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RESEARCH PAPER

Virulent HaNPV isolates for the management of *Helicoverpa armigera* (Hubner) in sunflower

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Abstract **:** Under field condition, at 7 and 14 days, the pooled larval reduction during both spray revealed the superiority of Coimbatore and Gulbarga isolates with a average larval reduction of 51.97 and 51.82 at 7 days and 71.29 and 69.19 at 14 days, respectively. The pooled of head damage recorded during first and second spray revealed the superiority of Coimbatore, Gulbarga and Dharwad isolate which have recorded on average of 32.25, 32.88 and 35.56 per cent head damage, respectively. Gulbarga and Coimbatore HaNPV isolates also registered higher yield of 10.97 and 10.32 q/ha, respectively and also yielded highest benefit cost ratio of 3.37 and 3.43, respectively.

Key Words **:** HaNPV isolates, Sunflower head borer, Field evaluation

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INTRODUCTION

Among the different species of *Helicoverpa* occurring in India, *H. armigera* is the most widely prevalent and devastating pest. It is known for its extensive host range and severe damage it causes to many food and fibre crops (Anonymous, 1977). Its economic importance as a pest is magnified due to its direct attack on fruiting structure, voracious feeding habit, high mobility, opportunist and multivoltine nature. NPV of *H. armigera* has a great potential for control of this pest and it has received a great deal of attention owing to several advantages. Considering the reliability and suitability of HaNPV in terms of economic and ecological reasons, its utilization in pest management has received a great deal of significance. However, vast differences exist in the pathogenecity and virulence of different geographic isolates of HaNPV against the local natural populations of the pest all over the world (Battu and Arora, 1996).

Sunflower is an important oilseed crop of India. The Production of this crop is seriously affected by the insect pests attacking at different stages of crop growth. Head borer is a polyphagous insect and a severe pest of sunflower responsible for causing 20-25 per cent loss in yield under normal conditions. However, some times the damage is so sever and loss goes up to 40-70 per cent. There is an immense scope for utilization of bio-pesticides mainly the viral insecticide for the management of this notorious pest under field condition.

MATERIALS AND METHODS

Field experiment was designed at the Regional Agricultural Research Station, Bijapur to evaluate the virulence of different HaNPV isolates collected from different parts of the country on sunflower. The experiment was designed with eight treatments replicated thrice with a plot size of 5m x 5 m. Two sprays were undertaken at an interval of 15 days based on the ETL of the pest. The observations were recorded on larval load per plants before the initiation of spray and 7 and 14 days after each spray. Further, head damage caused by the insect was recorded during each spray and the per cent head damage was calculated. The yield per plot was recorded and converted on per hectare basis. The data was converted to arc sin transformation before analysis.

RESULTS AND DISCUSSION

The observations recorded before initiation of the spray revealed that the larval population was uniform in all the treatments and was statistically non significant (Table 1). The

per cent larval reduction recorded at 7 days after the first spray showed significant difference among the treatments. The larval reduction ranged between 21.55 to 52.32 per cent among the different treatments. The treatments sprayed with the isolates collected from Coimbatore, Gulbarga and Dharwad were statistically superior over other isolates and were at par with each other by recording 38.43, 37.22 and 30.75 per cent larval mortality, respectively. The isolates collected from PCI, BPM and BPL have recorded larval mortality between 21 to 25 per cent and all the three isolates were found statistically on per with each other including unrelated check. At 14 days after the spray, there was change in the trend of virulence where in Dharwad isolate was not efficient enough to be at par with Coimbator and Gulbarga (65-60%) isolates which was statistically inferior. The other isolates collected from the private firms were found statistically inferior to other isolates but were found superior over the untreated control. However, the treatment with RPP recorded highest larval mortality at both 7 and 14 days after the spray. The head damage was recorded at 14 days after the treatment which ranged between 41.71 to 22.99 per cent. Among the treatments, though RPP recorded lowest head damage, the treatments with Dharwad, Coimbatore and Gulbarga isolates recorded statistically lower head damage and were statistically at par with each other. The isolates *viz*, BPM, PCI and BPL were statistically at par and found inferior over other isolates.

During the second spray, there was a significant difference among the treatments before spray. At 7 days after spray though RPP recorded highest larval mortality (77.46%). Among the isolates, Coimbatore and Gulbarga isolates performed better by recording 65.50 and 66.42 per cent larval mortality, respectively and were statistically at par with each other. The trend of virulence of these isolates remained constant even after 14 days after the spray, where they recorded 75.73 and 72.78 per cent mortality and were statistically at par with each other. During both the interval of observation, Dharwad isolates has emerged as the next best isolate in the order of virulence by recording 54.67 and 61.52 per cent larval mortality at 7 and 14 days after spray, respectively (Table 2). Head damage recorded during the second spray revealed that the per cent head damage ranged between 52.43 to 27.30 being highest in untreated check and lowest in RPP. Among the HaNPV isolates, Dharwad, Coimbatore and Gulbarga isolates recorded lower head damage of 37.34, 34.69 and 33.3, respectively and were statistically at par with each other. The other isolates were found statistically inferior by recording more than 40 per cent head damage but were superior to untreated check.

