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Review Article

REVIEW ON RED ROT MANAGEMENT IN SUGARCANE

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Abstract: Sugarcane, a vital crop for sugar and ethanol production, is highly susceptible to red rot caused by *Colletotrichum falcatum*. This disease significantly reduces yield and quality. Effective management strategies include using resistant varieties, crop rotation, sett treatment, biocontrol agents, plant extracts and fungicides. Integrated Disease Management (IDM) practices, combining these approaches, have proven most effective in reducing disease incidence and improving crop productivity. Sustainable implementation of these strategies is crucial for protecting sugarcane from red rot and ensuring consistent agricultural output.
Keywords: Sugarcane, Red rot, *Colletotrichum falcatum*, Management, IDM.

INTRODUCTION

Sugarcane is an important crop cultivated primarily for sugar and ethanol production. Sugarcane plays a vital role in global agriculture and the economy. Despite its robust nature, sugarcane is susceptible to diseases such as smut, rust and red rot that can have a major impact on both yield and quality. Among these, red rot is one of the most devastating diseases affecting sugarcane. It is caused by the fungus *Colletotrichum falcatum* Went. Red rot causes reddening and rotting of the interior tissues of the stalk. Red rot can be managed by integrated disease management strategies such as adopting resistant varieties, crop rotation, sett treatment and timely application of fungicides.

MANAGEMENT

Spread of sugarcane red rot attributed to the unrestricted movement of seed material, especially from endemic regions. Restriction on the transport of plant material from high-risk areas to disease-free zones prevents the spread of the disease [19]. Eliminating crop residues such as stubbles, dry foliage, and dried canes reduced the inoculum of red rot disease from the sugarcane field [11].

(A) Selection of varieties:

Selecting resistant varieties is one of the cost effective and eco-friendly tools in plant disease management. Varieties such as HOTH-325, CP-82-1172, S-2002-US-640, CP-81-1254, S-2002-US-452, CP-87-1128, S-2001-US-129, BF-138, S-98-CSSG-676, N-S-G-49, S-2002-

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US-312, SPF-244, S-2001-US-750, S-2002-US-637, S-2000-US-50, CP-87-1628, S-2002-US-133, N-S-G-555, S-98-CSSG-668 and S-2001-US-72 proved resistant towards *C. falcatum* [7]. Entries *viz*., N 144, N 66, SES 594, WS 18, N 197 and N 87 displayed resistant reactions [21]. Baragua, Koelz 11131 and Koelz 11132 of *S. officinarum*; 28 NG 251 and 57 NG 238 of *S. robustum*; Chin, Dhaur Kalig, Kansar, Maneria IMP-1552, Mungo 254, Nargori, Kewali-14G and Manga (SIC) of *S. barberi*; Reha, Ikhri and Kalkya of *S. sinense* found resistant [27]. Cultivars such as 2015A 230, 2015A 51, 2015A 233, 2015A 59, and 2015A 228 expressed resistance [25]. Genotypes *viz*., CoP16437, BO91, CoP17437, CoP17438, CoP9301, CoP16439, CoP17440 and CoSe16451 found resistant [13]. Genotypes/varieties *viz.*, CoP 16456, CoP 17436, CoP 17446, CoP 18437, CoP19436, CoP 20439 and CoP 16439 found resistant [22].

(B) Crop rotation/Inter cropping:

The red rot incidence can be reduced through sugarcane planting following the harvest of onion, garlic, coriander, linseed or mustard [11] Sugarcane crop rotation with rice controls the disease [3]. Lowest disease incidence (7.19%) and highest germination (28.24%) can be achieved in Sugarcane + Garlic intercropping [22].

(C) Sett treatment:

Hot water treatment of setts at 52°C for 30 min reduces the incidence of red rot [18]. Sett treatment with Carbendazim 50 WP at 0.1 percent for 15 min reduces the incidence and also enhanced the different cane parameters [4]. Treatment of Bavistin at 0.1% as sett dips for 30 min before planting prevents disease from penetrating through cut ends [11]. Sett treatment with two fungicides (Tebuconazole + Trifloxystrobin and Thiophanate methyl) result in >30% reduction in incidence [6]. Carbendazim 50 WP (0.5 g/l of water) or carbendazim 25 DS (1 g/1 of water) as a sett treatment before planting along with 2.5 kg of urea in 250 liters of water effectively reduces the disease [3].

