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Evaluation of poison baits against *Spodoptera litura* Fab. (Lepidoptera: Noctuidae) in spinach

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ABSTRACT

Choice tests were conducted under laboratory condition to standardize food bait using larvae of *S. litura* revealed the combination of rice bran + jaggery 20% + yeast 0.1% and rice bran + molasses 10% have proved best in attracting more larval populations. Efficacy of different combinations of poison baits was evaluated under field condition for the management of cutworm population in spinach. The jaggery based bait mixed with spinosad (rice bran + jaggery 20% + yeast 0.1%+ spinosad @ 2.5ml/kg) proved best next to spinosad spray in reducing the larval population and leaf damage and thereby increased leaf yield over other baits and untreated control. Hence, jaggery based bait with spinosad may be recommended for management of cutworms in vegetable ecosystem.

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INTRODUCTION

Spinach (*Spinacia oleracea*) is an edible flowering plant in the family Amaranthaceae, native to central Asia. Spinach is grown for its leaves which are used as a vegetable. *Spodoptera litura* (Fab.) (Lepidoptera: Noctuidae), commonly known as tobacco caterpillar in India it is a major pest because of its polyphagous feeding habit, high reproductive potential, overlapping generations, year round availability of host plants, ability of adults to migrate over long distances and frequent control failures with most of the commonly used insecticides.

Measures implementing for the management of early instars were spraying of the insecticides and poison baits are used for grown up larvae because of their hiding behaviour during day time near the base of the plants and cause damage during night time. Spraying of insecticides will not reach the target pest, thus it becomes difficult to manage the pest. Baiting is a technique that uses an attractive food to attract insect pests to an insecticide rather than treating an entire area. The poison bait containing monocrotophos was found superior in causing mortality compared to spraying and dusting of other chemicals. The poison bait was highly effective in

killing a large number of armyworm moths (Hiremath *et al.*, 1990).

The recent development of keeping of monocrotophos under restricted use in some crops by Central Insecticide Board and Registration Committee (Anonymous, 2005) and arrival of less toxic insecticides for use in pest management necessitates investigations on efficacy of alternate toxicant molecules to be used in the preparation of poison baits. Therefore, the use of rice bran for the bait preparation and cheaper and cost effective.

MATERIAL AND METHODS

Baits were prepared from rice bran as food material, by adding different fermentation hastening products such as jaggery, molasses and yeast.

Preparation of food bait :

For preparation of food baits, jaggery and molasses were used as a phagostimulant with rice bran. Yeast was added to enhance the fermentation and agar to hold the moisture.

Jaggery based food bait :

10 and 20 g of jaggery was used to prepare 10 and 20 per cent bait, respectively and was dissolved in 50 ml of water then poured on to rice bran 100g mixed thoroughly and kept for 12 hours for fermentation under dark condition.

Molasses based food bait :

10 and 20 g of molasses was used to prepare 10 and 20 per cent baits was dissolved in 50 ml of water and then poured on to rice bran 100g, mixed thoroughly and kept for 12 hours for fermentation under dark condition.

Maintenance of insect culture :

The culture of *Spodoptera litura* (Fab.) were maintained in the laboratory by providing leaves of spinach as food to maintain culture under laboratory at Department of Entomology, College of Horticulture, Bagalkot during January to June, 2016.

Evaluation of food bait ingredients for larval preference :

Series of trials were carried out in the laboratory to know the choice/ preference of the larvae to the different food materials.

All the rice bran based treatments were prepared by adding equal amount of water to maintain uniform consistency. The baits of 50g each was kept on a paper disc and treatments were arranged in a circle placed equidistantly on laboratory floor. Eight hours starved, 20 third instar larvae of *S. litura* were released at the centre at 8.00 pm. The larval settlements at different treatments were recorded after one hour and two hours.

Evaluation for preference of food baits over natural food :

Choice test was conducted to evaluate best food bait selected from above will be evaluated in the presence of natural host plants.

Selection of best insecticide for preparation of poison bait :

The best combination of food baits selected from above trail were mixed with chemical insecticides such as chlorpyriphos, malathion, lambda cyhalothrin, spinosad and quinolphos at recommended dosages mentioned in a table and evaluated for larvalpreference and mortality under laboratory condition. The experiment was conducted in two sets separately, but simultaneously for jaggery based and molasses based because of more number of treatments.

