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SHORT NOTE

Field efficacy of Myco-jaal, an oil based commercial formulation of *Beauveria bassiana* (Deuteromycotina:Hyphomycetaceae) against mango inflorescence hopper, *Idioscopus nitidulus* (Walker).

M. S. PRABHAKARA, S. K. GHOSH and MALVIKA CHAUDHARY

Bio-control Research Laboratories, A R&D division of Pest Control India private Limited
36/2, Sriramanahalli, Rajanakunte, Bangalore - 561 203, India.
E-mail : prabhakara.ms@pcil.in

Mango is an important subtropical fruit, with high commercial value in both national and export markets. Like other tree crops, mango is also attacked by several pests that directly or indirectly affect the mango production in all mango growing countries (Tandon and Verghese, 1985). The mango hoppers, *Amritodus atkinsoni* (Lethierry), *Idioscopus clypealis* (Lethierry) *I. niveosparsus* (Lethierry) and *I. nitidulus* (Walker), are serious pests of mango at flowering and fruiting stages and yield loss could be 80-100 per cent (Rahman and Kuldeep, 2007). Both nymphs and adults aggregate on the under side of leaves and suck the sap of tender shoots, young leaves and inflorescence. Heavy puncturing and continuous draining of the sap causes curling and drying of the infected tissue. The infested florets turn brown and dry up which adversely affects fruit setting. Hopper infestation also causes honey dew secretion resulting in sooty mould formation affecting photosynthesis and also stains the fruits which reduces market value (Rahman and Kuldeep, 2007). Presently only insecticidal control is available for management of mango hoppers. Considering the deleterious affect caused by chemicals to the beneficial organisms in mango ecosystem and the demand for organic production of mango there is a need to develop alternate, safe and eco-friendly management strategy for the control of mango hoppers. Natural occurrence of entomofungal pathogens against mango hopper have already been reported in India, (Srivastava and Tandon, 1986, Gangavisalakshi *et.al.*, 2010) but no information is available on potential of these fungal bioagents by their inundative field application. Present paper reports the efficacy of Myco-jaal, a commercial oil based formulation of *Beauveria bassiana* against *I.nitidus* under field condition.

The field efficacy of Myco-jaal, a commercial formulation of *Beauveria bassiana* with a spore load of $1x10^{10}$/ml was carried out against *I. nitidulus* infesting mango. Two trial was conducted, one at Sriramanahalli, Bangalore and other one at Srinivaspura, Kolar district of Karnataka during February to April 2011. The test concentration of Myco-jaal was kept 2ml, 4ml, 6ml per litre as a treatment. Since, mango hoppers are very active fliers and migratory in behavior, we followed exclusion method and sticky trap method to assess the population to determine the efficacy of Myco-Jaal against *I.nitidulus.* In exclusion method, mango trees infested with hoppers were selected and given a fine spray of the treatments in two round at 15 days intervals. After each spray, the inflorescens infested with mango hoppers were randomly selected and covered with a thin muslin cloth bag. The mouth of the bag was tightly tied with the branch, to prevent escape of the hoppers. After 72 hrs of each spray, the inflorescence along with the cloth bag was removed and brought to the laboratory to estimate dead and alive population. The bag was opened inside an aerated plastic bucket in such a way that the base of the bucket was facing towards the light to attract the live hoppers into the bucket. Observations were made on the number of live hoppers and dead ones that have fallen into the bag and sticking to the twigs were also counted. The dead ones were kept in a moist Petri plate and incubated at 70 -80 per cent RH for fungal growth and sporulation to confirm the mortality caused by *B. bassiana*, the active ingredient of Myco-jaal. Similarly, sticky trap method was followed to record the hopper population in the field by installing one sticky trap/ tree after 1st spray and recorded cumulative hopper population caught in the trap till 45 days of trial period. To record the impact of hopper infestation on fruit setting of mango we marked five randomly selected panicle/tree, counted the fruit set before treatment and after 45 days of treatment. Five trees were selected for each treatment and each tree was considered as replication. Parallel to these treatments, a control without any spray and check (Imidaclorprid at 2ml/L) was also included as treatment The data was later converted into percentage and also subjected to ANNOVA. The trees were of seven years old and mixed variety Alphonso, Mallika, Banganapalli and Dashehari.

The pre-treatment count of hopper population indicates an uniform distribution of hopper in both the trial area, ranged between 41.2 to 44.8/panicle in Bangalore and 51.4 to 57.4/panicle in Kolar region. All the test concentration of Myco-jaal (6ml/L, 4ml/L, 2ml/L) recorded reduction in hopper population as well as fruit setting which is directly related with hopper population. Among the various dosage of Myco-Jaal evaluated, maximum reduction of hopper was recorded in the highest dosage and mortality rate was related to the concentration of Myco-Jaal.

In the first trial, the maximum population reduction was recoded in the highest dosage of Myco-jaal (82.29%) which was on par with Imidaclorprid (Table-1). About 43.26 and 60.67 per cent reduction was recorded in 2ml and 4ml of Myco-Jaal respectively that was significant to control. However, among the three concentration tested, the lower dosage was found to be significantly least effective. Similarly, hopper mortality due to to *B.bassiana* infection was recorded in all the Myco-jaal treatments and maximum mycosed population (37.65%) was recoded in highest dosage of Myco-Jaal (Fig-1). Effort was also made to record the infected hopper population in field condition but due to high active flying and migratory behavoiur we couldn't notice any mycosed population.

