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ASSESSMENT OF *LECANICILLUM LECANII* (ZIMMERMEN) AGAINST SUCKING PESTS IN BT COTTON

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ABSTRACT

An on-farm trial on the assessment of *Lecanicillum lecanii* (Zimmermen) on management of sucking pests in cotton on farmer's fields was conducted by the Krishi Vigyan Kendra, Kampasagar during kharif 2015 to 2017. Three sprayings of *L. lecanii* @ 5 g/ l from 25 DAS (days after sowing) at an interval of 10 days were taken up. Incidence of leaf hopper *Amrasca biguttula biguttula* (Ishida), thrips *Thrips tabaci* (L.) and whitefly *Bemisia tabaci* (Genn) were observed as counts three leaves. Significantly less incidence i.e. 2.9, 4.3 and 4.5, respectively, was observed in improved practice (spraying of entomopathogenic fungi *L. lecanii* @ 5 g/ l three times with an interval of 10 days from 25 DAS) as against farmers' practice (i.e. 4.9, 9.0 and 7.9, respectively). Seed cotton yield was significantly more with improved practice (2335.7 kg/ ha) with 18.9% increase. Higher gross and net returns, and benefit cost ratio were obtained with improved practice.

Key words: Cotton, on farm trial, *Lecanicillum lecanii*, *Amrasca biguttula biguttula*, *Thrips tabaci*, *Bemisia tabaci,* yield, gross returns, net returns, benefit cost ratio

Cotton (*Gossypisum hirustum* L.) is one of the most important cultivated commercial crop in India which is subjected to the ravages of a number of insect pests. The insect pest spectrum of cotton is quite complex with 1326 pests, of which in India, 162 insect pests had been reported with 24 species attaining pest status (Dhawan, 2000; Puri, 1998). These cause yield losses up to 30-80% and it is a major limiting factor (Sundaramurthy, 1985; Kranthi et al., 2009). The major ones are the boll worms and sucking pest complex. Sucking pests cause significantly more damage, and these include leafhopper *Amrasca biguttula biguttula* (Ishida), thrips *Thrips tabaci* (L.) and whitefly *Bemisia tabaci* (Genn). Estimated yield losses are to an extent of 21.2% (Dhawan and Sindhu, 1986), 28.13% (Chavan et al., 2010) and 33.02% (Tukaram et al., 2017). In conventional methods of pest management, dependence on widespread use of chemical pesticides has resulted in environmental pollution and human health hazards (Perry et al., 1998). Continuous and indiscriminate use of pesticides results in ability of sucking pests to develop resistance, requiring ecofriendly measures (Koul, 2008). Microbial biopesticides reduce pesticide load and entomopathogenic fungi preferably decrease human toxicity, with low persistence in the environment (Isman et al*.,* 2001), more biodegradable and less toxic to humans and natural enemies (Isman, 1984). Entomopathogenic fungi play an important role in IPM especially against sucking pests i.e. aphids and whiteflies in vegetables (Saito and Sugiyama, 2005; Singh and Kaur, 2020), and thrips, mites, aphids, whiteflies and mealybugs (Khan et al., 2012). *Beauveria bassiana* (Balsamo), *Metarhizium anisopliae* (Metsch) and *Lecanicillium lecanii* (Zimmerman) are the major entomopathogenic fungi (Daniel and Wyss, 2010; Shah and Shukla, 2014). *Lecanium lecanii* is the most effective entomopathogenic fungi against all stages of the sucking pests and is available in liquid and powder formulations. It is effective for the control of sap feeding pests like aphids, whiteflies, scale insects, thrips, mealy bugs (Kanagaratnam et al., 1982). The mode of action of *L. lecanii* is of contact with host integument, it gets adhere to the epicuticle, germinate and internal colonization which results in death of host insect (Rabindra and Ramanujam, 2007). *Verticillium lecanii* was found more effective against sucking pests (Wadhani et al., 2020; Ghelani et al., 2014); NSKE 5% and *V. lecanii* 0.5% (Gore et al., 2021) in cotton, aphid and jassid in okra (Janghel et al., 2015; Suraj et al., 2016). The use of such microbial formulations are ecofriendly and safe to human beings (Singh and Kaur, 2020). Hence, this study to assess the effectiveness of the *L. lecanii* on sucking pests in cotton at Nalgonda District.