No. of larva attracted after two hours were recorded and maintained separately for two days to record mortality after one and two days. The above treatments were analysed and three best insecticides were chosen based on the attraction and mortality rate and used for testing field efficacy.

Evaluation of poison baits for their efficacy against cutworms on Palak under field condition:

The field trial was laid out at College of Horticulture, Bagalkot to evaluate the efficacy of poison baitsfor management of nocturnal caterpillars. Number of larvae per m^2 area was recorded a day before application and 3, 5 and 10 days after application, per cent leaf area damagedat a day before and 5 and 10 days after application was recorded at 7.30 pm to 9.00 pm. Finally, leaf yield was recorded from each plot and extrapolated to hectare basis.

Analysis of data :

Laboratory and field experimental data were subjected to square root transformation in case of zero

values and arc sine transformation in the case of percentage values and analysed with single factor ANOVA, the treatments were compared after subjecting them to DMRT by using software *Wasp 2*.

RESULTS AND DISCUSSION

To select the ingredients for food bait, various concentrations of attractants were tested towards the attraction of larva. Among the different ingredients, more number of larvae were attracted to the food bait with jaggery (20%) and molasses (10%) as well as and yeast (0.1%). Other ingredients and concentrations did not influence much on the attraction of larvae (Table 1).

It is evident from the results that, more number of larvae was attracted to the food bait with jaggery (20%) and molasses (10%) may be attributed to appropriate fermentation of food bait. In addition, rice bran alone can able to attract the larvae, thus, it was used in the preparation of poison baits. More larval attraction towards jaggery was observed when compared to molasses. Thus, the current study was supported by Basavaraju *et al.* (2010) who used jaggery with food bait in potato fields for the control of cutworms. In the present study, yeast 0.1 per cent, was also found attractive to larvae and could influence on enhancing the rate of fermentation of bait. Thus, various combinations of food baits were prepared by using these four ingredients *viz.*, rice bran, jaggery, molasses and yeast and tested for their efficacy.

Studies with various combinations of food ingredients, revealed that among the various combinations of food baits significantly more number of larvae were attracted towards the rice bran + molasses

Table 1: Response of *Spodoptera litura* towards various ingredients of food bait

Tr. No.	Treatments	No. of larva attracted after 2 hrs.
T_1	Rice bran + Jaggery 10%	0.5 (0.9) [d]
T_2	Rice bran + Jaggery 20%	3.7 (2.0) [a]
T_3	Rice bran + Molasses 10%	3.7 (2.0) [a]
T_4	Rice bran + Molasses 20%	2.5 (1.7) [bc]
T_5	Rice bran + Yeast 0.1%	2.5 (1.7) [bc]
T_6	Rice bran + Yeast 0.2%	1.7 (1.4) [c]
T_7	Rice bran + Agar 1%	1.6 (1.4) [c]
T_8	Rice bran + Agar 2%	0.7 (1.0) [d]
T_9	Rice bran alone	2.7 (1.7) [ab]
	S.E.±	0.9
	C.D. (P=0.05)	0.3
	CV (%)	12.00

Figures in the parenthesis are √x + 0.5 transformed values Means followed by same letter do not differ significantly by DMRT (P=0.05)

Table 2 : Response of *Spodoptera litura* towards different combinations of food bait

Tr. No.	Treatments	No. of larva attracted after 2 hrs.
T_1	Rice bran + Jaggery 20%	2.6 (1.7) [bc]
T_2	Rice bran + Molasses 10%	5.2 (2.3) [a]
T_3	Rice bran + Jaggery 20% + yeast 0.1%	3.2 (1.9) [b]
T_4	Rice bran + Molasses 10% + yeast 0.1%	3.0 (1.8) [b]
T_5	Rice bran + Jaggery 20% + agar 1%	1.8 (1.4) [cd]
T_6	Rice bran + Molasses 10% + agar 1%	1.8 (1.5) [cd]
T_7	Rice bran + Jaggery 20% + yeast 0.1% + agar 1%	2.8 (1.8) [b]
T_8	Rice bran + Molasses 10% + yeast 0.1% + agar 1%	1.0 (1.1) [d]
	S.E.±	0.1
	C.D. (P=0.05)	0.3
	CV (%)	13.9

