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SHORT NOTE

EFFICACY OF POISON BAITS AND BIOPESTICIDES AGAINST *Spodoptera litura* Fab. (LEPIDOPTERA: NOCTUIDAE) IN POTATO

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The tobacco caterpillar, *Spodoptera litura* Fab. is a serious pest on potato in Karnataka and causes severe defoliation (Konar and Mohasin, 2003). It occurs during monsoon season (June-September) on 40 to 60 days old crop. Field trials were carried out at Agricultural Research Station, Madenur, Hassan, (12°45' to 13°57' N and 76°45' to 78 °24' E), during *kharif* 2005 and 2006 in order to find an effective management strategy for this pest. Thirteen treatments consisting of NPV, insecticides, *Bt*, poison baits and an untreated check were evaluated (Table 1). Sex pheromone traps were placed at 0.3 m above the crop canopy at 30 m distance in 35-40 days old 'Kufri Jyothi' variety of potato to monitor the pest activity. Treatments were imposed after recording the infestation. The poison bait was prepared using 50 kg rice bran, 5 kg jiggery and the respective insecticides mixed with 4 liters water. After thorough mixing, the poison bait was kept in plastic boxes (0.1m X 0.1m) for 32 to 36 h. Poison baits were randomly distributed at the base of plants of 35-40 days old during evening hours (4.30 – 5.00 pm) after noticing initial infestation or symptoms of defoliation. A blanket spray application of dicofol 25 EC @ 2 ml/liter of water and quinalphos25 EC @2 ml/liter was given to control mites and potato tuber moth infestation. Initial larval counts and post treatment counts at 1, 7 and 21 days were recorded on ten randomly selected plants. Yield data were recorded and the means were compared through ANOVA at 5% level of significance after suitable transformations.

The efficacy of different treatments at 1,7 and 21 days after application are presented in Table 1. Methomyl 40 SP, chloropyriphos 20 EC, quinalphos 25 EC, profenofos 50 EC and baits of methomyl 40 SP, monocrotophos 36 SL and malathion 50 EC resulted in complete suppression of pest by recording zero larval count at 1 day after application during 2005. The effectiveness of application persisted up to one week. Subsequently, the number of larvae increased. The pooled data on efficacy of insecticides during *kharif* 2005 and 2006 at 1,7 and 21 days after spray recorded 1.27, 0.45, 0.25 and 0.20 mean larval counts against the initial density of 1.89 larvae per plant after SlNPV application. The *Bt* formulation recorded 0.97, 0.74, 0.39 and 0.29 mean larva against the initial density of 1.49 larvae per plant.

Table 1. Efficacy of insecticides and baits against *Spodoptera litura* in potato (2005 and 2006)

Treatments	No. of larvae / plant*								Yield Q/ha.		BC Ratio
	DBS		1 DAS		7 DAS		21 DAS				
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	
Sl NPV 1 ml \ l + 5g sugar	2.40 (1.70)	1.37 (1.36)	1.67 (1.47)	0.87 (1.17)	0.47 (0.98)	0.50 (1.00)	0.20 (0.83)	0.20 (0.83)	93.75 (9.63)	129.17 (11.39	1.21
Bacillus thuringiensis 1m\l	1.60 (1.45)	1.27 (1.33)	1.13 (1.27)	0.80 (1.13)	1.00 (1.22)	0.47 (0.98)	0.40 (0.93)	0.17 (0.81)	106.94 (10.34)	125.93 (12.30)	1.26
Nomuraea rileyi 1g\l	1.73 (1.49)	1.10 (1.26)	1.00 (1.22)	0.97 (1.21)	0.33 (0.91)	0.40 (0.95)	0.20 (0.83)	0.00 (0.71)	92.36 (9.58)	139.90 (11.85)	1.27
NSKE 5%	2.27 (1.66)	1.17 (1.29)	0.73 (1.10)	0.67 (1.08)	0.40 (0.95)	0.47 (0.98)	0.40 (0.95)	0.33 (0.91)	106.94 (10.34)	140.05 (11.85)	1.34
Methomyl 40 SP 1 g\l	1.87 (1.58)	1.20 (1.30)	0.00 (0.71)	0.43 (0.96)	0.00 (0.71)	0.43 (0.96)	0.33 (0.90)	0.20 (0.83)	123.61 (11.16)	148.61 (12.20)	1.38
DDVP 76 SL 1.5 ml \ l	1.80 (1.47)	1.40 (1.38)	0.20 (0.83)	0.83 (1.15)	0.73 (1.10)	0.47 (0.98)	0.53 (1.01)	0.37 (0.93)	78.89 (9.06)	123.15 (11.12)	1.10
Chlorpyriphos 20 EC 3ml \ l	1.80 (1.52)	1.27 (1.33)	0.00 (0.71)	0.27 (0.87)	0.00 (0.71)	0.07 (0.75)	0.27 (0.88)	0.00 (0.71)	115.28 (10.76)	144.16 (12.03)	1.41
Quinalphos 25 EC 2 ml \ l	1.47 (1.40)	1.00 (1.22)	0.00 (0.71)	0.63 (1.06)	0.00 (0.71)	0.30 (0.89)	0.07 (0.75)	0.00 (0.71)	102.78 (10.16)	132.64 (11.54)	1.28
Profenofos 50 EC 2 ml\l	1.73 (1.49)	1.17 (1.29)	0.00 (0.71)	0.47 (0.98)	0.00 (0.71)	0.40 (0.95)	0.13 (0.79)	0.00 (0.71)	98.61 (9.95)	142.36 (11.95)	1.30
Poison bait of Methomyl 40 SP @ 150 g\ acre	1.87 (1.53)	1.27 (1.32)	0.00 (0.71)	0.13 (0.79)	0.00 (0.71)	0.20 (0.83)	0.20 (0.83)	0.20 (0.83)	126.39 (11.26)	139.58 (11.83)	1.44
Poison bait of Monocrotophos 36 SL @ 150ml \ acre	1.67 (1.47)	1.20 (1.30)	0.00 (0.71)	0.20 (0.83)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.10 (0.77)	116.67 (10.25)	152.08 (12.35)	1.46
Poison bait of Malathion 50 EC 150ml\acre	1.40 (1.38)	1.47 (1.40)	0.00 (0.71)	0.50 (1.00)	0.47 (0.98)	0.20 (0.83)	0.40 (0.93)	0.27 (0.87)	86.11 (9.30)	118.93 (10.93)	1.11
Control	1.47 (1.40)	1.20 (1.30)	0.87 (1.16)	0.90 (1.18)	0.93 (1.19)	0.73 (1.11)	0.73 (1.10)	0.43 (0.96)	77.78 (8.84)	104.86 (10.25)	-
S.Em±	**0.06**	**0.04**	**0.04**	**0.05**	**0.05**	**0.04**	**0.08**	**0.05**	**0.52**	**0.14**	
CD (0.05)	**0.17**	**NS**	**0.12**	**0.15**	**0.15**	**0.13**	**NS**	**0.15**	**NS**	**0.40**	

