

Storability of HaNPV and S/NPV under Refrigerator Condition

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Abstract—The laboratory experiment was conducted to determine the storability of HaNPV and S/NPV under refrigerator condition at Bio-control Research laboratory, Department of Entomology, Junagadh Agricultural University campus, Junagadh during 2012 and 2013. The pooled result concluded that the HaNPV and S/NPV infected larvae can be stored under refrigerator condition (6.0 to 7.5°C) for 12 month and 7 month, respectively without hampering their virulence and can be used for management of respective pest or mass production NPV.

1. INTRODUCTION

Helicoverpa armigera (Hub.) is a polyphagous pest and it is reported to infest 181 plant species (Manjunath *et al.* 1985). Chemical control is not worked against this pest due to resistance against many of the commercially available insecticides. *H. armigera* has been controlled on a wide range of crops including cotton (Jones, 1994), legumes (Rabindra *et al.* 1992), vegetables (Jones *et al.* 1998), and oil seeds (Rabindra *et al.* 1985) by the use of HaNPV. *Spodoptera litura* (Fab.) is cause damage to the tobacco nursery in seedling stage. Besides tobacco, it feeds on cotton, castor, groundnut, tomato, cabbage and various other cruciferous crops. It is a very destructive pest in some crops. NPV is a viral biopesticide which infect the wide variety of pests. It is important component of the IPM programme for the control of pest in different crop eco-system (Singh *et al.* 1998). During the mass production of local strain of NPV and its storage at end becomes necessity to keep the NPV in unused position prior to its utilization either for mass rearing or field release. Little information on storage technique for NPV is available in published literature and the study is highly needed to have a sound technique for time period storage of local stain of NPV with a view to synchronize with its mass production programme and field utilization.

2. MATERIALS AND METHODS

The laboratory experiments were conducted during 2012 and 2013 at Bio-control Research laboratory, Department of Entomology, J.A.U., Junagadh. Bottles containing NPV suspension were stored at refrigerated condition, and at room

temperature, in earthen pot, in glass bottle and in amber colour bottle. Concentration of POBs was estimated in all the samples using Nuebaur haemocytometer before storage. The desired concentration of polyhedra was reached by adjusting the amount of distilled water added to the suspension.

The bottles containing NPV infected larvae were kept in domestic refrigerator (Maintaining 6 to 7.5°C temperature) for study. At one month interval known quantity of respective diseased larvae were taken out for further study. Freshly produced HaNPV/S/NPV (1×10^9 POB/ml) from diseased larvae was utilized for all storage period. 10 sets of known number (10 test insect larvae) of respective insect larvae (5th instar) were allowed to feed on the freshly produced NPV treated food (artificial diet) for 1 day and on next day they were reared on fresh food until the adult emergence. This test was repeated at 1 month interval throughout the year. Number of diseased larvae/pupae and deformed adults were recorded to determine the percentage virulency and percentage mortality in each stage was worked out.

3. RESULT AND DISCUSSION

The fitness life parameters of S/NPV and HaNPV were investigated under laboratory conditions after stored for various storage duration (1 month to 12 month storage).

3.1 *Spodoptera litura*

The mortality in *S. litura* larvae due to S/NPV showed a consistent decrease in all the storage periods of diseased larvae (one month to twelve month). Data presented in Table 1 and 2 showed that the cumulative (Larval + Pupal + Adult) mortality due to S/NPV ranged from 79.29 to 100.00 per cent in all storage period. The cent per cent cumulative mortality was recorded in case of S/NPV infected larvae stored for ten month. Thereafter, mortality of *S. litura* decreased to 79.29 per cent at 12 month storage of infected larvae.

3.2 *Helicoverpa armigera*

The pooled result (Table 3 and 4) indicated that the mortality due to HaNPV ranged from 72.15 to 100.00 per cent in all

storage period of infected larvae. The cent per cent cumulative mortality was recorded in case of *HaNPV* infected larvae stored for seven months. Thereafter mortality of *HaNPV* decreased to 72.15 per cent at 12 month storage of infected larvae.