Figures in the parenthesis are √x + 0.5 transformed values Means followed by same letter do not differ significantly by DMRT (P=0.05)

10% and rice bran + jaggery 20% + yeast 0.1%. Whereas, other food bait combinations with molasses or jaggery attracted less number of larvae. Thus, the results of current findings may be due to role of yeast in enhancing the fermentation of jaggery which attracted more number of larvae towards jaggery based combinations. Therefore, it can be concluded that, addition of yeast with jaggery could enhance fermentation but, its combination with molasses failed to attract more number of larva may be due to over fermentation of food bait that might have repelled the larvae. So, rice bran + molasses (10%) and rice bran + jaggery (20%) + yeast (0.1%) were considered for subsequent studies (Table 2).

The choice tests were conducted with above two combinations of food baits in the presence of host plant. The data obtained from the trial revealed that, rice bran + jaggery (20%) + yeast (0.1%) performed significantly superior followed by rice bran + molasses (10%). However, both the food baits were superior over host plants in attracting more larvae, indicating higher efficacy of baits to attract more larvae even in the presence of natural host plant (Table 3).

Standardized two food baits were tested with various insecticides for their efficacy in attracting larvae and subsequent mortality of larvae. Results of the choice test on attraction and killing of larvae revealed that, more number of larvae were attracted to the jaggery based food bait containing malathion followed by food bait with spinosad, and were found at par with each other. The next best treatment was molasses based food bait with malathion and was found at par with food bait without insecticide. Whereas, the baits with chlorpyriphos and lambda cyhalothrin failed to attract the larvae and found significantly inferior when compared to other treatments. This may be due to the repellency or pungent smell of these insecticides (Table 4).

In addition, mortality of larvae due to consumption

Table 3 : Relative preference of larvae to food bait over the natural host leaves

Tr. No.	Treatments	No. of larva attracted after 2 hrs.
T_1	Rice bran + Jaggery 20% + yeast 0.1%	7.5 (2.7) [a]
T_2	Rice bran + Molasses 10%	4.5 (2.1) [b]
T_3	Host plant	2.0 (1.4) [c]
	S.E.±	0.6
	C.D. (P=0.05)	0.18
	CV (%)	8.4

Figures in the parenthesis are √x + 0.5 transformed values Means followed by same letter do not differ significantly by DMRT (P=0.05)

Table 4: Response of *Spodoptera litura* to insecticides treated poison baits in terms of attraction and mortality under laboratory

Tr. No.	Treatment details	No. of larva attracted after 2 hours	Mortality (%)
T_1	Jaggery bait + Spinosad 45 SC @ 2.5 ml/kg	2.5 (1.7) [bc]	81.2 (72.9) [ab]
T_2	Jaggery bait + Chlorpyriphos 20 EC @ 10 ml/kg	0.0 (0.7) [i]	0.0 (0.3) [f]
T_3	Jaggery bait + Quinolphos 25 EC @ 10 ml/kg	1.0 (1.2) [g]	87.5 (78.5) [a]
T_4	Jaggery bait + Malathion 50 EC @ 10 ml/kg	2.6 (1.7) [b]	69.7 (56.6) [cd]
T_5	Jaggery bait + Lambda- cyhalothrin 5 EC @ 5 ml/kg	0.6 (1.0) [h]	85.0 (70.0) [a]
T_6	Jaggery bait (control)	4.1 (2.1) [a]	0.0 (0.2) [f]
T_7	Molasses bait + Spinosad 45 SC @ 2.5 ml/kg	1.8 (1.5) [de]	79.1 (62.8) [bc]
T_8	Molasses bait + Chlorpyriphos 20 EC @ 10 ml/kg	0.0 (0.7) [i]	0.0 (0.2) [f]
T_9	Molasses bait + Quinolphos 25 EC @ 10 ml/kg	1.5 (1.4) [ef]	75.0 (60.0) [c]
T_{10}	Molasses bait + Malathion 50 EC @ 10 ml/kg	2.1 (1.6) [cd]	95.8 (78.2) [a]
T_{11}	Molasses bait + Lambda- cyhalothrin 5% EC @ 5 ml/kg	1.1 (1.2) [fg]	56.2 (48.7) [d]
T_{12}	Molasses bait (control)	2.1 (1.6) [cd]	0.0 (0.2) [f]
	S.E.±	0.4	3.9
	C.D. (P=0.05)	0.13	11.1
	CV (%)	9.9	27.4

