Effect of new Neem insecticides on Brinjal shoot and fruit borer

1.	**Project Title**	Bioefficacy of new Neem formulations against Brinjal shoot and fruit borer
2.	**Principal Investigator**	Project Leader, Biocontrol Vittal Mallya Scientific Research Foundation (VMSRF), Bangalore
3.	**Name and address of the Manufacturer**	Biosynergies India Private Limited (under license from VMSRF) UB Tower, Level 12, UB City, No. 24, Vittal Mallya Road, Bangalore – 560001
4.	**Product Overview**	SoluNeem™ (Azadirachtin 6%)* is the world's first water-soluble, Neem based bio-insecticide powder made from high quality Neem seed kernel extract. Made by the "Microencapsulation technology", which protects highly sensitive bioactives, while storage and post application. This makes SoluNeem™ better in field with enhanced effectiveness over existing Neem products. SoluNeem™ is approved by US EPA (Reg No. 81899-4). It comes as a powder, freely soluble in water and has over 2 years of shelf life, proven in accelerated stability studies. Neem Magic (Azadirachtin 5%) is an emulsifiable neem concentrate with 50000 ppm of Azadirachtin. The process of preparation is unique and certified by IMO for use in organic agriculture.
5.	**Objectives**	1. To conduct field evaluation on the bioefficacy of SoluNeem™ formulation against brinjal fruit and shoot borer, *Leucinodes arbonalis* Guinee. 2. To evaluate the effect of SoluNeem™ formulation on the phytotoxicity to brinjal.
6.	**Experiment details**	
i	**Experimental design and layout**	RBD – 8 treatments and 4 replications (Table 1). The experiment was laid out in the organic research farm of VMSRF at Kunigal, Tumkur, Karnataka.
ii	**Name of the crop and variety**	Hybrid Brinjal – Bulldozer (Mahyco Seeds Ltd.)
iii	**Soil type**	Medium Red
iv	**Fertilization**	Organic manures @ 10 tons/acre. No chemical fertilizers added.
v	**Irrigation**	Flooding
vi	**Tillage**	Tractor and Conventional
vii	**Season**	Rabi-Summer
viii	**Sowing date**	27.10.2009
ix	**Plot size**	30m X 4 m
x	**Spacing**	3' X 3'
xi	**Mode& type of treatment application**	Foliar spray
xii	**Equipment used**	Knapsack sprayer
xiii	**Quantity of spray solution**	500l/ha

***SoluNeem™ (Azadirachtin 6% SP) is AzaSol™ in USA**

xiv	**Dates of treatment imposition**	03.11.2009; 16.11.2009; 18.12.2009; 22.1.2010
xv	**Time of application**	Evening
xvi	**Harvesting dates**	From 14.1.2010 onwards at 3 to 5 days interval

8. Observations

Insect pest incidence

The incidence of the pest was observed during the cropping period irrespective of treatment imposition. The shoot borer damage (%) was observed for first 60 days of the crop stage, at 8-10 days interval starting from 20 days after transplanting (DAT). In each replication, shoot damage in 5 plants and their top 5 branches (if available) were recorded and converted to percentage of total number of shoots in the observed plants. After flowering and fruiting initiation (from 70 DAT), fruit damage was recorded by observing total number of damaged fruits in randomly selected 100 fruits harvested from each treatment plot. The data was converted to percentages and averaged.

Fruit yield

Fruit yield (after removing severely damaged fruits) in each plot was recorded after each harvest and the total yield per treatment was converted to q per acre for treatment comparison.

Phytotoxicity

The observations were recorded on the phytotoxicity symptoms, if any, on the crop due to different treatments with the test material. Effect on crop health (viz. leaf injury on tips, wilting, vein clearing, necrosis etc) was recorded after spray treatment by using following score.

Score	Per cent crop health affected
0	No adverse effect
1	1-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	61-70
8	71-80
9	81-90
10	91-100

9. Results

Shoot and Fruit borer damage

SoluNeem at 0.5 and 1.0 g/l resulted in lower shoot borer incidence and was comparable to the chemical insecticide treatment and the higher dosage of Neemazal (5 ml/l) across observations. Analysis of average data indicated that SoluNeem at 1.0 g/l were superior resulting in lowest shoot borer incidence compared to all other treatments, except SoluNeem at 0.5 g/l. SoluNeem at 0.5 g/l was as effective as the chemical insecticides and better than Neemazal formulation of Neem.

The average fruit borer incidence was significantly reduced in SoluNeem treatments at 1.0 g/l (17.83%) followed by 0.5 g/l (22.87%) compared to the chemical insecticide treatment (31.67%) and other botanical treatments (35-47%) and untreated control (66%).

Phytotoxicity

No phytotoxicity symptoms like injury to leaf tip and leaf surface, wilting, vein clearing, necrosis, epinasty and hyponasty were observed on the crop after both the sprays with the test material (Table 3).

