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Effect of pruning on the severity of anthracnose disease of rejuvenated mango cv. Amrapali

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Abstract
The effect of rejuvenation times on mango cv. Amrapali under sub-Himalayan Terai region of West Bengal; the plants were headed back at 150 cm above from the ground level with six different pruning times at the instructional farm, Department of Pomology and Post-Harvest Technology, Faculty of Horticulture, UBKV. The different times of rejuvenation were considered as the treatments to find out the severity of anthracnose (*Colletotrichum gloeosporioides)* disease of mango under natural field condition without any control measures during 2019-20 and 2020-21. The maximum severity of anthracnose (37.03%) was recorded with the plants of Amarapli pruned during 15th January, where as it was minimum (28.61%) with the plants pruned during 1st December. The mean percent disease index (PDI %) for severity (January to November) of anthracnose was recorded highest with the plants pruned during 15th January and lowest with the plants pruned during 1st December.

Keywords: Anthracnose, Amrapali, mango, rejuvenation, sub-Himalayan terai region

Introduction
Mango (*Mangifera indica* L.) is popular fruit crop in India, Because of its sweet peerless test and richness in phytochemical and nutrient content, it is called as the *King of Fruit.* The fruit is highly valued because of its excellent flavour, appealing aroma, delicious taste, attractive shades of colour and nutritive value, which has attracted the world market. Mango is more susceptible to many fungal diseases, resulting in significant losses occur in yield (Ploetz 2001) [10]. Rejuvenation of old and unproductive mango orchard have important role to rebuild canopies and productivity of trees. Decline in productivity of senile mango orchards is largely due to dense, intermingling, overcrowding and pest infested branches with more of wood mass and canopy of unhealthy shoots. In such orchards, selective pruning and thinning of crowded branches for proper air circulation, improved photosynthetic efficiency, fruit yield and quality has been reported in many fruit crops by earlier researchers. Severe pruning i.e. beheading is needed to alter not only physiology but also biochemical behaviour of these senile old mango trees. It is necessary to standardize the beheading height of old mango trees so that shading does not occur in skirts of tree canopy and on adjacent rows (Sharma and Singh, 2006) [11] and also to re-establish the canopy at low and within easy reach for management. Shorter trees have more accessible canopies and are easier to harvest, prune and spray, require fewer labour inputs. Fruit crops are managed to facilitate light penetration into the canopy, the photosynthetic activity during fruit growth period might be augmented to increase yield (Durand, 1997) [4]. Judicious pruning of mango trees maintains good balance between growth and fruiting (Gross, 1997) [5].

Several diseases can damage mangos at any stage in their growth, from the plant in the nursery to the fruit in storage or transit. A significant loss in yield can result from the mango's susceptibility to a number of fungal diseases, including Anthracnose, Rhizopus rot, Stem end rot, Penicillum rot, Black mould rot, Mucor rot, Phyllosticta rot, Pestalotia rot, Macrophoma rot, and powdery mildew (Ploetz,2001) [10]. Among the all these diseases, anthracnose is the most common in mangos, affecting all parts of the plant leaves, twigs, flowers, and fruits with the exception of trunk and root all year long. Anthracnose has been reported to result in losses of 5 to 20% at the postharvest stage (Kumar *et al*., 2013) [7]. Mango fruits appear to be more severely affected by anthracnose produced by *Glomerella*

cingulata (Stoneman) and *Colletotrichum gloeosporioides* (Penz.), which can cause devastation during grading, packing, shipping, storage, and marketing. However, several earlier attempts were made to mitigate the pest infestation through pruning operation also (Hasan *et al*., 2009) [6] and (Das *et al*., 2013) [3].

Considering this fact, the present experiment was conducted to know the incidence percentage of mango anthracnose on shoot pruning and unpruned plants of different mango cultivars grown under Sub-Himalayan *Terai* region of West Bengal.