Similar trend was observed when cumulative hopper population caught in sticky trap was recorded and highest was found in the control (2033) and lowest in Imidaclorprid treated plants followed by different dosage of Myco-jaal (Fig-2) with a clear indication that the dosage has a positive impact in reduction of hopper population.

Observation on fruit setting has also shown that all the treated dosage of myco-jaal could reduce the loss in fruit setting significantly over control and the lowest reduction (13.33%) was recorded in highest dosage of Myco-jaal whereas, 34.78 per cent and 45.45 per cent was recorded in 2m/L and 4ml/L respectively (Table-2).

The results obtained in the second trial were in conformity with first trial. A maximum of 81.67 per cent hopper population reduction was recorded in highest dosage (6ml/L) of Myco-Jaal that was significant over control and other treatments. Similarly, fruit setting was also shown significant improvement with reduction of hopper population in treatments and minimum loss in fruit setting was recorded 16.67 per cent in highest dosage of Myco-jaal treatment (Table-2).

The present result clearly indicates that the application of Myco-jaal could improve the loss of fruit setting by suppressing the hopper population significantly in field condition, though we failed to trace any fungal

Fig. 1 : Total hopper population caught in sticky trap in 45 days of trial period

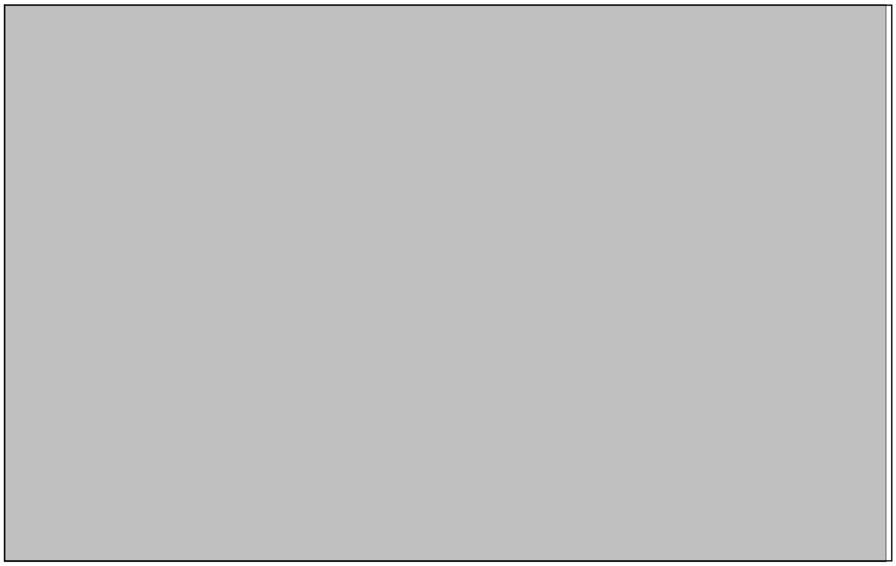

Fig. 2 : Hopper mortality (%) caused by *B. bassiana* infection

Table 1. Mango hopper population after Myco-jaal spray in Bangalore and Kolar

Treatment	Pre-treat count	72 hrs after 1st spray	72 hrs after 2nd spray	% Reduction	Pre-treat ment	72 hrs after 1st spray	72 hrs after	% Reduction
MycoJaal (2 ml/L)	41.6	35.6^{a}	23.6^{b}	43.26	55.4	33.4^{b}	17.8^{b}	67.87
MycoJaal (4 ml/L)	41.2	26.2b	16.2c	60.67	51.4	26.2b	12.2bc	76.26
MycoJaal (6 ml/L)	41.8	17.8b	7.4d	82.29	52.4	21.8bc	9.6c	81.67
Imidaclorprid (2ml/L)	43.6	10.6c	6.6d	84.86	57.4	14.2c	4.8c	91.63
Water spray (Control)	44.8	41.8a	36.4a	18.75	55.4	44.2a	32.6a	41.15
F-Value	NS	**	**	**	NS	**	**	**
CD (.5%)		8.29	5.5	5.34		10.26	10.26	9.98

Table 2. Fruit setting of mango after myco-Jaal spray in Bangalore and Kolar

	Number of fruit set/panicle (mean of 5 observation					
	Trial - 1 (In Bangalore)			Trail-2 (In Kolar)		
Treatments	**Pre-treat**	**45 DAS**	**% Reduction**	**Pre-test Count**	**45 DAS**	**% Reduction**
MycoJaal (2 ml/L)	1.76	0.96c	45.45	2.6	1.2b	53.85
MycoJall (4 ml/L)	1.84	1.2cb	34.78	2.8	1.4b	50
MycoJaal (6 ml/L)	1.8	1.56ba	13.33	2.4	2.0a	16.67
Imidaclorprid (2 ml/L)	1.88	1.68a	10.64	3.4	2.8a	17.65
Water sprays (Control)	1.8	0.88c	51.11	2.8	1.0b	64.29
F – Value	NS	**	NS	NS	**	NS
CD at 5%		0.41	2.33		0.83	0.92

infected hopper in field condition. The possible reason could be high migratory behavior of hopper which made them escaped from our observation. Other possibilities also could be some repellent action of the oil used as carrier in Myco-Jaal formulation. Further studies would be carried to device suitable method to establish the infection in field condion and also exploring the potential of Myco-jaal to include as a IMP input to manage mango hopper in mango ecosystems.

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