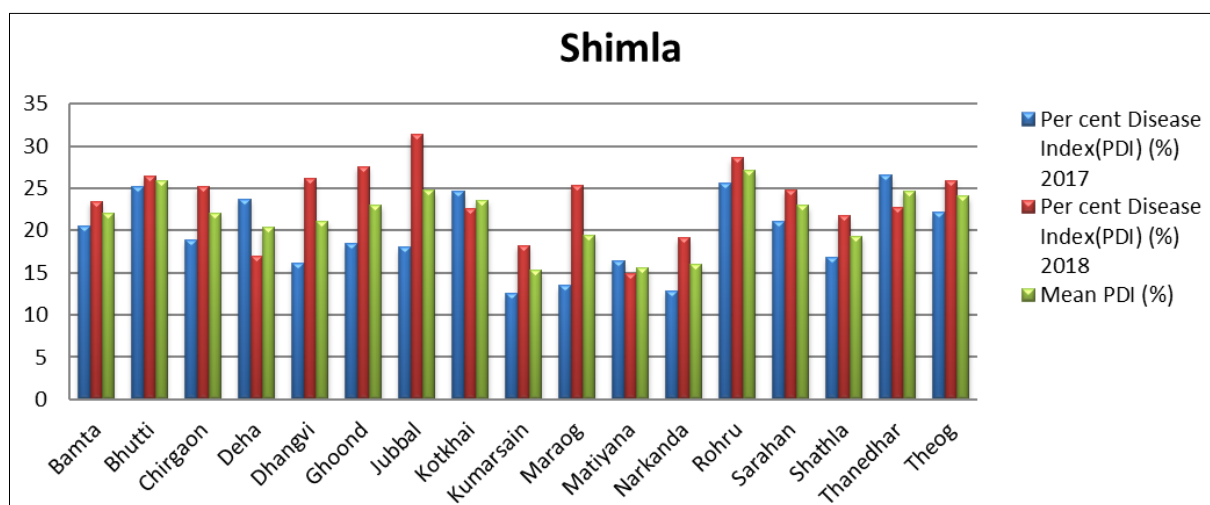


Fig 4: Per cent disease index of smoky blight canker (*Botryosphaeria obtusa*) in Shimla district of Himachal Pradesh

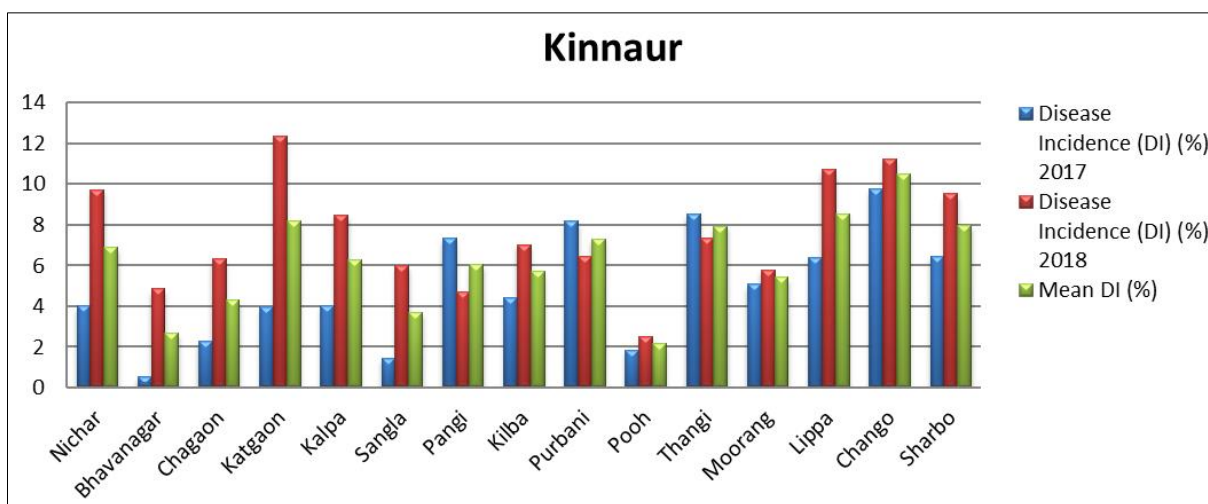


Fig 5: Disease incidence of smoky blight canker (*Botryosphaeria obtusa*) in Kinnaur district of Himachal Pradesh