Materials and Methods

The effect of rejuvenation times on mango cv. Amrapali under sub-Himalayan Terai region of West Bengal; the plants were headed back at 150 cm above from the ground level with six different pruning times at the instructional farm, Department of Pomology and Post Harvest Technology, Faculty of Horticulture, UBKV. The different times of rejuvenation were considered as the treatments. The age of the plants are 23 years, spacing is 8x8m and six treatments randomized with four replications. Heading back at 150 cm from the ground was carried out at 15 days intervals starting from 1st December. One set of plants were headed back during 2018-19 and another set during 2019-20 for comparison. The treatment details are following:

Treatments	Treatment details (Time of heading back)
T_1	1st, December
T_2	15th, December
T_3	1st, January
T_4	15th, January
T_5	1st, February
T_6	15th, February

Diseases severity of mango was measured at monthly interval after rejuvenation with following standard procedure and disease scoring scale. Out of different diseases, mango anthracnose was considered were the present study because of their more prevalence in this region. Five uniform twigs of each variety having 8-10 leaves were marked for screening and observation was taken at monthly interval.

Disease severity was calculated by using the following formula.

$$\text{Percent Disease Index (PDI)} = \frac{\text{Sum of all the disease rating}}{\text{No. of leaves observed} \times \text{Maximum disease grade}} \times 100$$

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Disease scoring scale for anthracnose (0-5scale) on leaves were calculated following Narasimhudu (2007) [8].

Sl.	Disease reaction	Rating	Percentage of area infected
1.	Immune	0	No infection
2.	Resistant	1	1-10
3.	Moderately Resistant	2	11-20
4.	Moderately susceptible	3	21-30
5.	Susceptible	4	31-50
6.	Highly Susceptible	5	Above 50

The Percent Disease Index (PDI) was recorded from January to November (11 months) during both the season (2019-20 and 2020-21).

Results and Discussion

The maximum severity of anthracnose (37.03%) was recorded with the plants of Amrapali pruned during 15th January, where as it was minimum (28.61%) with the plants pruned during 1st December (Table 1). The mean percent disease index (PDI %) for severity (January to November) of anthracnose was recorded highest with the plants pruned during 15th January and lowest with the plants pruned during 1st December (Fig.1). The weather parameters of present study were more or less congenial with the experimental results of Arauz (2000) [1] for spreading of anthracnose infestation. The emergence of leaves was earlier in the trees pruned during 1st December compared to other trees. In general, the disease is favoured by wet, humid warm weather (Nelson, 2008) [9]. As the age of shoots are more during the pruned of 1st December, it contains much amount of pectin and cellulose substances higher on leaf surface compared to other plants, pruned after 1st December. Due to this substance the anthracnose severity least in plants pruned during 1st December (Fig.2). (Bhagwat *et al*., 2016) [2] explained after a field survey was carried out during November to May in Navsari and Valsad districts of south Gujarat region and reported that among the seven different months, maximum anthracnose incidence in percent i.e. (26.15%) was found during the month of May and minimum percent i.e. (17.44%) in November.

Table 1: The effect of date of pruning on the severity of anthracnose disease on rejuvenated mango cv. Amrapali

Months	T_1 (1st December)			T_2 (15th December)			T_3 (1st January)			T_4 (15th January)			T_5 (1st February)			T_6 (15th February)		
	PDI			PDI			PDI			PDI			PDI			PDI		
	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean
January	17.5	12.86	15.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February	19.08	35.5	27.29	15.42	41.58	28.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
March	23.04	30.01	26.525	23.58	31.92	27.75	19.25	38.75	29.00	12.05	16.28	14.17	12.56	10.2	11.38	0.00	0.00	0.00
April	25.42	27.48	26.45	21.08	22.88	21.98	20.42	32.85	26.64	18.83	33.50	26.17	15.05	18.28	16.66	10.08	28.54	19.31
May	54.08	35.08	44.58	59.58	60.00	59.79	48.75	54.29	51.52	54.80	66.66	60.73	51.08	67.92	59.5	46.63	57.74	52.19
June	11.79	26.44	19.115	20.08	45.42	32.75	12.33	29.42	20.88	17.75	40.79	29.27	21.17	54.17	37.67	14.25	54.67	34.46
July	29.67	28.12	28.895	24.13	44.86	34.50	17.13	32.50	24.82	44.25	43.17	43.71	34.5	35.71	35.105	25.00	37.08	31.04
August	31.57	31.31	31.44	40.75	33.51	37.13	30.33	33.11	31.72	37.25	44.17	40.71	33.58	55.41	44.495	43.46	45.83	44.65
September	39.08	26.55	32.82	32.58	43.33	37.96	34.00	31.81	32.91	41.35	43.33	42.34	27.67	45.17	36.42	39.67	48.33	44.00
October	41.02	24.01	32.52	43.25	50.71	46.98	46.00	42.50	44.25	45.00	42.08	43.54	50.41	29.42	39.915	28.41	39.02	33.72
November	28.83	30.87	29.85	28.67	43.33	36.00	27.16	44.40	35.78	16.17	49.08	32.63	43.42	57.4	50.41	33.00	30.48	31.74
Avg. PDI	29.18	28.02	28.61	30.91	41.75	36.33	28.37	37.74	33.06	31.94	42.12	37.03	32.16	41.52	36.84	30.06	42.71	36.39
Reaction	---	---	MS	---	---	S	---	---	S	---	---	S	---	---	S	---	---	S