Figures in the parenthesis are √x + 0.5 transformed values Means followed by same letter do not differ significantly by DMRT (P=0.05)
Ingredients- Jaggery bait: Rice bran + Jaggery 20% + yeast 0.1% Molasses bait: Rice bran + Molasses 10%

of poison bait was assessed under laboratory condition at one day after ingestion. The results revealed that, jaggery based bait with spinosad and molasses based bait with malathion found superior in killing the larvae after 24 hours of application and were found at par with each other. The next best treatments were jaggery based bait with malathion and molasses based bait with spinosad and were on par with each other. Whereas, the food baits with chlorpyriphos and lambda cyhalothrin have failed to attract the larvae thus no mortality was observed. Shankargouda *et al*. (2016) studied the bio-efficacy of newer molecules against *S. litura* using oiled and de-oiled rice bran through no-choice test under laboratory condition and concluded that chlorfenapyr with oiled rice bran at 25, 50, 75 and 100 per cent of recommended doses was recorded cent per cent mortality followed by chlorpyriphos and profenofos which might be due to the no choice preference for larvae. Whereas, in the present study,the choice test was conducted to know the attraction and feeding preference of larvae to the food bait mixed with insecticides. And thus, it is concluded that both jaggery and molasses based bait with malathion and spinosad were proved best in attractingand killing of larvae (Table 4).

Efficacy of poison baits on population of cutworm larvae in the field revealed that, all the treatments were significantly superior over untreated control. However, the data recorded at five days after application showed spinosad sprayed plot (T_7) as significantly superior over jaggery bait with spinosad (T_4), plot sprayed with quinolphos (T_8), jaggery bait with quinolphos (T_5) and molasses bait with spinosad (T_1) and were at par with each other, but superior compared to other baits. Spray of malathion (T_9) found significantly inferior when compared to other treatments (Table 5). Jaggery based bait with spinosad proved best among the different poison baits and was next best to spinosad spray. There were no earlier reports of spinosad mixed with poison bait. However, the effectiveness of poison bait with spinosad may be due to its mode of action as stomach poison which successfully brought down the cutworm population (Table 5). Jaggery based bait with malathion also found effective in controlling the larval population and was on par with quinolphos spray. These results are also supported by Basavaraju *et al*. (2010) who reported that poison bait with malathion resulted in complete suppression of cutworms by recording zero larval count and the effectiveness was persisted upto one week.

Among the different food baits evaluated against cutworm (*S. litura*) in the field, spray of spinosad, quinolphos, molasses based bait with spinosad and malathion were found at par with each other and were proved best in reducing the leaf damage after ten days of application, followed by the jaggery based poison baits with spinosad and malathion. The present findings were supported by Basavaraju *et al*. (2010) who reported

Table 5:Impact of poison baits on population of cutworms, leaf damage and leaf yield in spinach

