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Effect Of *Moringa oleifera* On Fruit Infestation In Different Tomato Varieties Against *Heliothis armigera*

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Abstract-

Solanaceae family includes the flowering species *Lycopersicon esculentum*. This plant is commonly known as a tomato (10). Tamil Nadu, Andhra Pradesh, Karnataka, Madhya Pradesh, Gujarat, Odisha, West Bengal, Bihar, Telangana, Uttar Pradesh, Maharashtra, and others are among the states in India that produce the most tomatoes (18). These states contribute about 90% of the nation's tomato harvest. The tomato fruit borer, or *Helicoverpa armigera*, is a pest that damages tomatoes all over the country and feeds on over 15 different crops. 90% of the time, Helicoverpa damages fruit, causing up to 3.48% in economic losses. Fruit damage causes bacterial infection, which in turn causes surface deformation and rotting (11,15). Numerous biotic and abiotic obstacles have hindered tomato development. The usage of pesticides on fruits and vegetables has increased by 10–20% annually in India. Here, pesticides are more likely to have detrimental impacts on human health. In addition to damaging ground water, excessive use of chemical pesticides reduces soil fertility and eliminates soil microorganisms. Therefore, one alternate strategy to synthetic chemical management is integrated pest management, or IPM. During current experiment, five different tomato varieties Pusa Gaurav, Ratna, Arka Saurabh, Pant bahar and Arka Abha were assessed based on fruit infestation against *Heliothis armigera* after different concentration of Moringa sprays. Ratna (1.33) variety of tomato is found to be most resistant against *Heliothis armigera* while Pant Bahar (1.66) is most susceptible.

Keywords: Sahajan, *Heliothis armigera*, Pusa Gaurav, Arka Abha, Arka Saurabh, Biopesticides

1. Introduction:

India is one of the world's top producers of vegetables. With an annual yield of 84.8 million tons, vegetable agriculture currently takes up 6.09 million hectares of land. Due to the nation's exceptional natural resources, which include a variety of climates and distinct seasons, more than 100 different kinds of vegetables can be grown. The tomato is one of the most significant vegetable crops in India. It is one of the primary sources of income for small farmers. Ninety-four percent of tomato fruits are made up of water, soluble sugars, citric and malic acids, vitamins B1, B2, and A, as well as several mineral salts (8,10). Insects, of which *Helicoverpa armigera* is one of the most prevalent in India, regularly attack it. Chemical pesticides are used at extremely high levels by tomato farmers in India. The concerning increase in Helicoverpa chemical management is endangering both human health and the agro-ecosystem. But as a result of this technique, resistant bugs have been produced. As a result, developing sustainable management practices that use fewer chemical pesticides is gaining traction. *Helicoverpa management* requires an integrated pest management approach that aims to maintain a more sustainable agro-ecosystem and provide healthier crops (6,7). Keeping insect populations

below levels that result in economic harm is the main goal of integrated pest management. Larvae consume growing pods, leaves, flower buds, blooms, fruits, and seeds. In the majority of crops, larvae will initially only feed on leaves before transitioning to growing pods, bolls, cobs, and grain when they reach the third instar or beyond (8 mm or longer) (2,3). Larvae infest reproductive structures (flowers, squares) in certain crops, like cotton and moonbeams, as soon as they hatch. Larvae are far more challenging to manage with insecticides once they have established themselves in these hidden feeding areas. Larvae from the third instar (8–13 mm long) do 90% of all feeding (and hence harm). Since the fifth and sixth instars of larvae devour around half of their total diet, large larvae (longer than 24 mm) are the most harmful stage. Controlling larvae requires focusing on them while they are still tiny (less than 7 mm). Therefore, using locally available botanical extracts and bio-pesticides as an IPM component would be an alternative approach for the preferred control of *H. armigera* in order to lessen the negative effects of synthetic chemicals. The utilization of essential oils, botanical extracts, and isolated compounds as promising insect pest management implements (3).

