



ETIOLOGY AND OCCURRENCE OF VALSA APPLE CANKER IN JAMMU & KASHMIR STATE

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Apple (*Malus domestica* Borkh.), a predominant fruit crop of Jammu & Kashmir State, is grown on an area of 1,19,041 ha and contributes towards 65% of the total fruit produce of the State (Anonymous, 2008). In recent years apple trees have encountered a new problem in the form of various types of cankers which have assumed epiphytotic proportions in some pockets of Kashmir valley (Bhat *et al.*, 2009). The cankers inflict huge economic losses through girdling of limbs and branches, blightening and die-back of twigs and ultimately lead to the death of either whole or part of the tree (Jones and Aldwinkle, 1990). In view of the alarming damage by canker diseases on apple trees, a preliminary study was undertaken to assess the canker status in Kashmir valley and to identify the causal pathogen.

Apple orchards at different locations in three major apple growing districts of Kashmir valley, viz., Baramulla, Pulwama and Budgam, were surveyed in 2006 and 2007 in August-September to record the prevalence and intensity of canker diseases. Three locations in each district were selected with 5 villages/location and 5 orchards/village. Besides main trunk, three scaffold branches (limbs) and nine fruiting wood (branches/twigs) for each of the ten randomly selected trees were examined to assess canker incidence and intensity. The canker intensity on branches/twigs was assessed on 0–5 scale (Crosse, 1957) with slight modifications; wherein 0 = no incidence; 1, 2 and 3 represent 0.1-10, 10.1-20.0 and 20.1-30.0% surface area of branch/twig diseased, respectively; 4 = either 0.1-40.0% surface area of branch/twig diseased or one side of branch/twig showing partial girdling; and 5 = either >40.0% surface area of branch/twig diseased or complete girdling of branch/twig with branch above girdled portion completely dead. The pathogen responsible was isolated from canker-infected wood as per the standard method (Wilkinson, 1945; Proffer and Jones 1989). Single spore isolates, obtained by the transfer of germinating spores individually onto oat meal agar medium, were used for various studies. The pathogenic nature of fungus was established on one year potted apple saplings cv. “Red Delicious” by inserting 4 mm mycelial disc inside 5 mm “T” shaped flap on potted saplings and wrapped with paper tape. The uninoculated twig served as control.

The canker disease was observed in all the surveyed locations with varying degrees of prevalence. The canker incidence ranged from 8.4 to 25.0%, and intensity from 4.0 to 12.3%. Among the locations surveyed Keller and Shopian orchards exhibited maximum canker incidence of 25.0 and 20.1% and intensity of 12.3 and 11.7%, respectively; while it was minimum at Sopore with incidence and intensity of 8.4 and 4.07%, respectively (Fig. 1). High canker incidence at Keller and Shopian could probably be attributed to low temperature injuries inflicted on tree parts as these locations experience severe winter than other sites. Sakuma (1990) observed that the sites prone to winter injuries are more vulnerable to cankers caused by *Valsa sacculans* and *V. ambiens*.

The canker was noticed only on twigs and branches originating around the stubs created during pruning and fruit and leaf scars. The twig infection initiated as sunken discoloured areas which darkened with age leading to the death of twigs without producing any conspicuous canker symptom. However, infection of small branches caused vertical cracks and splits which lead to the death of branches. Conspicuous canker symptoms produced on major branches initiated as small water-soaked

pale yellow areas, which later turned brown and became brittle (Plate 1). Downward elongation of canker resulted in the formation of sunken areas which usually girdled the branch. The dead branches/twigs were usually studded with numerous black pin-head like pycnidia, exuding yellowish spore tendrils under moist conditions. Zeller (1924) and Gupta and Agarwal (1973) observed almost identical disease symptoms under natural conditions of disease development.

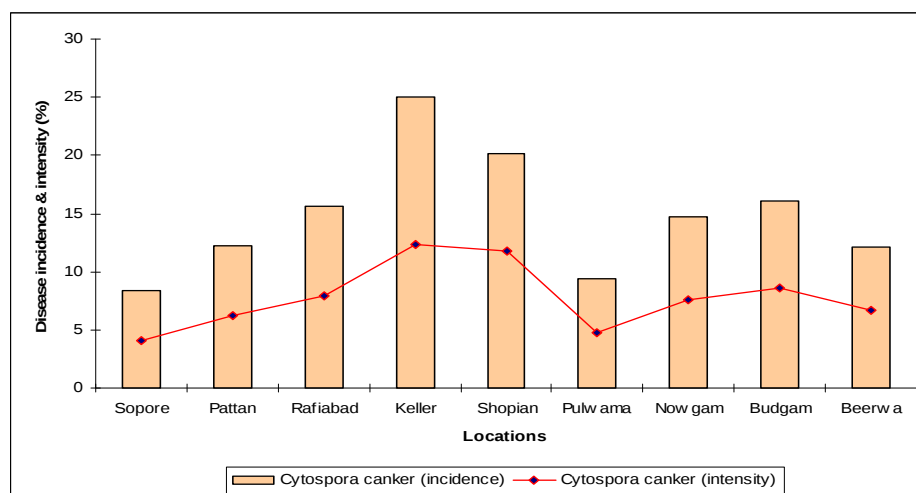


Fig. 1: Incidence and intensity of Cytospora canker at various locations in 2006 & 2007 (pooled)

