A Review on Early blight of Tomato menacing disease caused by Alternaria solani.

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Abstract: Alternaria solani is considered as the weed of field because of its wide adaptability under various field conditions. It causes numerous diseases to various plants and even causes huge economic loss to the farmers every year. Various techniques have been used to control this pathogen under various conditions from cultural to chemical management, certainly there is more hope for better results from these techniques. Hence by this we review various techniques that have been used by the management of this pathogen and what will be the future aspects for the management under field conditions. We have considered most of the techniques that have been currently used for the management by various researchers and they have got tremendous results. Various new techniques have been listed which provides better results viz., homeopathy and plant extracts.

Keywords: Alternaria solani, Early Blight, Homeopathy, Plant extracts, Management.

1. INTRODUCTION:

Tomato (Lycopersicum esculentum), which is also called as Nightshades that include more than 300 species belongs to the family Solanaceae. The other examples of different crops within the Nightshade family includes potato, tobacco, pepper & eggplants etc. Tomatoes were originated from the Andean region now which is presently called as Bolivia, Peru, Ecuador and Chili. Aztecs and Incas were first to cultivate the tomato in 700 AD, however, the origin of the tomatoes is unclear(ChitraMani & Kumar, P. (2020); Sharma, M., & Kumar, P. (2020); Chand, J., & Kumar, P. (2020); Naik, M., & Kumar, P. (2020); Kumar, P., & Naik, M. (2020); Kumar, P., & Dwivedi, P. (2020). In 16th century tomatoes were brought to India by Protuguese explorers. Although tomato plants have been attacked by a wide range of pathogens which are in soil and air borne in nature and causes huge economic loss every year in terms of crop production and monetary loss to farmers. Out of various diseases early blight of tomato is most devastating disease among all other diseases. It causes approximately tonnes of loss in crop production throughout the year and about 79% of total production loss throughout the world. In India it causes nearly about 72% of total production loss every year and about 1.36% of yield loss every year (Gomes et al., 2010). Early blight of tomato is caused by soil borne pathogen Alternaria solani (Agrios, 2005) this pathogen has various species which attacks different host plants viz., Alternaria solani (causing early blight in potato and tomato); Alternaria cucumeriana (causing leaf spot in cucurbits); Alternaria brassicae (causing damping off cabbage and broccoli etc); Alternaria citri(causes black rot on citrus); Alternaria japonica (causing blackspot disease in crucifers); Alternaria alternate (causing fruit spot in peppers) ; Alternaria burnsii (causing cumin blossom blight); Alternariara dicina (causing black rot of carrot); Alternari atriticina (causing leaf blight in wheat) (Agrios, 2005).This pathogen causes severe symptoms on leaves, stem, fruits and stalks as well. It produces concentric ring spots and later on fruits become macerated and shows severe infestation of Alternaria in plants (Martin and Hepperly, 1987). Like other plants tomato plants also have some important defence response against this diseases which help them to defend themselves against this pathogen. This defence responses involves various types of mechanisms which have been activated after the entry of this pathogen into the plant body (Agrios, 2005). This disease causes nearly 20-30% crop loss than potato crops (Shahbazi et al., 2010). The reason behind its devastating nature is that fungi also produces some mycotoxins which are the types of pathotoxin. Hence also produces the same symptoms when applied on plants as same symptoms produced by pathogen itself. They directly influence the pathogenicity of pathogen (Singh, V. 2015). It also has various toxins as well viz., AME (alternariol monomethyl ether), TEA (tenuazoic acid), AOH (alternariol), ALT (altenuen) (Logrieco et al., 2009; Liu et al., 1992).

These toxins are the secondary metabolites and are chemically and thermally stable compounds (Matic et al., 2010). Near about 70 mycotoxins have been reported that produced by this fungi under various conditions while invading different host (Battilani et al., 2009). It can survive both on living as well as on dead tissues that make it possible for this fungi to survive under harsh conditions and it’s widespread under natural conditions. It is also known as weed of fields because it can easily available in any kind of soil (Agrios, 2005). In some cases it has also been found to cause various post-harvest diseases in various crops causing spoilage of crops under storage conditions (Ostry, 2008). It produces majority of asexual spores (conidia) measuring between 160-200 micrometer long and is transversely as well as logitudinallyseptate (Rangel, 1945; Devi, P., & Kumar, P. (2020); Kumari, P., & Kumar, P. (2020); Kaur, S., & Kumar, P. (2020); Devi, P., & Kumar, P. (2020); Sharma, K., & Kumar, P. (2020); Kumar, S. B. P. (2020); Devi, P., & Kumar, P. (2020); Chand, J., & Kumar, P. (2020).