(D) Application of biocontrol agents:

The PGPR strains of *Pseudomonas fluorescens* induce systemic resistance against *C. falcatum* and also enhanced sett germination, tillering and growth of the cane [26]. The *Pseudomonas putida* strain NH-50, reduces disease severity by 44 to 60 percent [5]. The *B. subtilis* shows complete inhibition of *C. falcatum* followed by P. *fluorescens* (94.13%) [12]. The *T. harzianum* shows a maximum inhibition of 84.4 percent [15]. At the time of planting, *Trichoderma* (20 kg/ha) mixed with 200 kg of sterilized decomposed press mud/FYM reduces the inoculum and

creates systemic resistance [28]. The *T. harzianum* (TPU-1) shows the highest inhibition (60.05%) [13]. The *Bacillus subtilis* shows maximum inhibition (69.4%) [16].

(E) Application of plant extracts:

The maximum suppression (90.93%) of red rot can be exhibited by Fenugreek extracts at all (5, 10 and 20%) concentrations [12]. Tulsi extract expresses maximum inhibition percent (74.72, 85.74, and 92.59%) at 5, 10, and 15 percent concentrations, respectively [2]. The *Withania somnifera* extract expresses the maximum inhibition (65.31%) [14]. Neem extract at 15 percent concentration shows the maximum inhibitory potential (93.25%) [24]. Essential oils *viz*., peppermint oil and lemon grass oil completely inhibit the growth at concentration of 10µl [1].

(F) Application of chemicals:

Treatment with thiophanate methyl and *P. fluorescens* against red rot exhibits maximum survival of the sugarcane plant (81.67%) [9]. The highest disease suppression up to 86 percent observed with sett treatment + soil drenching of thiophanate methyl at 45 DAP [8]. Fungicides *viz*., benomyl, tebuconazole, metalaxyl, and propiconazole completely inhibit the growth at all concentrations i.e., 5, 10, 20, 50 µg/ml [23]. Thiophanate methyl exhibits complete inhibition of the red rot pathogen at 10 ppm concentration [10]. Thiobendazole, streptocycline and carbendazim show complete inhibition of the mycelial growth at 1000 ppm concentration [17]. Complete inhibition can be achieved with Azoxystrobin + Tebuconazoleat at 200 ppm concentration [13]. Carbendazim completely inhibits the growth of *C. falcatum* (CF 01) at all four concentrations (5, 10, 20, and 30 ppm) [22].

(G) Integrated Disease Management:

Reduced red rot incidence, enhanced growth parameters and quality attributes of sugarcane can be achieved in IDM practices i.e. Furrow application of *T. viride* mixed culture (TMC) multiplied on 20 kg FYM mixed with 200 kg FYM + sett treatment with Moist Hot Air at 54^{o}C for 150 min + sett dipping in carbendazim at 0.1 percent for 60 min + application of *T. viride* mixed culture (TMC) at the time of bud sprouting (ratoon) [20]. Lowest red rot incidence (4.26, 4.54, and 4.65%) at 90, 105, and 120 DAP in integrated practices i.e. sett treatment + drenching + spraying with carbendazim 50 WP at 1g/l + furrow application with borax at 10 kg/ha + Zinc sulphate at 25 kg/ha [22].

CONCLUSION

Sugarcane, an important crop for sugar and ethanol production. Effective management of red rot disease is essential to sustain yield and quality. Strategies such as the adoption of resistant

varieties, crop rotation, sett treatment, biocontrol agents, plant extracts and the application of fungicides have shown promising results in reducing red rot incidence. Integrated Disease Management (IDM) practices, combining multiple approaches, offer the most effective solution to minimize disease impact, enhance growth parameters, and improve sugarcane quality.

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