2.0 Material and methods:

2.1Collection of plant material: Seeds of *Moringa oleifera* were collected from the different local areas. Fresh plant materials were washed through the distilled water thoroughly and dried on blotting paper. All plant materials shed dried under room temperature (25°C). Plant materials were powdered by using grinder.

2.2 Rearing of insect: To start the culture larvae of *Heliothis armigera* were collected from plots of Vegetable research farm, Kalyanpur and reared in a petridish containing fresh food. The food was changed daily. The larvae were kept till they became pupae under the laboratory conditions (27 ± 2°C and 75 ± 5% relative humidity). Sterilized soil was provided for pupation. After pupation, the pupae were collected from the soil and placed inside the cage for the emergence of adults. Cotton soaked with 10% honey solution mixed with a few drops of multivitamins was provided for adult feeding to increase the fecundity. They were allowed to mate. The pair of *Heliothis armigera* carefully transferred to fresh plate for egg laying after 24 hours. As soon as hatching starts, the newly hatched larvae were transferred to petridish and food was kept over moist filter paper.

2.3 Application of treatment: In the field experiments, each protectant solution sprayed on crop at seven days interval for four times. Extracts were sprayed with the help of one-liter hand compression "poly sprayer" on respective tomato crop plots. During the first spray, 2.5gm of protectant get dissolved in one-liter water. 5 gm powder of protectant get dissolved in one-liter water for second spray. During third spray, 10 gm powder of protectant get dissolved in one-liter water to make spray solution. For the fourth spray, 15 gm powder of protectant get dissolved in one-liter water to make respective spray solutions.

2.4 Data collection: During field experiments, first data was collected after third day of spray while second data was recorded at seventh day after application of above components of each module to test their bio-efficacy.

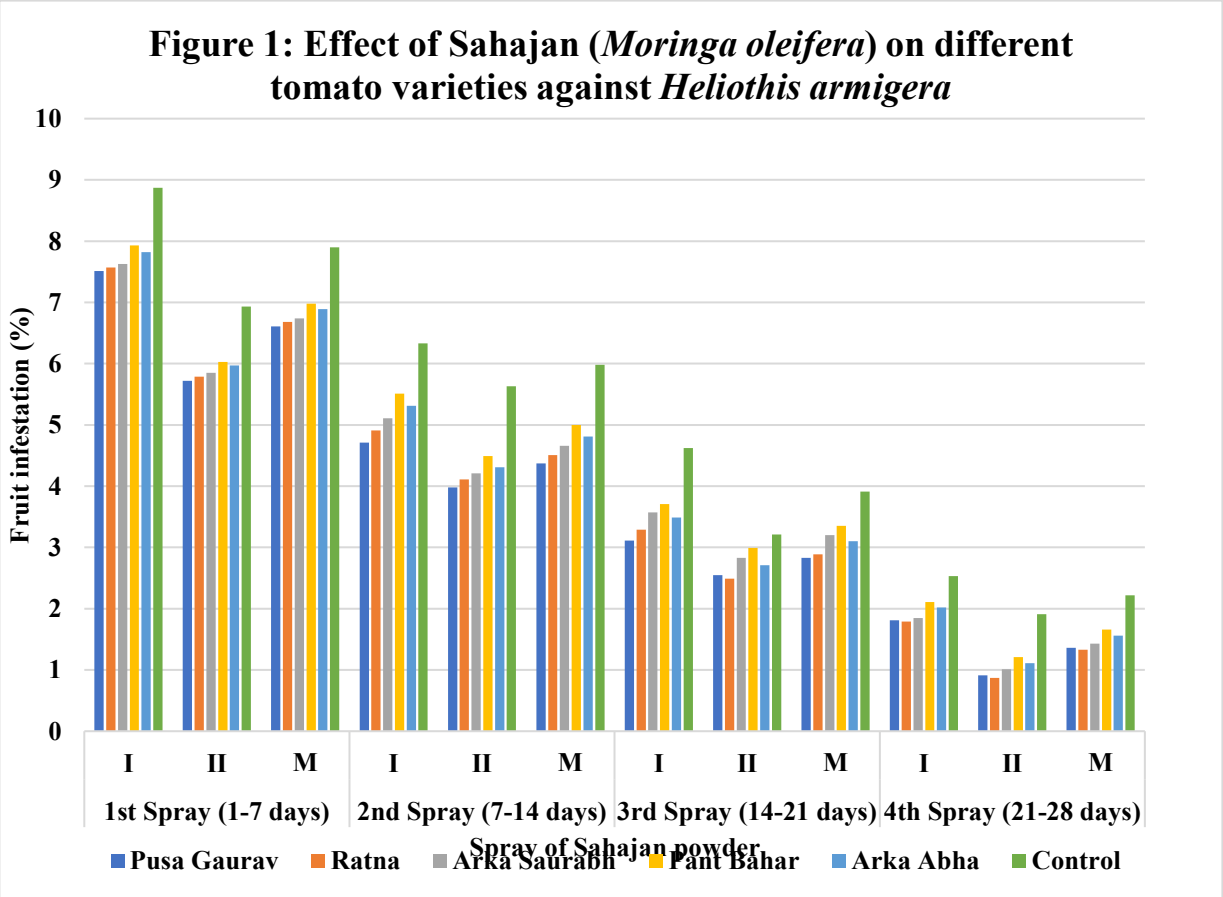
2.5 Statistical analysis: the data will be subjected to statistical analysis, "F" test for testing the variance ratio.