A new approach for the management of early blight:

Besides we kept using older techniques to prevent or manage early blight, we can rather approach some highly advanced and new techniques. These are follows;

1. Homeopathy: Homoeopathy is the one means that permitted in natural agriculture for the management of this disease. It helps to induce resistance within plants to defend their growth and production (Gomes et al., 2010). It has been seen that various medicines of homeopathy helps to protect the development of plants, seedling growth and seed germinations. With the treatment of various homeopathic medicines it has been seen that they reduced the disease severity by 72.8% (Gomes et al., 2010; Kumar, P. (2019); Kumar, D., Rameshwar, S. D., & Kumar, P. (2019); Dey, S. R., & Kumar, P. (2019); Kumar et al. (2019); Dey, S. R., & Kumar, P. (2019); Kumar, P., & Pathak, S. (2018); Kumar, P., & Dwivedi, P. (2018); Kumar, P., & Pathak, S. (2018).

2. Use of botanicals: Including these techniques for the management of early blight in tomato also the use of various botanicals have been recommended by various researchers. These include onions, ginger, garlic and neem plants for the extraction of various types of botanicals (Swami et al., 2013). According to a research it has been that plants treated with 50%, 75%, 100% concentrations of different botanicals helps to reduce disease incidence by 43.3% in an average (Mudyiwa et al., 2016). Other plant extracts have also been used for the management of this fungi viz., Canna indica, Ipomoea palmata, Menthapiperita, Lawsoniainermis, daturastramonium, Agremone maxicana and Convolvulus arvensis (Thakur, et al 2017.,). The use of neem leaves have been very prominent among all the botanicals. According to a research it has been that neem extracts inhibit the spore germination by 43.3% respectively under in-vivo conditions (Sharma et al., 2007). In some other studies various botanicals have been extracted to be used against this pathogen to check its effect on spore germination and other growth parameters under field conditions. These includes use of Oliveria decumbens, Cinnamomum zeylanicum, Carumcopticum and Thymus kotschyanus (Bahraminejad et al., 2016). The extracts from these plants have been used from 1.0microlitre/ml to 0.25 microlitre/ml. The major oils in these extracts were thymol, myristicin, terpinene, cymene (Bahraminejad et al., 2016; Kumar et al.,2018; Kumar, P., & Hemantaranjan, A. (2017); Dwivedi, P., & Prasann, K. (2016). Kumar, P. (2014); Kumar, P. (2013); Kumar et al. (2013); Prasann, K. (2012); Kumar et al. (2011); Kumar et al. (2014).

3. Use of bio-agents: Besides these various plants extracts various bio-control agents have also been used for the management of this disease. It has been seen that Trichoderma harzianum and Trichoderma koningii proved to be very effective against this fungi under field conditions when inoculated with these bio-agents at 2*106 spores per ml (Babuet al., 2000)

4. Chemical management practices: Various chemicals have also been used for the management of this disease viz., Thiram 75% proved to be very effective at 5000 ppm under field conditions (nayyar et al., 2014). It has also been seen that complete control of alternaria has been occured at 10000 ppm of Thiram 75% (Sahni and Singh., 1967). Dithane M-45 of 0.25% also inhibits the mycelial growth (Singh and prasad, 1989; Singh and Singh, 2006). It has also been seen that various growth regulators inhibits the mycelial growth viz., Indole Butyric acid and Napthalic acid at the rate of 200 microgram per litre of water (Datar, 1996). Various other fungicides viz., Chlorthalonil, Mancozeb, Hexaconazole and Azoxystribin when used at different concentrations viz., 1000, 500, 200, 100, 50 ppm under field conditions proved to be very effective against this pathogen and help to reduce its severity under various crops (Prasad and Naik, 2003; Singh and Singh, 2006). In one of the researches it has been found that Topsin-M proved that very effective against this pathogen when used at the rate of 0.2% under field conditions (katiyar et al., 2001). Under another research other chemicals viz., Indofil M-45, Indofil Z-78 and carboxin proved to be very effective against this fungi (Singh and Rai, 2003).

5. Other management practices: There are some miscellaneous methods which also have been used for the management of this pathogen. These include the use of marigold (Tageteserecta) which reduced the incidence of this pathogen by 40% (Rodriguez et al., 2003). It has also been seen that balanced nutrition provide better control over this pathogen under field conditions (Mamgain et al., 2013). In some other studies it has been found that various seaweed extracts by various concentrations proved to be very effective against Alternaria pathogen under field conditions. They respectively reduce the fungal growth by 84-94% under different concentrations (Chanthini et al., 2012).

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