Table 1. Efficacy of *Lecanicillum lecanii* against sucking pests of Bt cotton- improved *vs* farmer's practice (kharif 2015 to 2017)

Year	Improved practice			Farmers practice			Yield (kg/ha)		% increase of yield over the control	Gross returns (Rs/ha)		Cost of cultivation (Rs/ha)		Net returns (Rs/ha)		B:C ratio	
	Leaf hoppers/ 3 leaves	Whiteflies/ 3 leaves	Thrips/ 3 leaves	Leaf hoppers/ 3 leaves	Whiteflies/ 3 leaves	Thrips/ 3 leaves	Improved practice	Farmers practice		Improved practice	Farmers practice	Improved practice	Farmers practice	Improved practice	Farmers practice	Improved practice	Farmers practice
2015-16	1.4	2.6	2.6	4.8	9.0	7.2	2107.0	1694.0	18.4	79276.2	60136.4	36706.0	37702.0	42570.2	22434.4	2.2	1.6
2016-17	1.4	2.4	2.0	3.4	9.2	6.6	2175.0	1762.5	23..4	101375.0	80362.5	64750.0	41275.0	36625.0	39087.5	2.8	2.1
2017-18	6.0	7.8	8.9	6.5	8.7	9.8	2725.0	2437.5	10.4	115450.0	100362.5	41412.5	42950.0	74037.5	57412.5	2.8	2.3
Mean	2.9	4.3	4.5	4.9	9.0	7.9	2335.7	1964.7	18.9	98700.4	80287.1	47622.8	40642.3	51077.6	39644.8	2.6	2.0

MATERIALS AND METHODS

The experiments were carried out by the Krishi Vigyan Kendra, Kampasagar in farmer's fields of Nalgonda District, Telangana during kharif 2015 to 2017. During the study period, 5 farmers were selected in each season under on farm trials. The improved technology comprised of spraying of *L. lecanii* @ 5 g/ l at 25 days after sowing (DAS) as three sprays with an interval of 10 days. Whereas farmers' practice includes use of insecticides like monocrotophos @ 1.6 ml/ l and acephate @ 1.5 g/ l at various stages of crop growth period. Observations were recorded on population of sucking pests- *A. biguttula biguttula, T. tabaci,* and *B. tabaci* on three leaves (upper, middle and lower) each on five randomly selected plants in each field. Seed cotton yield was also recorded and economics were worked out.

RESULTS AND DISCUSSION

Efficacy of improved practice of spraying entomopathogenic fungi *L. lecanii* @ 5 g/ l three times at an interval of 10 days from 25 DAS vs farmers practice is presented in Table 1; these data reveal significantly less incidence of *A. biguttulla biguttula*, *B. tabaci* and *T. tabaci* (2.9, 4.3 and 4.5, respectively) in improved practice, during kharif 2015-2017. These results agree with those of Gore et al. (2021) on the application of NSKE 5%+ *V. lecanii* @ 0.5%. Sasikumar et al. (2018) reported that *L. lecanii* @ 5 g/ l was highly effective against thrips in cotton. Ghelani et al. (2006; 2014) found that *V. lecanii* @ 5 g/ l was effective against *Aphis gossypii*; and *V. lecanii* @ 2.5 kg/ ha combined with azadirachtin @ 0.0009% were found moderately effective against major sucking pests of Bt cotton. Raghunandan et al. (2018) observed that sucking pests in cotton get reduced significantly with spraying of *V. lecanii* @ 4 g/ l. Hole et al. (2015) observed effectiveness of *V. lecanii* (2×10^{12}cfu/g) @ 2000 g/ ha against sucking pests in Bt cotton. Wawdhane et al. (2020) also observed such effectiveness. Whitefly incidence reduced with spraying of *V. lecanii* @ 3 g/ l in cotton (Ritasharma and Sudha, 2017), and *V. lecanii* @ 7 g/ l gave higher mortality of jassids in okra (Baladaniya et al., 2010). The cotton yield in improved practice ranged from 2107.0 kg/ ha to 2725.0 kg/ ha over farmers practice of 1694.0 kg/ ha to 2437.5 kg/ ha. Similar results were obtained by Raghunandan et al. (2018) and Patil et al. (2012) with *V. lecanii*, as also observed by Harischandranaik and Shekharappa (2009); maximum gross returns of Rs. 98,700/ ha, net returns of Rs. 51,078/ ha and benefit cost ratio 2.6 were observed with such an improved practice. These results agree with those of Raghunandan et al. (2018) and Patel et al. (2019). Meena et al. (2013) obtained maximum cost benefit ratio with application of *V. lecanii* in mustard.

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