


AN OVERVIEW ON COTTON ALTERNARIA LEAF SPOT AND IT'S MANAGEMENT

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ABSTRACT: Cotton is one of the most important commercial crops of the world and is affected by many diseases. Among them cotton Alternaria Leaf Spot is most commonly occurring disease in the Andhra Pradesh. Initially symptoms appeared on leaves later spread to the stem leads to cracking and breaking of the stem. The favourable conditions for this disease are wide range of temperatures and prolonged high humidity and frequent rains. Among fungicides combination of propiconazole+mancozeb and biocontrol agents *Trichoderma viride* gives maximum protection against Alternaria Leaf Spot of Cotton. Whenever necessary this combination fungicide and *Trichoderma viride* should be recommend to the farmers.

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Copyright: ©2016 Venkatesh I. This is an open-access article distributed under the terms of the Creative Commons Attribution License , which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited**INTRODUCTION**

Cotton is one of the most important commercial crops of the world, which belongs to the botanical family "Malvaceae". Cotton is referred to as "King of Fibres" and also known as "White Gold". It provides livelihood to about 60 M people and is an important agricultural commodity providing remunerative income to millions of farmers both in developed and developing countries. India is the largest cotton growing country in the world with an area of around 11.7 M ha followed by China (5.3 M ha). Cotton production of India is 25.5 M bales of 170 kg and productivity is 475 kg ha⁻¹. Andhra Pradesh stands third in area with 2.27 M ha and production of 7.20 M bales but sixth in productivity with 496.39 kg ha⁻¹ during 2012-13 (AICCIP, 2013).

Economic Importance

Cotton crop is affected by fungal, bacterial and viral diseases. In India, foliar diseases (fungal, bacterial and viral boll rot) have been estimated to cause yield losses up to 20 to 30% (Mayee and Mukewar, 2007). Among fungal diseases, leaf spot/blight caused by *Alternaria macrospora* Zimm. is the most commonly occurring disease in Andhra Pradesh. Under favourable conditions, losses to the tune of 26.59 % (Monga *et al.*, 2013) and 38.23% (Bhattiprolu and Prasada Rao, 2009) were recorded.

Geographical Distribution

Jehle and Wood (1926) reported severe outbreak of cotton leaf spot caused by *Alternaria* sp. in Salt River valley of Arizona. Hopkins (1931) recorded the occurrence of *A. macrospora* was for the first time from South Rhodesia. The occurrence of *A. macrospora* mainly on older leaves of carcabat and acala varieties of cotton in East Africa (Bigi, 1954). Rane and Patel (1956) observed for the first time cotton Alternaria leaf spot in transitional belt of Dharwad and also in Poona and Ahmednagar district of Maharashtra on Co-4-B-40 cotton variety.

Srinivasan and Kanan (1974) reported the occurrence of both *Myrothecium* and *Alternaria* leaf spots of cotton in South India. Chopra and Sharma (1976) observed that cotton leaf spot caused by *A. gossypina* was common in Northern India. Severe incidence of *Alternaria* leaf blight and grey mildew was recorded during August to September and October to November months, respectively, while bacterial leaf blight was severe during September to October (Harlapur *et al.*, 2004). In Northern Karnataka, *Alternaria* leaf spot incidence was found to be more in Dharwad district (Hosagoudar *et al.*, 2008).

Symptomatology

The main part affected is the leaf on which small, dull to dark brown, circular or irregular shaped spots appear, varying in diameter from 0.5 to 10 mm. They often develop concentric ridges with a target board appearance on the upper surface. Mature spots have dry, greyish centers which may crack and drop. The spots coalesce and occupy large areas of the leaf. Watkins (1981) observed dark chains of conidia on the spots. Veins of leaf may also be affected. Spots occur on the cotyledons which are severely affected. Cankers occasionally develop on the stem. In India, circular lesions develop on the bolls resembling those on the leaves. The seeds may get infected and carry the infection (Padaganur, 1979). (Fig-1 and 2).

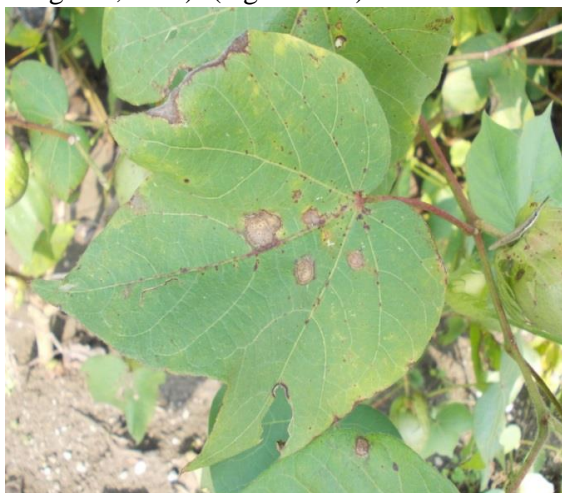


Fig-1: Symptom on the leaf



Fig-2: Symptom on the stem

Epidemiology

The pathogen survives in infected plant debris during off season. *A. macrospora* becomes seed borne both internally and externally to the extent of 50% and 100% respectively. The ability of pathogen to sporulate under a wide range of temperatures and prolonged high humidity and frequent rain promote the disease. The pathogen infects all the four cultivated species of *Gossypium* (Srinivasan, 1994).