Table 1: Bio-efficacy of SINPV against *S. litura* after different month of storage

Month of storage	Pooled data of 2012 and 2013			
	SPODOPTERA Larval mortality per day			
	3 days	5 days	7 days	Total larva
1	44.29(48.76)	41.40(43.74)	13.89(5.76)	90.25(100.00)
2	44.29(48.76)	44.29(48.76)	6.39(1.24)	90.25(100.00)
3	45.25(50.44)	43.33(47.08)	3.32(0.34)	87.18(99.76)
4	40.44(42.08)	42.37(45.41)	10.82(3.52)	77.96(95.65)
5	43.33(47.08)	35.47(33.67)	21.39(13.30)	77.96(95.65)
6	43.33(47.08)	39.44(40.35)	3.32(0.34)	72.18(90.63)
7	37.47(37.01)	32.35(28.64)	24.11(16.69)	65.29(82.52)
8	34.46(32.02)	32.25(28.47)	26.57(20.01)	63.68(80.34)
9	35.47(33.67)	32.25(28.47)	18.68(10.26)	58.60(72.86)
10	34.46(32.02)	36.47(35.33)	23.50(15.90)	69.47(87.70)
11	30.14(25.21)	33.36(30.23)	21.39(13.30)	56.14(68.96)
12	31.25(26.91)	30.14(25.21)	20.04(11.74)	53.07(63.90)
S.Em.±	1.05	1.92	3.04	2.65
C.D. at 5 %	2.99	6.00	8.66	7.54
C.V. %	6.65	8.75	46.25	9.04
Y				
S.Em.±	0.42	0.78	1.24	1.08
C.D. at 5 %	NS	NS	NS	3.07
YXT				
S.Em.±	1.48	1.86	4.30	3.74
C.D. at 5 %	NS	5.30	NS	NS

Data in parenthesis are retransformed values, while outside were angular transformed values (0.25 was added in all transformed values)

Table 2: Bio-efficacy of SNPV against *S. litura* after different month of storage

Month of storage	Pooled data of 2012 and 2013			
	Pupation	Deformed pupae	Deformed adults	Cumulative
1	0.25(0.00)	0.25(0.00)	0.25(0.00)	90.25(100.00)
2	0.25(0.00)	0.25(0.00)	0.25(0.00)	90.25(100.00)
3	3.32(0.34)	3.32(0.34)	0.25(0.00)	90.25(100.00)
4	12.54(4.71)	9.47(2.71)	3.32(0.34)	90.25(100.00)
5	12.54(4.71)	9.47(2.71)	3.32(0.34)	90.25(100.00)
6	18.32(9.88)	6.39(1.24)	13.89(5.76)	90.25(100.00)
7	25.21(18.14)	16.97(8.52)	15.61(7.24)	90.25(100.00)
8	26.82(20.36)	15.25(6.92)	15.25(6.92)	90.25(100.00)
9	31.90(27.92)	22.75(14.95)	16.61(8.17)	87.18(99.76)
10	21.04(12.89)	6.39(1.24)	6.39(1.24)	76.61(94.64)
11	34.36(31.85)	15.61(7.24)	20.04(11.74)	72.18(90.63)
12	37.43(36.94)	15.61(7.24)	12.54(4.71)	62.93(79.29)
S.Em.±	2.65	3.30	3.18	2.19

C.D. at 5 %	7.54	9.41	9.07	6.25
C.V. %	34.78	79.86	87.03	6.32
Y				
S.Em.±	1.08	1.35	1.30	0.89
C.D. at 5 %	3.07	NS	3.70	NS
YXT				
S.Em.±	3.74	4.67	4.51	3.10
C.D. at 5 %	NS	NS	NS	NS

