

Breakdown of resistance in Surajmukhi cultivar of chilli or red pepper (*Capsicum annuum*) to bacterial wilt caused by *Ralstonia solanacearum*

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Bacterial wilt incited by *Ralstonia solanacearum* (Syn. *Pseudomonas solanacearum* E. F. Smith) is the most devastating disease in the tropical and subtropical regions of the world. In India, this disease is wide spread in the states of Karnataka, Kerala, Maharashtra, Goa, Orissa, Bihar and West Bengal causing yield losses upto 90.6 per cent (Kishun, 1987). In Kangra valley and surrounding areas of Mandi district of Himachal Pradesh, the cultivation of solanaceous vegetable like tomato, eggplant, capsicum, chilli, potato, etc. has suffered great setback due to the prevalence of this disease. On chilli or red pepper (*Capsicum annuum*) this disease was first reported in India by Khan et al. (1979). In Dargeel and Bhawarna villages of Kangra district, it was reported in mid 1981 (Sood and Singh, 1993) where it remained sporadic till 1985 but has since become endemic in Kangra and surrounding districts of Mandi and Kullu. The disease has also been reported from Solan district (Gupta et al., 1998). Race I biovar III of *R. solanacearum* is prevalent in Himachal Pradesh (Kalha and sood, 1994).

The bacterial wilt disease is difficult to manage because of its wide host range, exceptional ability of the pathogen to survive in the roots of non host plants and soil, susceptibility of commercial cultivars and non feasibility of chemical control. Great emphasis on stable sources of resistance and other alternative measures such as biological and cultural control has been laid. Resistance to bacterial wilt is rarely available and is known to be sensitive to high temperature and rainfall. It breaks down in areas where aggressive strains of the pathogen or root knot

nematodes along with bacterium are present. Moreover, genes governing resistance to bacterial wilt are known to be linked to horticulturally undesirable traits. Nevertheless, the use of resistant cultivars is the most simple, effective and widespread method of control as well as core of the integrated management strategies.

'Surajmukhi', a popular cultivar of chilli was identified as resistant to bacterial wilt and released for commercial cultivation in different wilt prone areas of Himachal Pradesh by the CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur in 1993. Since then it is widely cultivated in different parts of Himachal Pradesh because of its desirable horticultural traits such as high yield due to its fruit bearing habit in clusters in the upright position, complete withstanding to bacterial wilt and fungal fruit rots, attractive red colour of ripe fruits and high degree of pungency. The other commercial cvs. like Kullu Local, Kangra Local, Chamba Local, etc. are comparatively poor yielders and susceptible to bacterial wilt.

During a survey of the vegetable growing areas conducted during July-August, 2003, the mature fruit bearing plants of this cultivar were found to have succumbed to bacterial wilt in lower parts of kangra valley namely Kachhiari, Balla, Kotkwala, Jamanabad, Sunehar, etc. from where this disease was reported to occur for the first time in Himachal Pradesh by Sood and Singh (1993). The weather conditions in the affected area during the survey were very sultry with high temperature (> 40°C) and high RH (>90%). Contrarily, in upper areas of Kangra

valley viz. Palampur and lower Kullu valley (Jhiri and Bajaura) with elevation > 1000m asl, usually experiencing mild summer (temperature not exceeding 34-35°C), no wilt was observed on this cultivar although the soil at these places is heavily infested with the bacterial inoculum as was evident from the fact that the susceptible Kullu Local variety each of chilli and *C. annuum* (bell pepper) growing in nearby farmer's fields at Jhiri suffered as high as 100% wilt incidence.

The wilted plants of 'Surajmukhi' were brought to the laboratory and examined microscopically for the presence of bacterial ooze. Profuse ooze was seen from the affected plant parts especially tip of branches and fruits borne on such plants. The causal bacterium could easily be isolated on TZC medium (Kelman, 1953) producing typical virulent colonies having fluidal white, irregular, shining and convex growth with pinkish centres. The Gram's staining reaction revealed the presence of typical gram negative rods. The biochemical studies (Haywards, 1964) revealed that the bacterium was able to oxidize two disaccharides (maltose and lactose) and two sugar alcohols (mannitol and sorbitol) and thus the existence of race 1 and biovar III of *R. solanacearum* was confirmed. The survival of 'Surajmukhi' against wilt in comparatively cooler regions of Kangra and Mandi districts indicates the role of extreme environmental conditions in the breakdown of its resistance. These observations led to the conclusion that the resistance broke down under conditions favourable for disease development. These observations are supported by the statement of Vaughan (1944) that plants with incipient infections by *R. solanacearum* might remain apparently free

from wilt throughout the season and produce profitable crops of fruits if the proper sequence of climate prevails. In the absence of other suitable wilt resistant cvs., the breakdown of resistance of 'Surajmukhi' warrants timely identification of alternative wilt resistant cultivars as suitable replacements for the successful cultivation of chilli in wilt prone areas of Himachal Pradesh.

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