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REVIEW ARTICLE

BUD NECROSIS DISEASE- A SERIOUS THREAT TO WATERMELON CULTIVATION

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ABSTRACT

Watermelon, *Citrullus lanatus* (Thumb.) is an annual trailing creeper belonging to the family cucurbitaceae. The crop is considered to be a native of Africa. Its cultivation dates back to at least 4000 years by the Egyptians, whose artistic records remain even today.

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INTRODUCTION

Watermelon, *Citrullus lanatus* (Thumb.) is an annual trailing creeper belonging to the family cucurbitaceae. The crop is considered to be a native of Africa. Its cultivation dates back to at least 4000 years by the Egyptians, whose artistic records remain even today. World over watermelon is growing in an area of 3.69 million ha with an estimated annual production of 97.43 million tonnes and average productivity of 26.37 tonnes per ha. Leading producers in the world are China, Turkey, Iran, Brazil, USA, Egypt, Russian federation and Mexico. It is a major crop of various river beds in Uttarpradesh, Punjab, Haryana, Rajasthan, Bihar, Gujarat, Maharashtra, Andrapradesh and Karnataka. It occupies an area of about 20,000 ha with an annual production of 2.55 lakh tonnes and productivity of 12.75 tonnes per ha (FAO, 2014).

The major watermelon cultivars in our country comprises several introductions, viz., Asahi Yamato, New Hampshire Midget, Improved Shipper, Dexielce and released varieties such as Durgapura Meetha, Sugar Baby, Arka Manik and Hybrid Arka Jyothi (Rai et al., 2008). In recent days hybrid varieties developed by private companies are gaining popularity in India.

The major limiting factor in watermelon cultivation is low productivity due to diseases of diverse etiology. Viral disease is a serious problem in cultivation of cucurbits in India. A total of 14 viruses have been reported to infect watermelon naturally (Caciagli, 2008). Among them, *Cucumber green mottle mosaic virus* (Vani and Verma, 1993), *Watermelon bud necrosis virus* (Singh and Krishnareddy, 1996), *Papaya ring spot virus watermelon strain W*, *Watermelon mosaic virus 2* and

Cucumber mosaic virus (Dikova, 2005) were reported from India.

Watermelon bud necrosis disease (WBND) has emerged as a serious threat to watermelon cultivation in India recently. The occurrence of this disease in India has been reported by many of the workers. The first report of the disease was by Singh and Krishnareddy (1996). According to his report the extent of WBND was 39 to 100 per cent with an estimated yield loss of 60 to 100 per cent in Karnataka. Suresh et al. (2013) recently reported high incidence of WBND in Aurangabad and Paithan regions of Maharashtra.

Symptomatology

The symptoms induced by *Tospoviruses* are highly varied and include ring spots, line patterns, wilting, stunting, silvering, mottling, bronzing, chlorosis, necrosis and a range of leaf and stem lesions (German et al., 1992). Yeh et al. (1992) reported that the diseased plant shows symptoms such as mosaic, crinkling and yellow spotting on leaves, narrowing of leaf lamina and severe stunting of plant, upright growth of younger branches, tip necrosis and necrotic spots on fruits. Singh and Krishnareddy (1996) reported the disease first time in India and the symptoms described were crinkling, mottling and yellowing of leaves, necrotic streaks on vines, shortened internodes, upright branches and necrosis and dieback of buds. Bhanupriya (2006), recorded the symptoms as mosaic on leaves, stunted growth and shortened internodes on stem, un-opening of flower buds, bud necrosis, longitudinal brown necrotic streaks on vines, tendrils, petioles and fruit stalks.

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Bud necrosis symptom in watermelon

Causal agent

Watermelon bud necrosis virus belongs to genus *Tospovirus* and family *Bunyaviridae* (German *et al.*, 1992). The virions are quasi-spherically shaped and enveloped particles of diameter varying from 80-120 nm (Moyer *et al.*, 1999). Further, in electron microscopic studies revealed that *Tospovirus* infected watermelon in India was, WBNV particles of roughly spherical in shape with a diameter ranging from 80 to 110 nm (Singh and Krishnareddy, 1966). The nucleocapsid protein gene of a *Tospovirus* infecting watermelon in India was cloned and sequenced. Sequence analysis showed that the gene was most closely related to those of *Watermelon silver mottle tospovirus* (WSMV) from Taiwan and *Peanut bud necrosis tospovirus* (PBNV) from India, the two definitive species of serogroup IV (Jain *et al.*, 1998).

Transmission

Mechanical transmission

Transmission is an important experimental tool to establish the etiology of viral diseases and plays vital role in disease spread. Yeh *et al.* (1992) reported the sap transmission of WBNV using phosphate buffer (pH 7.0) to *Chenopodium quinoa* and *Nicotiana benthamiana* and observed local lesions on *C. quinoa* and systemic symptoms as mottling and wilting on *N. benthamiana*. Singh and Krishnareddy (1996) extracted *Tospovirus* from leaves of watermelon showing bud necrosis symptom using 0.1 M phosphate buffer, pH 7.0, containing 0.02 M 2 mercaptoethanol. On mechanical inoculation of the extract local lesions were produced in cowpea cv. C-152 and systemic infection was produced on watermelon. Krupashanker (1998) reported 20 to 80 percent transmission of WBNV among different plant species. The virus produced chlorotic or necrotic lesions on *Vigna unguiculata*, *Cheenopodium amaranticolor* and *Nicotiana rustica*.

Vector transmission

Studies on virus-vector relationship are necessary to find out role vectors in transmission. Pittman (1927) first reported the transmission of *Tospoviruses* by thrips (Thysanoptera;

Thripidae). The transmission by infective adults while the acquisition of virus occurred during the larval stage of the insect was reported first by Linford (1932). Singh and Krishnareddy (1995) reported transmission of WBNV in watermelon by *Thrips flavus* Shrank (Thysanoptera: Thripidae). According to this report about 10-15 nymphs of *T. flavus* require 3-4 days acquisition access period and 15-20 days of inoculation access period to transmit the virus successfully. Krupashanker (1998) recorded 30 per cent transmission of WBNV in watermelon plants by *Thrips palmi* Karny. According to the report, after the thrips inoculation 30-40 days was taken for the expression of symptoms. Sreekanth *et al.* (2006) reported that adults of *T. palmi*, could not acquire the virus, while their larvae could acquire. On the other hand, acquired larvae could not transmit the virus, and only freshly emerged adults from these acquired larvae could transmit the virus. According to this report *T. palmi* required two days acquisition access period during larval stage and two days inoculation access period in the adult stage for the virus transmission.

Symptomatology and transmission studies are the important experimental tools to establish the etiology of viral diseases and plays vital role in disease spread. Review studies based on these aspects on watermelon bud necrosis disease will be useful for further research studies in near future.

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