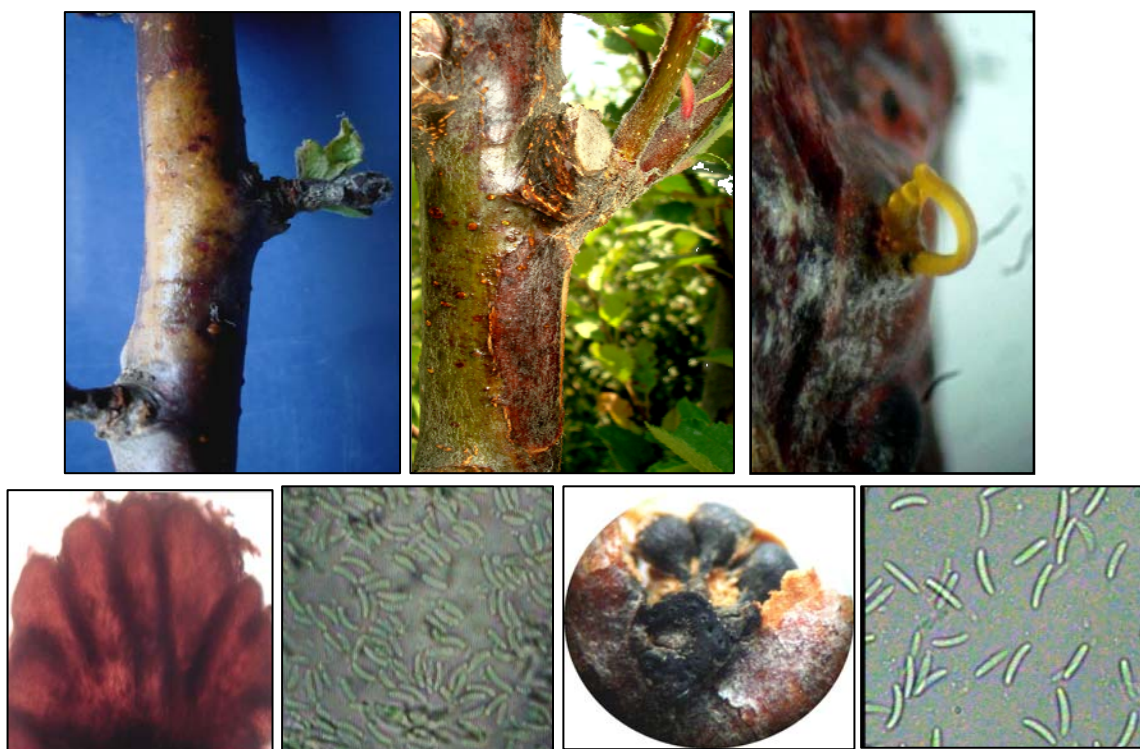


Plate 1: (1st row, left to right) i) yellowish water-soaked area of Valsacanker on apple twig; ii) downward elongation /brownish brittle area; iii) yellowish conidial ooze from pycnidia on host twig; (2nd row, left to right) i) multi-locular pycnidium; ii) conidia, iii) prethecia with ostiolar necks; and iv) ascospores

The fungus produced dirty white to light buff coloured colonies with sub-merged and sparse aerial mycelium. The pycnidia measuring 473.5-512.8 µm in size were black, globose to sub-globose, erumpent, multilocular, incompletely separate opening with a common central pore into adjacent chambers. The conidiophores (22.8-36.1 x 1.5-3.0 µm) were hyaline, mostly aseptate, cylindrical and irregularly branched. Conidia (2.6-5.7 x 0.8-1.0 µm) borne singly at the apex were hyaline, smooth and allantoid. The pararethical stroma observed in nature in clusters of 8-10 arranged into two whorls each with a slender ostioler neck converging through circular peritheical disc were black, globose to sub-globose or oblong and measured 460-510 µm in size. Asci (45.6-68.4 x 7.8-12.2 µm) were hyaline, clavate, unitunicate and eight spored, separated by filiform paraphysis. The ascospores (13.3-20.9 x 3.4-4.2 µm) were hyaline, smooth, unicellular and allantoids (Plate 1). The morphological features of anamorph and teleomorph were compared with the descriptions given in the literature (Ellis and Ellis, 1981; Hayova and Minter, 1998). The anamorph was identified as *Cytospora ambiens* (Pers. Ex. Fr.) Fr. and teleomorph as *Valsa ambiens* (Pers. Ex. Fr.) Fr. The culture was deposited in ITCC-IARI, New Delhi under accession No. 7387.09. *Valsa* spp. have previously been reported to cause apple cankers in tropical and sub-tropical regions of the world (Saccardo, 1884; Leonian, 1921) including Himachal Pradesh, India (Gupta and Agarwal, 1973) but, is *hitherto* unreported from Jammu and Kashmir State (India) and is a new record from the state.

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