Tr. No.	Treatment details	* No. of larvae/ m^2			Leaf damage (%)			Leaf yield (q/ ha)
		D B A	5 DAA	10 DAA	D B A	5 DAA	10 DAA	
T_1	Molasses bait + Spinosad 45% SC @ 2.5 ml/kg	2.3 (1.5)	1.5 (1.4) ^{ef}	1.3 (1.3) ^{d}	5.5 (13.5)	4.2 (11.8) ^{d}	3.2 (10.3) ^{cde}	174.0^{d}
T_2	Molasses bait + Quinolphos 25% EC @ 10 ml/kg	3.0 (1.7)	2.5 (1.7) ^{c}	2.0 (1.5) ^{c}	4.7 (12.5)	4.9 (12.7) ^{cd}	5.0 (12.9) ^{bc}	155.9^{ef}
T_3	Molasses bait + Malathion 50% EC @ 10 ml/kg	3.0 (1.7)	1.8 (1.5) ^{de}	1.8 (1.5) ^{c}	5.3 (13.3)	4.1 (11.6) ^{d}	4.5 (12.2) ^{bcd}	165.0^{de}
T_4	Jaggery bait + + Spinosad 45% SC @ 2.5 ml/kg	2.0 (1.3)	0.8 (1.1) ^{g}	0.3 (0.9) ^{f}	4.7 (12.5)	5.9 (14.0) ^{bc}	2.3 (8.6) ^{ef}	194.9^{b}
T_5	Jaggery bait + Quinolphos 25% EC @ 10 ml/kg	2.6 (1.6)	1.5 (1.4) ^{ef}	1.0 (1.2) ^{de}	5.4 (13.4)	4.7 (12.4) ^{cd}	4.3 (12.0) ^{bcd}	179.6^{cd}
T_6	Jaggery bait + Malathion 50% EC @ 10 ml/kg g	2.3 (1.5)	2.0 (1.5) ^{cd}	2.3 (1.6) ^{c}	5.1 (13.0)	4.8 (12.7) ^{cd}	5.1 (13.0) ^{bc}	172.1^{d}
T_7	Spray Spinosad 45% SC @ 0.3 ml/l	2.6 (1.6)	0.3 (0.9) ^{h}	0.0 (0.7) ^{g}	5.1 (13.1)	3.7 (11.1) ^{d}	1.6 (6.8) ^{f}	218.0^{a}
T_8	Spray Quinolphos 25% EC @ 2 ml/l	2.3 (1.5)	1.1 (1.2) ^{fg}	0.8 (1.1) ^{e}	5.0 (12.9)	4.5 (12.2) ^{d}	3.0 (10.0) ^{de}	189.9^{bc}
T_9	Spray Malathion 50% EC @ 2 ml/l	3.3 (1.8)	3.1 (1.9) ^{b}	3.0 (1.8) ^{b}	5.3 (13.3)	7.0 (15.3) ^{ab}	6.5 (14.7) ^{b}	149.7^{f}
T_{10}	Untreated control	3.3 (1.8)	4.6 (2.2) ^{a}	5.0 (2.3) ^{a}	5.1 (13.1)	7.5 (15.8) ^{a}	11.4 (19.7) ^{a}	127.1^{g}
	S.E.±	-	0.05	0.0	-	0.5	0.9	0.5
	C.D. (P=0.05)	NS	0.16	0.15	NS	7.2	2.8	15.0
	CV (%)	-	6.2	6.1	6.1	1.7	13.6	5.0

Figures in the Parenthesis are √x + 0.5 transformed values*, and arcsine transformed values (Leaf damage)
Means followed by same letter do not differ significantly by DMRT (P=0.05) DBA- Day before application DAA-Days after application
Ingredients- Jaggery bait: Rice bran + Jaggery 20% + yeast 0.1% Molasses bait: Rice bran + Molasses 10% * Average of two applications

significantly less infestation of *S. litura* in potato upto 21 days when spayed with quinolphos (Table 5).

Significantly highest leaf yield of spinach was recorded from the plots sprayed with spinosad followed by application of jaggery based poison bait with spinosad and quinolphos spray which were found on par with each other. The next best treatment was molasses based poison bait with spinosad and malathion. Thus, it can be concluded that jaggery based poison bait with spinosad or malathion can reduce the cutworm population and leaf damage there by giving higher leaf yield (Table 5).

REFERENCES

Ascher, K.R.S. and Rubin, A. (1983). Laboratory and field decay experiments with insecticides poisoned wheat bran baits for the control of *Spodoptera littoralis* Fab. (Lepidoptera: Noctuidae). *Int. Pest Cont.,* **24** : 156-160.

Balasubramanian, G., Chelliah, S. and Balasubramanian, M. (1985). Relative susceptibility of larval instars of *Spodoptera litura* (Fab.) to insecticides. *Indian J. Plant Prot.,***12**: 143-145.

Basavaraju, B.S., Shashank, P.R., Vijaykumar, L. and Chakravarthy, A.K. (2010). Efficacy of poison baits and biopesticides against *Spodoptera litura* Fab (Lepidoptera: Noctuidae) in potato. *Pest. Manag. Hort. Ecosyst*., **16**(1): 64-68.

