

# Bioefficacy Evaluation Of Garlic Extract Against Cotton Sucking Insects



## ABSTRACT

The present study was carried out to determine the bio efficacy of (allicin) garlic extract brand name Naturalus-I against sucking insect pests of cotton; *Amarasca devastan* *Gossypum hirsutum*; *Thrips tabaci*, *Gossypum hirsutum* and *Bemisia Tabaci* *Gossypum hirsutum*. Three dose rates of botanical pesticide (allicin) were evaluated against three major cotton sucking pests, (white fly, jassid & thrips) in comparison to synthetic chemical (bifenthrin). Naturalus-I show the best result @ 2 liters per acre to control sucking insect populations in comparison to standard chemical (bifenthrin) at 150 ml per acre after 72 hours of spray.

## INRODUCTION

Alliin is produced by enzymatic transformation of alliin [(+)-(S)-allyl-L-cysteine-sulfoxide]. Alliin and alliinase are found in parts of garlic clove (Stool and E. Seebeck, 1949). Alliin is an oily liquid, bright yellow in color, with a characteristic garlic pungent odor. ) alliin is a transient compound and is natural insecticide (Lin, 1990). That's why this project was studied to develop sustainable farming concepts to cut down the production cost of cotton; as major area is under Bt-cotton; which has resistance against bollworms but susceptible to sucking pests and farmers have to bear high costs of their management. Cotton (*Gossypium hirsutum* L.) is one of the most important fiber and cash

crop of Pakistan. In 2007 cotton crop was grown over an area of 3054 thousand hectares with production of 11655 thousand bales (Anonymous, 2008). Pakistan has made progress by increasing yield up to 641 Kg per hectare in 1992 -2000 (Jiskan, 2001). Still the yield per hectare is less than many other cotton growing countries. Among a variety of reasons of low yield, the magnitude of insect-pests, which damage the cotton crop from sowing to maturity, plays an important role. The insect-pests cause 5-10 percent losses on an average but severe attack of insect-pests can cause heavy qualitative and quantitative losses varying from 40-50% (Naqvi, 1976). ). It is attacked by 145 species of insects and mites in Pakistan (Huque, 1994).

More than 1326 species of insects have been reported in commercial cotton fields worldwide but only small proportions are pests (Matthews & Tunstall 1994). Among them white fly, Jassid and thrips are the most important sucking pests found in cotton crops.

### **1 – JASSID**

Jassid found in all cotton growing areas. It is also found on brinjal, potato, lady's finger and sunflower.

**Nature of damage:** Both the nymphs and adults suck up the plant sap from the under surface of leaves. The leaves show symptoms of "hopper burn" such as yellowing, curling, bronzing and sometimes drying up.

The economic threshold level [ETL] of jassid is 2 adults or nymphs per leaf or yellowing in the margins of the leaves.

### **2 – THRIPS**

Thrips feed on the tender plant foliage of cotton. The eggs are laid on plant tissue or may be inserted into slits.

**Nature of damage:** Adult and larvae feed on leaves, terminals, and other tender plant parts. Ragged crinkled leaves with a silvery appearance are typical symptoms of thrips damage to young cotton. Leaves usually curl upward and appear burned along edges as a result of feeding in the terminals. The economic threshold level [ETL] of thrips is 6 to 8 adults or nymphs per leaf.

### **3 – WHITE FLY**

White fly found particularly serious on cotton. It is very important as a vector of leaf curl virus disease of crops like tobacco, cotton, etc. and vein clearing disease of lady's finger.

**Nature of damage:** In cotton the nymphs are found in large numbers on the under surface of leaves and drain of sap due to sucking. Severe infestation results in premature defoliation, development of sooty mould on honey dew excreted, and shedding of buds and bolls and bad boll opening.

The ETL is 5 – 10 nymphs or 3 – 5 adults per leaf.

## **MATERIALS AND MEHODS**

Cloves of garlic were collected and grinded and finally blended with potassium hydro oxide and finally emulsified with Eruca sativa oil to avoid quick evaporation of the product in high temperature; at bard-yard NARC Islamabad – Pakistan. For its evaluation an experiment was conducted in the field under randomized complete block design (RCBD); at Tibba Sultanpur Vehari district Punjab on cotton variety MNH-886BT; sown in June; 2013; on plot size 1500 sq feet having five treatments along with a control; with three replications. One synthetic insecticide was used with recommended label dose rate; as standard to refine the effective dose rate of Naturalus-I [Garlic extract]; applied at Economic Threshold Levels (ETL) of each sucking insects.

