Bioeffectiveness of some Entomopathogenic Fungi (EPF) alongwith Spiromesifen against the Mite, *Oligonychus oryzae*, on Paddy

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Introduction

The mite, *Oligonychus oryzae* Hirst often becomes an important pest of paddy crop grown in the kharif season in many parts of India including West Bengal, Odisha and Southern India. The infestation when occurs becomes available on under surface in leaves and the colonies remain covered with thin webs where all stages may be seen. The feeding produces whitish stiplings which later turn into whitish patches. The infested clumps become droopy but no major crop loss has been noticed. Since occurrence of this mite on paddy (var. Masuri) was seen in Hooghly district of West Bengal during September, 2017 and as the efficacy of EPF on this mite has not been assessed earlier, it was thought desirable to conduct a field trial with 5 EPF taking one concentration each alongwith an organic pesticide namely Spiromesifen. The results thereof have been presented in this paper.

Material and Methods

The laboratory experiment was conducted for control of *Oligonychus oryzae* on paddy under field condition for evaluating efficacy of some EPF, i.e., *Beauveria bassiana, Metarhizium anisopilae, Paecilomyces fumosoroseus, Hirsutella thompsonii* and *Lecanicillium lecanii* at 10^8 spores/ml, alongwith a synthetic acaricide Spiromesifen (0.6 ml/l). Potted plants were maintained of common rice variety Masuri, each treatment having 3 replications. The rice variety Masuri was selected for this experiment and those were maintained in the field (1mt x 1mt area). Three clumps represented each replication. Since there were 7 treatments (including control), altogether 7 x 3 = 21 clumps were selected for this experiment. The EPF conc. which was used was 10^8 spores/ml of water. The EPF was applied with a hand sprayer. Population on each of the clumps before spraying and 3, 7, 10, 14 days after spraying was recorded. The % mortality over control was calculated by using the formula as % Mortality = (No. of dead mites/ total no. of mites) x 100. (McDonald et al.) In case of control only water was sprayed. The results obtained were statistically analyzed following SPSS software.

Results

The % mortality obtained in various treatments is presented in Table 1. The initial population of mites/ 6.25 sq. cm. area was found variable and in different treatments it was found to be 21.38 (*B. bassiana*), 25.03 (*M. anisopilae*), 20.73 (*P. fumosoroseus*), 24.66 (*H. thompsonii*), 30.40 (*L. lecanii*), and 14.18 (Spiromesifen).

3 days after spraying : At this interval, the minimum mite population was 19.29 in case of *B. bassiana* followed by 19.95 in *P. fumosoroseus*, 23.39 in *H. thompsonii*, 23.99 in *M. anisopilae*, 30.85 in *L. lecanii* and 41.94 in case of control. However, minimum mite population was seen in case of Spiromesifen which was 5.18/ 6.25 sq. cm. area.

7 days after spraying : At this interval, performance of both *B. bassiana* and *P. fumosoroseus*, maintained superiority over other treatment being both at par. This was followed by *H. thompsonii, M. anisopilae*, and *L. lecanii* registering mortality of 21.46%, 22.54% and 26.94% respectively. The mortality in case of control treatment was 43.22%. Spiromesifen registered the population of 6.23% which was far superior to all the treatment.

10 days after spraying : At this interval, *B. bassiana* registered the lowest mite population which was 18.71% which was close to 20.03% in case of *M. anisopilae*, 21.86% in case of *P. fumosoroseus*, 22.15% in *H. thompsonii*, and 23.87% in case of *L. lecanii*. In case of control, it was 41.15 mites and as usual Spiromesifen recorded the lowest mite population.

14 days after spraying : At this interval, *B. bassiana* recorded lowest mite population of 19.52 mites followed by 19.86 in case of *M. anisopilae*, 21.37 in *P. fumosoroseus*, 21.45 in *H. thompsonii*, and 25.17 in *L. lecanii*. Spiromesifen recorded population of 8.41 mites/ 6.25 sq. cm. area, as best while *B. bassiana* was the best among EPF.