Table 1 : Filed efficacy of different HaNPV isolates against *H. armigera in* sunflower (First spray)

Sr. No.	Isolates	Before application (larvae/15 plant)	Per cent larval reduction at		Head damage (%)
			7 DAS	14 DAS	
1.	Dharwad	10.41a	30.78b	43.82c	33.78b
2.	Gulbarga	11.67a	37.22b	65.60b	31.07b
3.	Coimbatore	12.12a	38.43b	66.85b	31.17b
4.	PCI, Ltd.	11.21a	24.47c	34.48d	38.58c
5.	BPM, Ltd.	11.52a	21.45c	35.51d	41.71d
6.	BPL, Ltd.	11.36a	22.12c	38.45d	39.07c
7.	RPP	10.97a	52.32a	83.22a	22.99a
8.	Untreated check	11.37a	21.55c	21.25e	47.03d

Table 2 : Filed efficacy of different HaNPV isolates against *H. armigera in* sunflower (Second spray)

Sr. No.	Isolates	Before application (larvae/15 plant)	Per cent larval reduction at		Head damage (%)
			7 DAS	14 DAS	
1.	Dharwad	6.33b	54.67c	61.52c	37.34b
2.	Gulbarga	5.18a	66.42b	72.78b	34.69b
3.	Coimbatore	5.44a	65.50b	75.73b	33.3b
4.	PCI, Ltd.	7.33b	33.45d	44.24d	42.27c
5.	BPM, Ltd.	7.00b	33.11d	43.25d	42.00c
6.	BPL, Ltd.	8.11bc	39.37d	48.83dd	41.92c
7.	RPP	4.11a	77.46a	89.67a	27.30a
8.	Untreated check	10.90c	6.85e	13.05e	52.43d

Note: The original values were converted to arc sin transformation before analysis
DAS: Days after spray PCI- Pest Control India Ltd. Bangalore BPM- Bio-Pest Management Ltd. Bangalore
BPL: Bio Pest Laboratories, Bangalore RPP- Recommended package of practices
Means followed by same alphabet in vertical column do not differ significantly by DMRT (P=0.05)

Yield (q/ha):

The data on yield of sunflower (Table 3) indicated that there was significant difference among the treatments. Highest yield was obtained in the recommended package of practices (13.44 q/ha). Among the HaNPV isolates Gulbarga and Coimbatore isolates registered higher yield of 10.97 and 10.32 q/ha, respectively, and were statistically at par with each other. Dharwad isolate recorded an average yield of 8.53 q/ha and is the next best isolate in the study. The benefit cost ratio was maximum (5.78) in RPP. However, among the different HaNPV isolates Gulbarga (3.37) and Coimbatore (3.43) isolates recorded higher benefit followed by Dharwad isolates (2.93). The isolates from private firms recorded BC ratio between 1 to 1.45 and were inferior to other treatments.

Table 3 : Filed efficacy of different HaNPV isolates against *H. armigera* in sunflower on yield

Sr. No.	Isolates	Kernel yield (q/ha)	B:C ratio
1.	Dharwad	8.53c	2.93
2.	Gulbarga	10.97b	3.37
3.	Coimbatore	10.32b	3.43
4.	PCI, Ltd.	7.25cd	1.03
5.	BPM, Ltd.	7.85cd	1.45
6.	BPL, Ltd.	7.65cd	1.45
7.	RPP	13.44a	5.78
8.	Untreated check	6.44d	-

Note: The original values were converted to arc sin transformation before analysis
PCI- Pest Control India Ltd. Bangalore
BPM- Bio-Pest Management Ltd. Bangalore
BPL: Bio Pest Laboratories, Bangalore
RPP- Recommended package of practices
Means followed by same alphabet in vertical column do not differ significantly by DMRT (P=0.05)

No research work was carriedout on the evaluation of HaNPV isolates in sunflower. However, the present findings are in agreement with the results of Gopali (1998) who reported the superiority of Gulbarga isolate in reducing the population of *H. armigera* but in pigeonpea ecosystem. Further the studies of Kambrekar *et al.* (2009) are also in accordance with the present studies who reported the virulence of Coimbatore and Gulbarga HaNPV isolates in the management of *H. armigera* in chickpea under field condition. The efficacy of HaNPV in chickpea had been on record (Santharam and Balasubramanian, 1982; Supare *et al.,* 1991; Rabindra *et al.,* 1994; Jagadeeshbabu *et al.,* 1995; Kumar *et al.,* 1998; Kumawat and Jheeba, 1999; Loganathan *et al.,* 2000). There are many studies that have documented the variation in the virulence of isolates (Jayaraj *et al.,* 1989; Rabindra, 1993; Odak *et al.,* 1984). Among the various factors responsible for these variations, selective forces that shape the genomic constituent of individual stains assumes utmost importance which might often favour better performance of the isolates.

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