Data in parenthesis are retransformed values, while outside were angular transformed values (0.25 was added in all transformed values)

Table 3: Bio-efficacy of HaNPV against *H. armigera* after different month of storage

Month of storage	Pooled data of 2012 and 2013			
	Larval mortality per day			
	3 days	5 days	7 days	Total larva
1	57.14(70.56)	13.89(5.76)	3.32(0.34)	90.25(100.00)
2	53.13(64.00)	6.39(1.24)	12.54(4.71)	90.25(100.00)
3	56.39(69.36)	3.32(0.34)	10.82(3.52)	90.25(100.00)
4	58.35(72.47)	10.82(3.52)	6.39(1.24)	90.25(100.00)
5	57.35(70.89)	21.39(13.30)	9.47(2.71)	77.96(95.65)
6	57.25(70.73)	3.32(0.34)	0.25(0.00)	79.68(96.79)
7	53.21(64.13)	24.11(16.69)	6.39(1.24)	72.43(90.89)
8	51.02(60.43)	26.57(20.01)	3.32(0.34)	62.57(78.78)
9	43.33(47.09)	18.68(10.26)	0.25(0.00)	55.03(67.15)
10	40.40(42.01)	23.50(15.90)	18.68(10.26)	57.54(71.19)
11	32.35(28.63)	21.39(13.30)	20.04(11.74)	59.36(74.03)
12	34.46(32.02)	20.04(11.74)	9.47(2.71)	48.14(55.47)
S.Em.±	3.42	3.04	2.65	2.32
C.D. at 5 %	10.64	8.66	7.54	6.62
C.V. %	6.66	46.25	9.04	7.82
Y				
S.Em.±	1.39	1.24	1.08	0.95
C.D. at 5 %	4.34	NS	3.08	2.70
YXT				
S.Em.±	1.91	4.30	3.75	3.29
C.D. at 5 %	5.42	NS	NS	NS

Data in parenthesis are retransformed values, while outside were angular transformed values (0.25 was added in all transformed values)

Table 4: Bio-efficacy of HaNPV against *H. armigera* after different month of storage

Month of storage	Pooled data of 2012 and 2013			
	Pupation	Deformed pupae	Deformed adults	Cumulative
1	0.25(0.00)	0.25(0.00)	0.25(0.00)	90.25(100.00)
2	0.25(0.00)	0.25(0.00)	0.25(0.00)	90.25(100.00)
3	0.25(0.00)	0.25(0.00)	0.25(0.00)	90.25(100.00)
4	0.25(0.00)	0.25(0.00)	0.25(0.00)	90.25(100.00)
5	12.54(4.71)	9.47(2.71)	0.25(0.00)	87.18(99.76)

6	10.82(3.52)	9.47(2.71)	0.25(0.00)	87.18(99.76)
7	18.07(9.62)	3.32(0.34)	15.61(7.24)	87.18(99.76)
8	23.50(15.90)	12.54(4.71)	12.54(4.71)	76.61(94.64)
9	35.47(33.67)	18.68(10.26)	12.54(4.71)	66.39(83.96)
10	32.96(29.60)	10.82(3.52)	7.75(1.82)	65.54(82.86)
11	31.14(26.74)	6.39(1.24)	12.54(4.71)	66.39(83.96)
12	42.37(45.42)	15.61(7.24)	15.61(7.24)	58.15(72.15)
S.Em.±	2.65	4.33	2.67	2.16
C.D. at 5 %	7.55	13.49	7.60	6.15
C.V. %	37.51	87.75	100.58	6.65
Y				
S.Em.±	1.08	1.77	1.09	0.88
C.D. at 5 %	3.08	NS	NS	2.51
YXT				
S.Em.±	3.75	3.69	3.78	3.06
C.D. at 5 %	NS	10.49	NS	NS

Data in parenthesis are retransformed values, while outsides were angular transformed values (0.25 was added in all transformed values)

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