* Mean of 10 plants, figures in parentheses are X+0.5 transformed values; **DBS - Day Before Spray; DAS - Days After Spray

Methomyl spray recorded maximum yield of 136.11 q/ha followed by monocrotophos bait, methomyl bait, chlorpyriphos, *B.t*. NSKE 5%, profenofos, quinolphos, *N. rileyi* , *S.l*. NPV, malathion bait and DDVP treatments which yielded 134.38, 132.99, 129.72, 128.94, 123.50, 120.49, 117.71, 116.13, 111.45, 102.52 and 101.02 q/ha respectively. The benefit cost ratio varied from 1.10 to 1.46 (Table 1).

Monocrotophos 36 SL bait effectively suppressed cutworm larvae up to 21 days and yielded 134.38 Q/ha. Tanwar *et al.,* (2005) also reported effective control of *S. litura* with bait consisting of rice bran, jaggery or molasses, carbaryl and water. Uhan (1989) tested carbaryl bait mixed with rice bran, maize and broken rice against *Agrotis ipsilon* (Hufn) on cabbage in Indonesia with success. Among the poison baits tested, methomyl bait proved effective and less persistent. The volatile gas of bait enters the hideouts, cracks and crevices and kills the cutworm larvae. Among the spray applications, methomyl 40 SP gave excellent control up to one week. After spray application, eight to ten days later, a slight increase in larval population was observed.

Spraying chlorpyriphos 20 EC was the next best and was found on par with methomyl in causing larval mortality. Chlorpyriphos curtailed cutworm build up up to 20 days after spray. This chemical was more persistent than methomyl but did not give instant effect like methomyl. Islam *et al.* (1991), Konar *et al.* (2003), Raj (2001), Patel *et al*. (2005) Wu Chang Xing *et al*. (2004), Bae *el al.* (2004) and Saini *et al.* (2005) also evaluated chlorpyriphos 20 EC against *Spodoptera* sp., and reported similar findings. Among the biopesticides tested, *Nomuraea rileyi* @ 1g/l gave best control of *S. litura* after one week and continued up to 21 days. Frequent rains and furrow irrigation created suitable micro environment for the entomofungus to establish in potato ecosystem. Navi *et al*. (2006) and Kulkarni and Lingappa (2002) recorded the maximum mortality of *S. litura* with *N. rileyi.* The bacterial formulation of *B. thuringiensis* was found to be on par with *N. rileyi* (Mohan *et al*., 2005; Tanwar *et al.*, 2005 ;Patel *et al.*, 2005). The next best microbial pesticide was *Spodo* NPV which was equally effective in reducing *S. litura* larvae up to 21 days. Because of continuous availability of *Spodoptera* population throughout the year, *Sl* NPV can spread or perpetuate in subsequent seasons. Tsuda *et al*. (2005) tested *S. litura* NPV and Im *et al*. (1990) obtained 97% mortality of *S.litura* irrespective of the formulation used. Narayanan (2005) obtained 100 % larval mortality in laboratory after application of *Sl* NPV. All these studies recommended use of *Spodo* NPV as one of the eco-friendly management tools for suppressing *S. litura* on potato.

Neem Seed Kernal Extract (NSKE) 5 % was on par with profenofos 50 EC (Table 1). However, NSKE can be used as one of the eco-friendly components as it is a feeding deterrent. Karnatak and Gupta (2005) determined the anti-feedant property of neemazal T/S at 300 and 150 ppm. Navi *et al*. (2006) confirmed that NSKE was on par with *N. rileyi* in reducing *S. litura* larval population. Efficacy of neem based formulations against *S. litura* in potato was also reported by Patel *et al*. (2005) and Nathan *et al*. (2005). From this study it can be concluded that combination of baits, *Sl* NPV and neem products could achieve effective control of *S. litura* in potato.

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