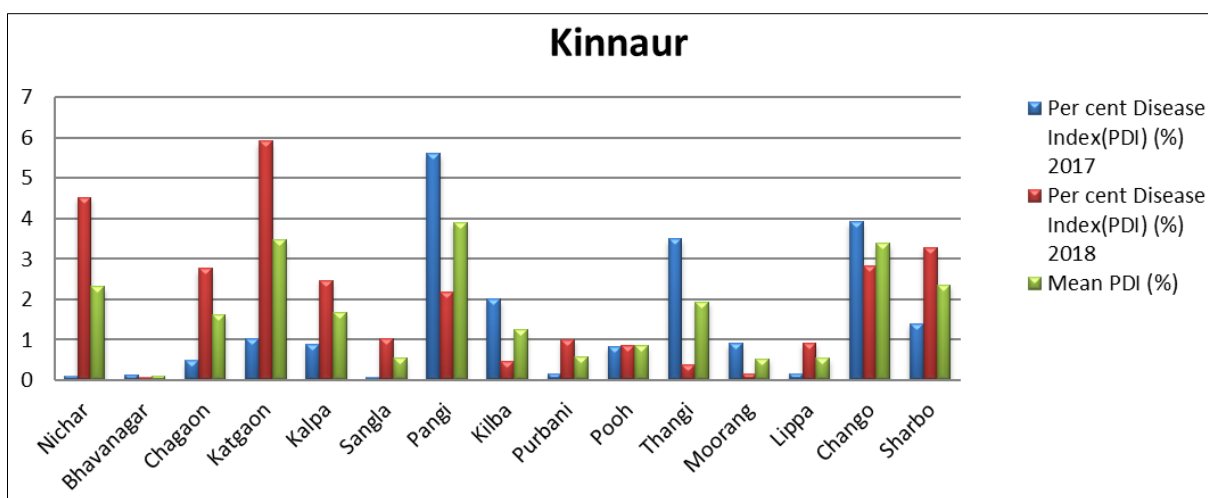


Fig 6: Per cent disease index of smoky blight canker (*Botryosphaeria obtusa*) in Kinnaur district of Himachal Pradesh