The population of the each sucking pest was counted from 20 randomly selected plants from each treatment and replication. The insect population was recorded from upper, middle and lower leaf of alternate plants; 24 hours before spray and 24 hours and 72 hours after spray.

Abbots formula [Flemings and Ratnakaran 1985] was used for percent population change which is as under;

$$\% \text{population change} = 1 - \frac{\text{post treatment population in treatment}}{\text{pre treatment population in treatment}} \times \frac{\text{pre treatment population in control}}{\text{post treatment population in control}}$$

Data analyzed by variance and means and transformed averages were used at 5% and 1% level.

## RESULTS AND DISCUSIONS

In table-1 & 2 *Amarasca devastans* population levels / mortality of 24 and 72 hours after 1<sup>st</sup> & 2<sup>nd</sup> spray are presented respectively. Maximum decrease in means per plant population of jassid after 24 hour of spray was recorded in treatment Naturalus-I [Garlic extract] @ 2 liters per acre and talstar [bifentherin]. This was significantly better at both cd1% and cd5% and gave mortality 78.60% & 80.12% respectively after 24 hours of 1<sup>st</sup> & 2<sup>nd</sup> spray respectively in comparison to talstar [bifentherin] 78.45% & 84.97%. Both show knock down effect on adults. This study shows that Naturalus-I [Garlic extract] keeps the jassid populations below ETL for 72 hours in comparison to talstar [bifentherin] in epidemic or severe attack of jassid. [See table 1 & 2].

Table-1: Percent mortality level of *Amarasca devastan* after 1st spray.

(click to enlarge)

Treatments	Brand Name	Chemical Name	Dose rate per Acre	Population per leaf before spray	Population per leaf After 24 hour	Population per leaf after 72 hour	% mortality after 24 hour	% mortality after 72 hour
T1	Naturalus-I	Allicin	1000ml	5.93	3.4	3.4	18.38NS	27.58c
T2	Naturalus-I	Allicin	1500ml	5.23	1.61	2.73	54.10b	31.66b
T3	Naturalus-I	Allicin	2000ml	6.85	1.01	2.25	78.60a	56.88a
T4	Talstar	Bifenthrin	150ml	6.11	0.91	1.86	78.45a	61.35a
T5	Control	–	–	7.33	5.13	5.88	–	–
Cd 5%							16.51	25.01
Cd 1%							23.76	35.99

Transformed averages of %mortality are used in ANOVAs.

Table-2: percent mortality level of *Amarasca devastan* after 2nd spray.

(click to enlarge)

Treatments	Brand Name	Chemical Name	Dose rate per Acre	Population per leaf before spray	Population per leaf After 24 hour	Population per leaf after 72 hour	% mortality after 24 hour	% mortality after 72 hour
T1	Naturalus-I	Alicin	1000ml	3.4	2.78	4.08	46.20b	35.73b
T2	Naturalus-I	Alicin	1500ml	2.73	2.16	2.85	51.69b	47.09b
T3	Naturalus-I	Alicin	2000ml	2.25	1.16	2.3	80.12a	68.32a
T4	Talstar	Bifenthrin	150ml	1.86	0.81	1.75	84.97a	72.15a
T5	Control	--	--	7.33	<b>5.15</b>	<b>6.46</b>	--	--
Cd 5%							<b>10.13</b>	<b>15.35</b>
Cd 1%							<b>23.81</b>	<b>36.07</b>

Transformed averages of %mortality are used in ANOVAs.

Table-3 and 4 indicate that Thrips tabaci, Gossypium hirsutum performance was significantly good after 1<sup>st</sup> and 2<sup>nd</sup> application. Naturalus-I [Garlic extract] gives significant results/mortality @ 2 liter per acre 61.74% & 80.22% respectively. Both applications keep the thrips populations significantly below recommended ETL's; that is 6-8 adults per leaf after 24 and 72 hr of spray.

**Table-3: Percent mortality level of thrips after 1<sup>st</sup> spray.**

*(click to enlarge)*

Treatments	Brand Name	Chemical Name	Dose rate per Acre	Population per leaf before spray	Population per leaf After 24 hour	Population per leaf after 72 hours	% mortality after 24 hour	% mortality after 72 hour
T1	Naturalus-I	Alicin	1000ml	15.3	9.71	9.53	35.23b	32.30NS
T2	Naturalus-I	Alicin	1500ml	11.78	6.68	6.81	41.70b	35.03NS
T3	Naturalus-I	Alicin	2000ml	11.75	4.3	4.46	61.74a	58.10a
T4	Talstar	Bifenthrin	150ml	13.13	3.88	4.55	69.67a	61.68a
T5	Control	--	--	13.4	13.05	<b>12.11</b>	--	--
Cd5%							<b>14.56%</b>	<b>22.06%</b>
Cd 1%							<b>14.86%</b>	<b>22.51%</b>

Transformed averages of %mortality are used in ANOVAs.