*R = Resistant; MR = Moderately Resistant; MS = Moderately Susceptible; S = Susceptible; HS = Highly Susceptible

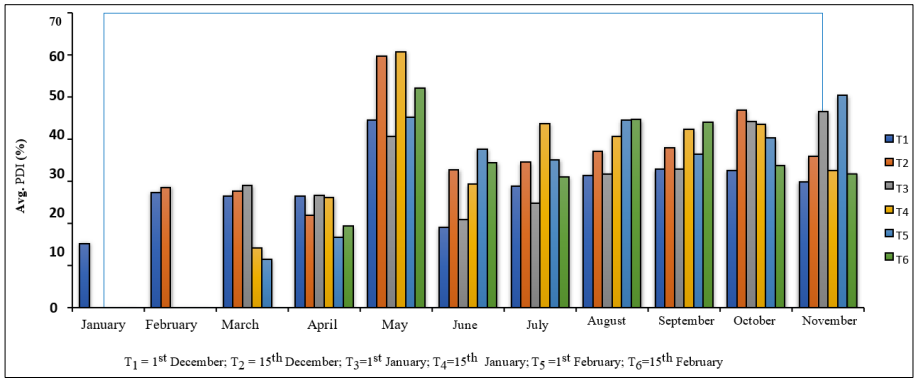

Fig 1: The effect of date of pruning on the severity of anthracnose disease on rejuvenated mango cv. Amrapali

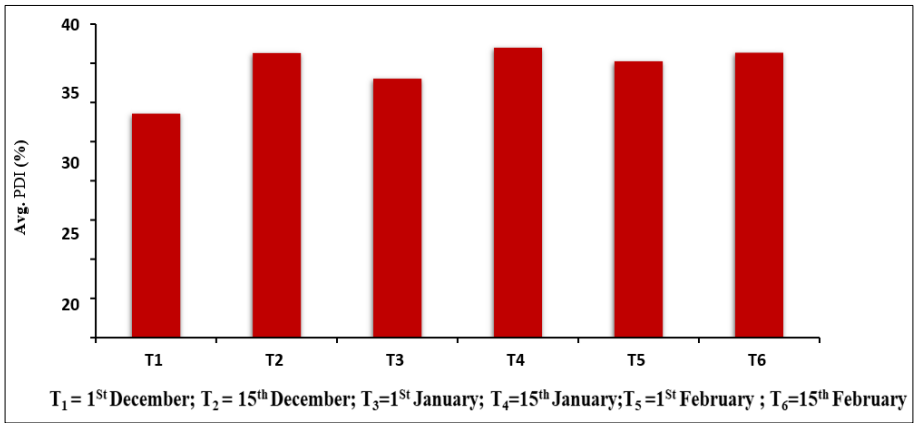

Fig 2: The effect of date of pruning on the severity of anthracnose disease on rejuvenated mango cv. Amrapali (Avg. PDI)

Conclusion

The study on the effect of rejuvenation times on mango cv. Amrapali in the sub-Himalayan Terai region of West Bengal revealed that the timing of pruning significantly impacts the severity of anthracnose disease. The data showed that mango trees pruned on December 1st exhibited the lowest disease severity, with an average Percent Disease Index (PDI) of 28.61%. In contrast, the highest severity was recorded in trees pruned on January 15th, with a PDI of 37.03%. The differences in anthracnose severity can be attributed to factors such as the age of shoots, pectin content on leaf surfaces, and environmental conditions, particularly humidity and temperature.

Overall, pruning in early December led to the emergence of healthier shoots and a lower susceptibility to anthracnose, likely due to the timing of leaf maturation and reduced disease-favorable conditions. This highlights the importance of selecting optimal pruning times to manage fungal diseases like anthracnose and improve the overall health and productivity of mango orchards.

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