10. Yield

The marketable yield (after removal of damaged fruits from the lot) from different treatment ranged from 11.44 q/acre (untreated control) to 37.65 q/acre (SoluNeem @ 1.0 g/l). It was significantly higher in SoluNeem at 1.0 g/l compared to all other treatments. SoluNeem at 0.5 g/l and the chemical insecticide treated plots produced equally (35.50 and 34.31 q/acre, respectively). Neemazal at 5 ml/l produced 28.52 quintal fruits per acre, significantly lesser than SoluNeem treatments at 1.0 and 0.5 g/l, but the yield difference was non-significant between SoluNeem at 0.5 g/l and Neemazal 5 ml/l treatments.

11. Conclusion

The results of the field experiment showed that SoluNeem (AzaSol) at 1.0 and 0.5 g/l were superior in reducing the shoot and fruit borer incidence and enhancing the brinjal fruit yield compared to recommended chemical insecticide and other EC formulations from Neem. There were no phytotoxicity symptoms in these treatments.

Table 1: Effect of SoluNeem™ on the incidence of brinjal shoot and fruit borer

Shoot borer incidence (%)

Treatments	Days after transplanting					
	20	28	35	50	57	Average
Untreated control	2.50	17.34 c	49.47 f	48.51 d	17.70 d	**27.10 e**
Malathion 50 EC @2 ml/l	4.17	9.28 a	12.03 ab	18.03 b	5.26 b	**9.75 b**
Neemazal 1% EC @2.5 ml/l	4.17	14.81 bc	33.09 e	34.73 c	14.79 c	**20.32 d**
Neemazal 1% EC @5 ml/l	2.78	12.59 ab	17.63 d	19.41 b	6.03 b	**11.69 c**
Neem Magic 5% EC @0.5 ml/l	2.27	15.58 bc	17.24 cd	20.64 b	6.38 b	**12.42 c**
SoluNeem 6% SP @0.25 g/l	2.08	11.65 ab	14.52 bcd	21.18 b	5.28 b	**10.94 c**
SoluNeem 6% SP @0.5 g/l	1.92	10.73 a	13.06 abc	13.25 a	5.11 b	**8.81 ab**
SoluNeem 6% SP @1.0 g/l	5.00	8.55 a	8.64 a	10.40 a	2.88 a	**7.10 a**
S Em +/-	**1.75**	**1.42**	**1.53**	**1.83**	**0.62**	**0.66**
CD (0.05)	**NS**	**4.20**	**4.52**	**3.83**	**1.83**	**1.96**

Fruit borer incidence (%)

Treatments	Days after transplanting						
	70	80	90	100	110	120	Average
Untreated control	81.62 d	60.00 f	53.00 d	58.00 e	70.00 f	76.00 c	**66.44 f**
Malathion 50 EC @2 ml/l	18.00 a	33.00 d	30.00 b	19.00 a	43.00 cd	47.00 b	**31.67 c**
Neemazal 1% EC @2.5 ml/l	47.00 c	40.00 e	45.00 c	42.00 b	60.00 e	50.00 b	**47.33 e**
Neemazal 1% EC @5 ml/l	35.00 b	29.00 c	40.00 c	39.00 b	32.00 b	47.00 b	**37.00 d**
Neem Magic 5% EC @0.5 ml/l	37.00 b	22.00 b	26.00 b	40.00 b	38.00 bc	49.00 b	**35.33 d**
SoluNeem 6% SP @0.25 g/l	31.00 b	21.00 b	27.00 b	34.00 b	49.00 d	48.00 b	**35.00 d**
SoluNeem 6% SP @0.5 g/l	19.00 a	15.00 a	18.00 a	20.00 a	27.00 a	34.00 a	**22.17 b**
SoluNeem 6% SP @1.0 g/l	13.00 a	16.00 a	12.00 a	13.00 a	22.00 a	31.00 a	**17.83 a**
S Em +/-	**2.93**	**1.22**	**2.15**	**2.87**	**3.06**	**2.40**	**0.78**
CD (0.05)	**8.67**	**3.61**	**6.35**	**8.49**	**9.06**	**7.11**	**2.29**

Table 2: Effect of SoluNeem™ on the fruit yield of brinjal

Treatments	Fruit yield	
	kg/plot	q/acre
Untreated control	34.31	**11.44 f**
Malathion 50 EC @2 ml/l	92.25	**34.31 b**
Neemazal 1% EC @2.5 ml/l	69.56	**23.19 e**
Neemazal 1% EC @5 ml/l	85.56	**28.52 c**
Neem Magic 5% EC @0.5 ml/l	74.56	**24.85 d**
SoluNeem 6% SP @0.25 g/l	89.81	**29.94 c**
SoluNeem 6% SP @0.5 g/l	106.50	**35.50 b**
SoluNeem 6% SP @1.0 g/l	112.94	**37.65 a**
S Em +/-		**0.53**
CD (0.05)		**1.56**