Causal Organism:

Several species of *Alteranaia* infects cotton crop. Among those, *A. alternata* (Fr.) Keissler reported from India (Singh *et al.*, 1984).

Morphological characters:

Alternariamacrospora Zimmermann

The fungus produces dark mycelium in the culture. Conidiophores were dark brown, short or long, 1-8 septate and with solitary conidia at the apex. In the culture, the conidia measured on the average of $43.4 \mu \times 13.3 \mu$, in addition to the average length of the beak was 16.6μ , long beak is the characteristic feature of *A.macrospora* (Vasudeva, 1960).

Alternariaalternata (Fr.) Keissler

The fungus produces initially white coloured mycelium, later at maturity it becomes dark coloured in culture plates. Conidiophores and conidia are golden brown. Conidiophore is simple, straight or curved, 1-3 septate, $50 \times 3-6 \mu$ with one to several apical scars. Conidia often in long branched chains, ovoid, obclavate, obpyriform, rarely ellipsoidal, with or without a short, conical or cylindrical apical beak not exceeding one third the length of conidium, smooth walled or warty, singly constricted at 3-8 transverse septa, with one or two longitudinal septa at the lower part, $18-63 \times 7-18 \mu$ (Srinivasan, 1994).

***Alternariagossypina* (Thum.) Hopkins**

Dark brown conidia, borne in chains, 30-55x12-15 μ with beak of 9-53 μ long, with nine transverse and 2-3 longitudinal septa (David, 1988).

Favourable conditions

The earliest peak of sporulation, the longest infectious period and the highest production of *A. macrospora* spores of cotton occurred under relatively warm, cool, and medium temperature regimes, respectively (Rotem *et al.*, 1989). Ramegowda and Naik (2008) recorded the maximum radial growth of *Altrenaria* sp. of cotton (84 mm) at 100 per cent RH, when incubated in alternate dark / light cycles of 12 h each. Relative humidity of 90% to 100% was ideal for germination, growth and sporulation of *A. alternata* of cotton (Dickinson and Bottomely, 1980). High humidity, intermittent rains and moderate temperature of 25-28°C favours the disease incidence.

Management of Alternaria Leaf Spot of cotton:**Chemical control**

Bhaskaran and Shanmugam (1973) found that mancozeb was effective in reducing the infection of *A. macrospora* in cotton. Mancozeb completely inhibited the fungal growth even at a lower concentration of 500 ppm (Vihol *et al.*, 2009). Padmanaban and Narayanaswamy (1976) and Padaganur and Siddaramaiah (1979) reported that zineb, brestan, duter and hexaferb were most effective against *A. macrospora* in cotton.

Spraying 0.1% propiconazole protected cotton crop from Alternaria leaf spot and increased seed cotton yields by 67.34% (Bhattiprolu and Prasada Rao, 2009).

Savanur (1984) evaluated different systemic and non-systemic fungicides for the control of Alternaria blight disease in cotton and observed the lowest per cent disease index with mancozeb, which gave maximum kapas yield. Padaganur and Basavaraj (1987) reported that duter 0.2%, mancozeb 0.2%, cuman L 0.2% and 0.4% and copper oxychloride 0.3% reduced the disease index of leaf spot (*A. macrospora*) in Laxmi and MCU 5 upland cotton (*G. hirsutum*) while significant control of the disease was obtained using cuman L 0.4% and copper oxychloride 0.3%. Chattannavar *et al.* (2006) found that copper oxychloride (0.3%) and mancozeb (0.2%) was effective in controlling the Alternaria blight of cotton and gave maximum. The combination fungicide, captan + hexaconazole (Taqat) at 500 g/ha significantly reduced fungal foliar leaf spots and increased yield by 22% (Bhattiprolu, 2010).

Propiconazole 0.1% was found to lower Alternaria blight severity and increase cotton yield (Chattannavar *et al.*, 2010). Bhattiprolu and Prasada Rao (2009) obtained a reduction in Alternaria leaf spot severity by 39.15% and increase in yield by 16.7 q ha⁻¹ with five sprays of propiconazole 0.1% at 15 days interval between 35 and 95 DAS. Three sprays of taqat at 750 g ha⁻¹ was on a par with 0.1% propiconazole in controlling Alternaria leaf spot with BCR of 1.36 and 1.4, respectively (Bhattiprolu, 2010).

Biological control

T. viride and *P. fluorescens* isolate Pf1 significantly reduced Alternaria leaf spot (Chidambaram *et al.*, 2004). *Pseudomonas fluorescens* (CHAO) was effective against Alternaria blight of cotton (Chattannavar *et al.*, 2001). Gholve *et al.* (2012) recorded the highest inhibition (63.64%) of *A. macrospora* of cotton with *T. viride*.

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