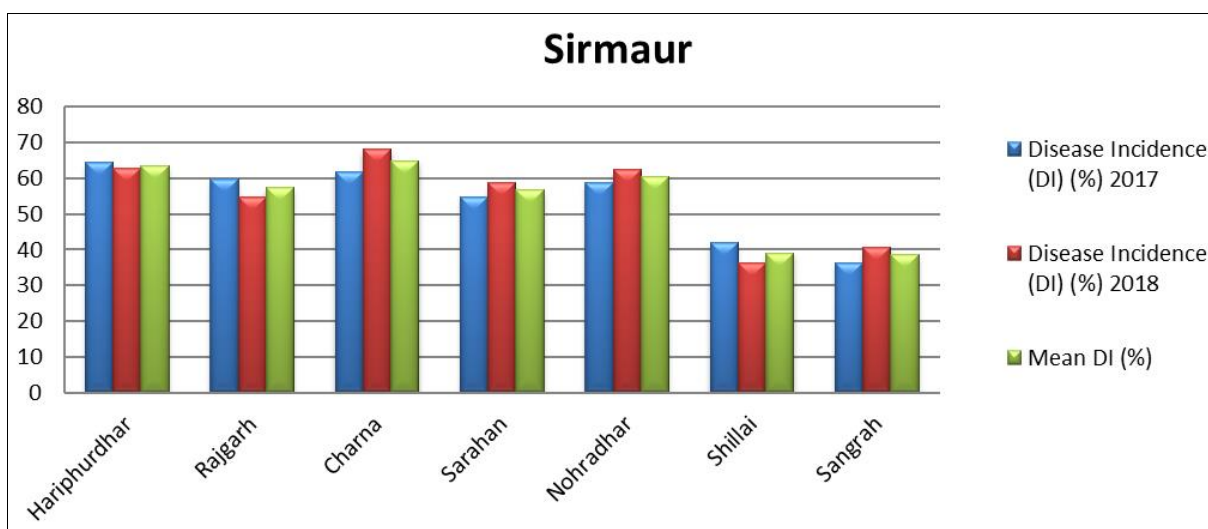


Fig 7: Disease incidence of smoky blight canker (*Botryosphaeria obtusa*) in Sirmaur district of Himachal Pradesh

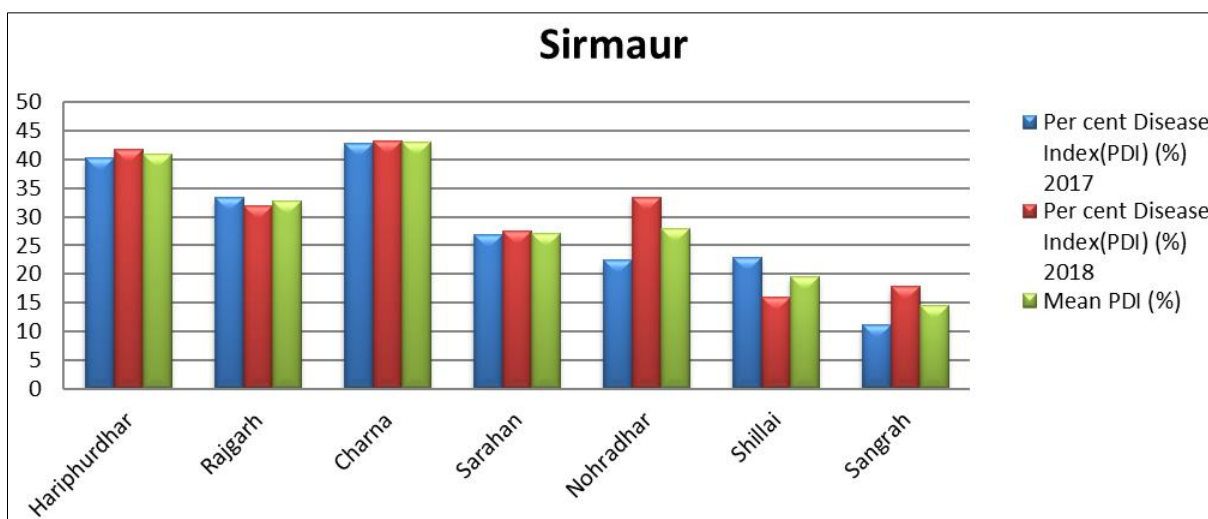


Fig 8: Per cent disease index of smoky blight canker (*Botryosphaeria obtusa*) in Sirmaur district of Himachal Pradesh