**Table-4: Percent mortality level of thrips after 2nd of spray.**

*(click to enlarge)*

Treatments	Brand Name	Chemical Name	Dose rate per Acre	Population per leaf before spray	Population per leaf After 24 hour	Population per leaf after 72 hours	%mortality after 24 hours	% mortality after 72 hours
T1	Naturalus-I	Allicin	1000ml	9.53	5.2	5.88	50.70b	48.72b
T2	Naturalus-I	Allicin	1500ml	6.81	3.43	4.11	55.04b	52.38b
T3	Naturalus-I	Allicin	2000ml	4.46	1.56	2.46	80.22a	71.31a
T4	Talstar	Bifenthrin	150ml	4.55	1.25	2.43	85.72a	74.35a
T5	Control	-	-	13.4	8.16	<b>4.11</b>	-	-
Cd 5%							<b>8.71%</b>	<b>13.19%</b>
Cd 1%							<b>9.97%</b>	<b>15.10%</b>

Transformed averages of %mortality are used in ANOVAs.

Bemisia tabaci control remain better than synthetic chemical and Naturalus-I [Garlic extract] show good results @ 2 liters per acre at cd5%6.47 and cd1% 17.07 and manages well the populations of bemisia tabaci after 1<sup>st</sup> spray 69.22% and 2<sup>nd</sup> spray 67.78% [See table 5 & 6].

**Table-5: Percent mortality level of bemisia tabaci after 1st spray.**

*(click to enlarge)*

Treatment s	Brand Name	Chemical Name	Dose rate per Acre	Population per leaf before spray	Population per leaf After 24 hour	Population per leaf after 72 hours	% mortality after 24 hours	% mortality after 72 hours
T1	Naturalus-I	Allicin	1000ml	4.98	3.36	5.01	45.90b	27.43NS
T2	Naturalus-I	Allicin	1500ml	6.9	2.98	4.35	48.28b	35.44NS
T3	Naturalus-I	Allicin	2000ml	6.26	1.71	2.85	69.22a	54.42a
T4	Talstar	Bifenthrin	150ml	6.15	1.96	3.48	64.13a	42.48b
T5	Control	-	-	6.4	5.71	<b>6.31</b>	-	-
Cd 5%							<b>6.47%</b>	<b>9.80%</b>
Cd 1 %							<b>17.07%</b>	<b>25.85%</b>

Transformed averages of %mortality are used in ANOVAs.

**Table-6: Percent mortality level of bemisia tabaci after 2nd spray.**

*(click to enlarge)*



Treatment s	Brand Name	Chemical Name	Dose rate per Acre	Population per leaf before spray	Population per leaf After 24 hours	Population per leaf after 72 hours	% mortality after 24 hours	% mortality after 72 hours
T1	Naturalus-I	Allicin	1000ml	5.01	4.7	6.1	38.47c	11.33NS
T2	Naturalus-I	Allicin	1500ml	4.35	3.91	5.6	47.93b	17.33NS
T3	Naturalus-I	Allicin	2000ml	2.85	2.2	2.68	67.78a	57.01a
T4	Talstar	Bifenthrin	150ml	3.48	1.81	2.5	72.84a	58.45a
T5	Control	—	—	6.4	6.9	6.21	—	—
Cd 5 %							7.35%	11.14%
Cd 1 %							9.19%	13.92%

Transformed averages of %mortality are used in ANOVAs.

## CONCLUSION

Naturalus-I (allicin) [Garlic extract] is the alternative of chemicals/pesticides; which has managed cotton sucking insects *Amarasca devastan* *Gossypum hirsutum*; *Thrips tabaci*, *Gossypum hirsutum* and *Bemisia Tabaci* *Gossypum hirsutum* in the field @ 2 liters per acre [78.60a & 80.12a; 61.74a & 80.22a; 69.22a & 67.78a] after 1<sup>st</sup> & 2<sup>nd</sup> spray respectively. Bio-pesticides proved statistically as good as chemicals against cotton sucking pests; which are cheaper in price; easy to prepare; environment friendly and can promote organic cotton for premium profits.

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