% reduction over control : Among the EPF the highest % reduction was 53.97 in case of *B. bassiana* followed by 50.66 in *P. fumosoroseus*, 47.03 in *M. anisopilae*, 34.53 in case of *L. lecanii*. So, among the EPF, *B. bassiana* was found to be the best. However, the % reduction was highest (82.82) in case of Spiromesifen which was far superior to all the EPF treatments.

Pooled mean: As regards, the pooled mean of mite population the data can be arranged from increasing order as *B. bassiana (20.08) < P. fumosoroseus (20.43) < M. anisopilae (23.32) < H. thompsonii (23.39) < L. lecanii (28.56)* < control (42.89). In case of Spiromesifen, only 10.60 mite population was found/ 6.25 sq. cm. area.

Table 1. Bioeffectiveness of some EPF and Spiromesifen for *Oligonychus oryzae* on paddy under field condition.

Treatments	Mites/ 6.25 sq. cm. area	Days after spraying				Mean no mites/ 6.25 sq. cm. area	% reduction over control	Pooled mean	Cumulative % reduction over control
10^8 spores/ml		3 days	7 days	10 days	14 days				
Beauveria bassiana	21.38	19.29	17.35	18.71	19.52	18.78	53.97	20.08	53.18
Metarhizium anisopilae	25.03	23.99	22.54	20.03	19.86	21.61	47.03	23.32	45.63
Paecilomyces fumosoroseus	20.73	19.95	17.34	21.86	21.37	20.13	50.66	20.43	52.37
Hirsutella thompsonii	24.66	23.39	21.46	22.15	21.45	22.11	45.81	23.39	45.47
Lecanicillium lecanii	30.40	30.85	26.94	23.87	25.17	26.71	34.53	28.56	33.41
Spiromesifen (0.6 ml/l)	14.18	5.18	6.32	8.14	8.41	7.01	82.82	10.60	75.29
Control	44.98	41.94	43.22	41.15	36.89	40.8		42.89	
CD (0.05)		2.75	0.29	0.48	0.60	1.03			

Cumulative % reduction over control : Among the EPF, this data can be arranged in following descending order - *B. bassiana (53.18) > P. fumosoroseus (52.37) > M. anisopilae (45.63) > H. thompsonii (45.47) > L. lecanii (33.41).*

However, Spiromesifen registered the highest cumulative % reduction which was 75.29%.

Discussion

Poinar & Poinar, (1998) reported *H. thompsonii* being considerably good against many mite species. Kumar & Singh, (2007) while studying bioefficacy of *P. fumosoroseus* against *T. urticeae* reported that the fungi in WP formulation alongwith *Azadirachta* showed maximum mortality of 55.83% of adults at 0.187 + 5 ml. conc. followed by *P. fumosoroseus* WP with Neem oil (48.33%), *P. fumosoroseus* WP alone (47.50%) and *P. fumosoroseus* WP with NSKE (46.66%) at 0.187 + 2 ml., 0.375 and 0.187 + 5 ml. respectively. Rangrez & Rather (2007) also worked with *B. bassiana, L. lecanii, M. anisopilae* against *Tetranychus urticae* and reported mortality of 42.22%, 33.33% and 23.33% respectively after 144 hours at a spore conc. of 1.0 x 10^8 spores/ ml respectively. *P. fumosoroseus* was the least effective. *H. thompsonii* at 2.5 x 10^7 spores/ml gave a mortality of 23.33% after 144 hours.

Conclusion

All the EPF treatments and Spiromesifen proved to be good acaricide registering mortality ranging from 79.29% in case of Spiromesifen and among the EPF, it ranged between 53.18 in *B. bassiana* to 33.41 in case of *L. lecanii*. Therefore, it was found that Spiromesifen was best among all the treatments, though EPF like *B. bassiana* and *P. fumosoroseus* were also quite effective as they registered mortality of over 50% in all the cases.

In case the mite population in the field is at low level, any of the two EPF like *B. bassiana* and *P. fumosoroseus* can be applied in pest management programme, in lieu of synthetic chemical pesticide like Spiromesifen.

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