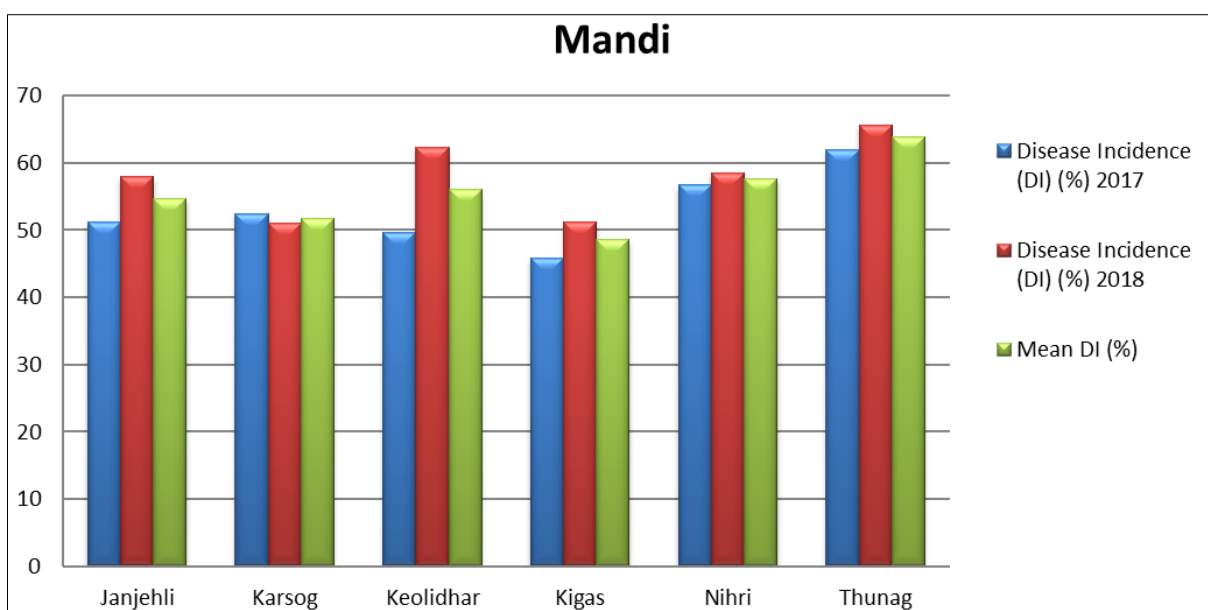


Fig 9: Disease incidence of smoky blight canker (*Botryosphaeria obtusa*) in Mandi district of Himachal Pradesh

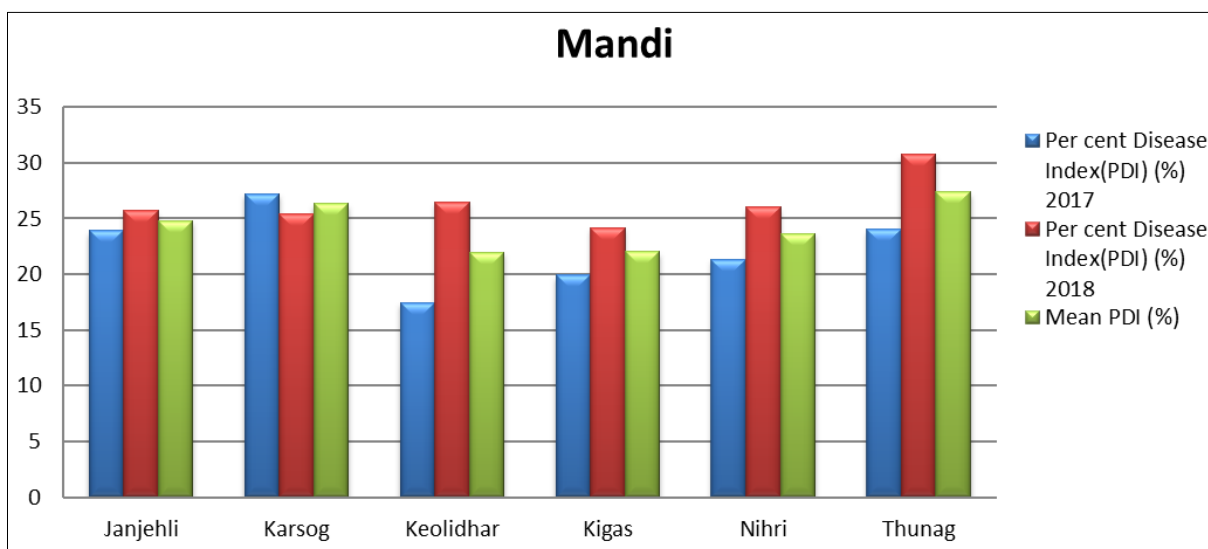


Fig 10: Per cent disease index of smoky blight canker (*Botryosphaeria obtusa*) in Mandi district of Himachal Pradesh

Conclusion

It can be concluded from the data that smoky blight canker development needs higher temperature mainly during the starting of cropping season for infection and subsequent disease development. This is clear from the data that the disease incidence was high in Kullu, Mandi, Shimla and Sirmaur while lowest in Kinnaur (6.24%) district.

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