

CORYNEUM BLIGHT AND OTHER DISEASES ON APRICOT (*PRUNUS ARMENIACA*) IN NORTH-WEST PAKISTAN

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(Received August 11, 1971)

Abstract. Three major stone fruit diseases, viz. coryneum blight, bacterial canker and gummosis and ring pox virus were found severely attacking apricots in various apricot growing areas of NWFP. None of these diseases have been previously reported from Pakistan. *Stigmina carpophila*, the incitant of coryneum blight, is also a new fungal record for Pakistan. In the present paper are presented disease symptoms on various parts of the plant, and morphological studies on the causal organisms.

Apricot (*Prunus armeniaca*) is one of the major fruit crops of West Pakistan and especially so of the North-West Frontier Province (N.W.F.P.). During 1965-66, the area under apricot cultivation was 754 acres giving a yield of 2379 tons of fruit. The area under cultivation has shown a steady rise during the Third Five-Year Plan (1965-70). Table 1 shows that the area under cultivation, and the fruit yield was almost twice as much in 1969-70 as compared with 1965-66. The trend indicates that apricot cultivation and yield will increase in subsequent years. This increase may be further supplemented by effectively checking the incidence of diseases and insect attacks. A knowledge of the type and the nature of diseases that occur on this fruit is, therefore, essential for better cultural practices, control measures in the orchards, and disease-free storage.

The fruit loss, due to insect attacks, has been calculated, on the average, at about 15-20% per year. However, no data are available on the losses caused by fungal, bacterial, or viral attacks, and none of the diseases caused by these agents have been reported from Pakistan. In this paper, coryneum blight, bacterial canker and gummosis, and ring pox virus, are presented as three new records from Pakistan. *Stigmina carpophila*, the causal agent of coryneum blight is a new fungus recorded from Pakistan.^{1,2} No mention of *Xanthomonas pruni*, the casual organism of bacterial canker and gummosis, or ring pox virus was found in literature on plant diseases of Pakistan.¹⁰

TABLE 1. AREA UNDER CULTIVATION AND FRUIT YIELD OF APRICOT IN WEST PAKISTAN AND N.W.F.P. DURING THE THIRD FIVE-YEAR PLAN PERIOD 1965-70.⁹

Year	West Pakistan		NWFP	
	Area (acres)	Yield (tons)	Area (acres)	Yield (tons)
1965-66	3495	9002	754	2379
1966-67	4434	11396	1224	3095
1967-68	5024	11978	1354	3165
1969-70	—	—	1376	5175

Coryneum Blight

Coryneum blight is quite common in Peshawar, Hazara, Murree, Poonch, Muzaffarabad and elsewhere in the apricot cultivating areas of N.W.F.P. Disease incidence is estimated at about 60-70 % of the total fruit received in the market during 1971. The disease is more severe in neglected orchards or in those where the air-drainage is poor. Economic losses due to the disease attack as such are not of much consequence except for rendering the fruit to be classified as low quality grade. However, the disease causes premature defoliation, resulting in weakened twigs and fruits, thereby preventing normal fruit development. Other common names used for coryneum blight are: shot hole, fruit spot, winter blight, and pustular spot.^{4,13}

Symptoms. Very small cankers (1 mm to 1.5 cm) are occasionally formed on small shoots and twigs. Brown spots occur on leaves. The affected parts soon fall out, leaving a shot-hole effect (Fig. 1). Young leaves sometimes develop disease lesions, which increase in size; a large portion of the leaf blade turns brown and is killed without developing the characteristic shot-hole effect. According to Samuel¹¹ the cell walls on the margins of spots develop lignin, the cells just beyond divide, and the new walls become suberized. The next step is abscission, which occurs by the dissolution of the middle lamellae between the two layers of cells bordering the lignified zone. No abscission, however, occurs under unfavourable moisture conditions. Leaf buds and flower buds are also affected and may be detected by canker colour as compared to normal buds. They may also have a shiny appearance due to the presence of a layer of exuded gum. The most distinctive and characteristic symptoms appear on fruits (Fig. 2). Small purple brown to reddish spots with light centers are usually formed on young fruits (fruits about 1.5 cm). The spots become roughened, are slightly raised above the fruit surface, and are more numerous on the upper sides of fruits as compared with the lower sides.