Chandrasekhar (1992). Studies on soil born pests of potato in Karnataka with reference to biology and management of *Spodoptera litura* Fabricius (Lepidoptera: Noctuidae). M.Sc. (Ag.) Thesis, University of Agricultural Sciences, Bangalore, KARNATAKA (INDIA).

Chari, M.S. and Patel, N.G. (1972). Efficacy of some newer insecticides against the tobacco leaf eating caterpillar, *Spodoptera litura*, (Fab.). *Indian J. Entomol.,***34**: 361-362.

Dhandapani, N., Abdulkareem, A. and Jayaraj, S. (1987). Studies on poison baiting for the tobacco caterpillar, *Spodoptera litura* (Fab.). *Entomon*,**12**: 223-225.

Dhandapani, N. and Babu, P.C.S. (1995). Efficacy of nuclear polyhedrosis virus against *Spodoptera litura* on groundnut in different locations of Tamil Nadu. *Madras Agric. J.*,**82**: 521-533.

Dhawan, A.K., Saini, S., Mohindru, B. and Singh, K. (2007). Susceptibility of *Spodoptera litura* (Fab.) to some novel insecticides. *Pesti. Res. J.*,**19**: 169-171.

Hiremath, I. G., Bhuti, S. G., Kachapur, M. D., Viraktamath, S., and Lingappa, S. (1990). Mass killing of moths – A new approach in the management of armyworm, *Mythimna separata* (Walker). *Karnataka J. Agric. Sci.,***3** : 128-130.

Joyce, J.A., Ottens, R.J., Herzog, G.A. and Bass, M.H. (1986). A laboratory bioassay for thiodicarb against the tobacco bud worm, boll worm, beet worm and fall army worm, *J. Agric. Entomol.,* **3**: 207-212.

Konar, A., Santanu Paul, Basu, A. and Chettri, M. (2003). Field evaluation of Bio- pesticides and insecticides against cutworm in plains of West Bengal. *J. Indian Potato Assoc.,* **30** (1-2): 155-156.

Mohan, S., Varadharajan, N. and Balasubramanian, M. (1989). Development and testing of pesticide bait pellets for tobacco cutworm, *Spodoptera litura,* Fab. *Pestology,***13**: 22-23.

Patel, P.J., Chaudhari, S.M., Patel, R.N., Patel, C.K. and Patrel, N.H. (2005). Integrated management of potato defoliating caterpillar. *Potato J.*, **32**(3-4): 252.

Renju, T., Giraddi, R. S., Hunje, R. and Mantur, S.M. (2009). Evaluation of new insecticidal poison baits against *Mythimna separata* (Walker) in sorghum. *Karnataka J. Agric. Sci*., **22** (4) : 773-776.

Sechriest, R.E. (1968). Greenhouse experiments with baits for control of the black cutworm. *J. Econ. Entomol.,***61**: 591-593.

Shankargouda, K.R., Kalibavi, C.M., Gururaj and Someshekar (2016). Bio-efficacy of new insecticide molecules against *Spodoptera litura* (Fab) as poison bait in groundnut. *Internat. J. Agric. Sci. Res.*,**6**(1): 331-338.

Shashibhushan, V., Rameshbabu, V., Dharmareddy, K. and Umamaheswari, T. (2010). Efficacy of certain insecticides against Spodoptera litura (Fab.) on potato. *Karnataka J. Agric. Sci.,* **23**(1) : 195-196.

Uhan, T.S. (1989). Effect of several kinds of poisonous baits on the black cutworm (*Agrotis ipsilon* Hufnagel; Lepidoptera: Noctuidae) and cabbage plant damage**.** Stat Peniliti Hama Balai Penelitian Horikultura Lembang, Indonesia. *Buletin Penelitian Hortikultura*, **17** (3) : 24-30.

Viswanadham, J.K., Punnaiah, K.C. and Rao, C.R.S. (1986). Studies on certain bait compositions against tobacco caterpillar, *Spodoptera litura* Fabricus (Noctuidae: Lepidoptera). *Andhra Agric. J.*,**33** : 16-19.

WEBLIOGRAPHY

Anonymous (2005). Pesticides restricted for use in India *http://cibrc.nic.in/list-pest-bann.htm.*