Morphology of the Casual Organism. The disease is caused by *Stigmina carpophila* (Lev.)^{7,8} an imperfect fungus belonging to the order Moniliales. *S. carpophila* has also been referred to as *Clasterosporium carpophyllum* (Lev.) Aderh., and *Coryneum bejerinckii*

Oud,^{3,7,8} Arising from leaf spots, and lesions on fruits and stems the fungus produces small sporodochia bearing conidiophores. Conidiophores are cylindrical, $14-15 \times 3-11 \mu$. Conidia are 3-6 celled, mostly 3-septate, slightly constricted at the septa. The conidia are olivaceous in colour, elongate-ovate to fusoid with obtuse ends, $21-57 \times 11-16 \mu$. Conidia germinate to give rise to hyaline septate hyphae.

Bacterial Canker and Gummosis

Canker formation and gum exudations occur in most stone fruits. However, these symptoms may be of different origins, and due to mechanical injury, insect attacks, and fungal or bacterial invasion. This disease is more common and severe in mineral deficient soils and poorly fertilized orchards. It is one of the most destructive for stone fruits.¹⁴ In favourable seasons, the injury may range from 33 to 76% on average trees or even 100% on weakened trees.⁵ In Pakistan, wherever apricots are grown, tree trunks and twigs are heavily damaged by such cankers and gum exudations. Cultural studies reveal that canker formation and gummosis on apricots in Pakistan is mainly of the bacterial origin. Other names given to such bacterial attacks are shoot blight, spur blight, sour sap, wither tip, dieback of stone fruits, bacterial spot of stone fruits, and blossom blight.

Symptoms. Circular to elliptical water-soaked lesions, which soon turn purple, brown or black, develop on sapwood and bark. The bark occasionally turns brown. Two types of cankers develop on twigs, viz. spring cankers and summer cankers. Spring cankers develop on delicate shoots at the time first leaves appear in spring. These start as small, dark water-soaked blisters, which dry out and grow into deep cankers (Fig. 3). Spring cankers persist through the following winter. Summer cankers are formed when the disease is already established on the leaves. They originate in the latter part of summer as water-soaked dark lesions, which soon get torn and form an open type of canker. From both the spring and summer cankers, gum exudes (Fig. 4) which is usually sour smelling. The gumming is more pronounced in humid seasons. No invasion on the root system could be detected. On leaves, the disease appears as small, irregular, brown, water-soaked dead spots. These sometimes have a tendency to fall out, giving a shot-hole effect. However, the shot-hole effect may be of many other different origins, and not necessarily always due to bacterial infection. Therefore, care should be taken in diagnosing the disease merely on the basis of this symptom. Affected leaves turn yellow and fall. The bacterial attack may cause considerable defoliation early in the season, which in turn reduces the fruit yield and quality. Small cankers are produced at the base of leaf and flower buds. Blighting of dormant buds is also quite common. On the fruit, numerous small, circular, sunken, brown spots appear, and pitting and cracking occurs near the spots. As the fruits mature, gum may be seen exuding from the injured areas. Symptoms on the fruits lower their quality grade, and make them especially susceptible to other decay organisms.

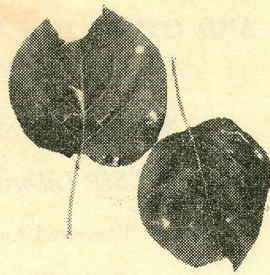


Fig. 1

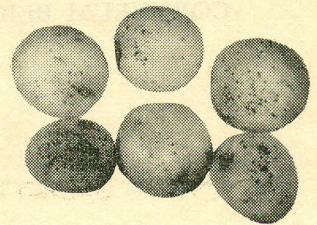


Fig. 2.



Fig. 4



Fig. 3

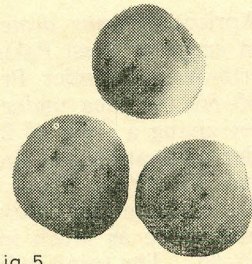


Fig. 5.

Fig. 1. Apricot leaves showing various shot-hole symptoms. Fig. 2. Coryneum blight symptoms on apricot fruits. Fig. 3. Bacterial canker on a shoot of apricot. Fig. 4. Bacterial gummosis on apricot. Fig. 5. Ring pox virus on apricot fruit.

Morphology and Cultural Characteristics of the Casual Organism. The casual organism is *Xanthomonas pruni* (E.F. Sm.) Dowson. Cultural studies reveal that the organism is a short rod, with rounded ends, occurring singly or in unbranched short chains. Rods are of the nonsporulating type, measuring $0.8-1.9 \times 0.3-0.7 \mu$. Rods are capsulate, capsules being formed after 250-hr incubation period. They are motile by one to several polar flagella, and are Gram-negative. The bacterium is also acid fast, aerobic, and produces yellowish pigment when grown under cultural conditions. This yellow pigment is not water soluble. The minimum, optimum, and maximum temperatures for growth are 7, 25, and 38°C respectively. The thermal end point is 51-52°C.

X. pruni overwinters in twig lesions and in terminal buds. With the advent of spring, the cankers enlarge and the bacteria are seen oozing out of these, from where they may spread to developing leaves, twigs, and young fruits.

Ring Pox Virus

Various surface blemishes on apricot fruits are caused by ring pox virus. Frequently, brown dead-spots are also present in the flesh. The disease is not very common in apricot growing areas of N.W.F.P.

Symptoms. The symptoms described here are essentially the same as those mentioned by Christoff.⁶ The infected trees show less vigorous growth when compared with healthy ones, and exhibit various types of mottling. However, in general, the mottling

is indistinct and consists of light green to yellowish green-brown blotches, which first appear after the leaves have attained full expansion. Christoff⁶ referred to this disease as 'broad-streak and ring spot verigation-plum pox', and described broad bands or stripes or a ring pox affect on the leaf blades. Fruits show the most characteristic symptoms of pox markings with discoloured gummy pulp underneath (Fig. 5). The disease causes an extensive fruit drop 30-40 days before ripening. The diseased fruits remaining on the tree ripen 10-15 days before the normal ripening period.

Transmission. The virus is transmitted by budding or grafting, but not seed or soil transmitted. The incubation period in the host is 9-13 months. An aphid vector, *Anuraphis helierissii*, is the cause of natural spread of the disease in Bulgaria and Yugoslavia.⁶

Acknowledgements. Acknowledgements are due to Mr. Akbar Khan, Assistant Statistical Officer, Office of the Director of Agriculture, Peshawar, N.W.F.P., for help in collecting the apricot production data.

References

1. S. Ahmad, *Fungi of West Pakistan* (Biological

- Society of Pakistan, Government College, Lahore, 1956) monograph No. 1, p. 1.
2. S. Ahmad, *Fungi of West Pakistan* (Biological Society of Pakistan, Government College, Lahore, 1969), suppl. 1, monograph No. 5, p. 1.
3. H.W. Anderson, *Diseases of Fruit Crops* (McGraw Hill, New York, 1956), p. 229.
4. E. J. Butler, and S.G. Jones, *Plant Pathology* (McMillan, London, 1955), p. 776.
5. K.S. Chester, *Nature and Prevention of Plant Diseases* (McGraw Hill, New York, 1950), p. 268.
6. A. Christoff, *Phytopathol. Z.*, **11**, 360 (1938).
7. M.B. Ellis, *Pap., C.M.I.*, **70**, 1, (1958).
8. M.B. Ellis, *Mycol. Pap., C.M.I.*, **72**, 1 (1959).
9. A.H. Khan, Personal Communication, (1971).
10. R. Mirza, A. Kazi and H. Huque, *Tech. Docum. FAO Plant Prot. Comm. S.E. Asia*, **43**, 1(1965).
11. G. Samuel, *Ann. Bot.*, **41**, 375 (1927).
12. West Pakistan Agricultural Statistics (Series No. 2, Fruits and Vegetables), Department of Agriculture, Government of Pakistan.
13. E.E. Wilson, *Calif. Agr. Expt. Sta. Bull.*, **608**, 1, (1937).
14. E.E. Wilson, *Bacterial Canker of Stone Fruits.* (U.S. Dept. Agri. Yearbook, 1953), p. 722.