3.0 Result and discussion: It is observed from the table 1 and figure 1 that during the experiment, fruit infestation in five different tomato varieties Pusa Gaurav, Ratna, Arka Saurabh, Pant bahar and Arka Abha were assessed after four sprays of Moringa. After 1st spray, fruit infestation in Pusa Gaurav was observed 6.61, after 2nd spray 4.37, after 3rd spray 2.83 and after 4th spray fruit infestation was recorded as 1.36. After 1st spray,

fruit infestation in Ratna was observed 6.68, after 2nd spray 4.51, after 3rd spray 2.89 and after 4th spray 1.33 was recorded. In Arka Saurabh variety of tomato, after 1st spray of moringa, fruit infestation was recorded as 6.74, after 2nd spray 4.66, after 3rd spray 3.20 and after 4t spray 1.43. While in Pant Bahar variety of tomato, after 1st spray fruit infestation was observed as 6.98, after 2nd, 3rd and 4th spray it was recorded as 5.00, 3.35 and 1.66. After 1st, 2nd, 3rd and 4th spray of sahajan, in Arka Abha fruit infestation was recorded as 6.89, 4.81, 3.10 and 1.56.

Table No. 1-EFFECT OF SAHAJAN (*Moringa oleifera*) ON DIFFERENT TOMATO VARIETIES AGAINST *Heliothis armigera*

Tomato varieties	1st Spray (1-7 days)			2nd Spray (7-14 days)			3rd Spray (14-21 days)			4th Spray (21-28 days)		
	I	II	M	I	II	M	I	II	M	I	II	M
Pusa Gaurav	7.51	5.72	6.61	4.71	3.98	4.37	3.11	2.55	2.83	1.81	0.91	1.36
	(15.89)	(13.81)	(15.00)	(12.52)	(11.39)	(12.11)	(10.14)	(9.28)	(9.63)	(7.71)	(5.44)	(6.80)
Ratna	7.57	5.79	6.68	4.91	4.11	4.51	3.29	2.49	2.89	1.79	0.87	1.33
	(16.00)	(13.94)	(15.00)	(12.79)	(11.68)	(12.25)	(10.47)	(9.10)	(9.81)	(7.71)	(5.44)	(6.55)
Arka Saurabh	7.63	5.85	6.74	5.11	4.21	4.66	3.57	2.83	3.20	1.85	1.01	1.43
	(16.03)	(14.06)	(15.09)	(13.05)	(11.83)	(12.52)	(10.94)	(9.63)	(10.31)	(7.92)	(5.74)	(6.80)
Pant Bahar	7.93	6.03	6.98	5.51	4.49	5.00	3.71	2.99	3.35	2.11	1.21	1.66
	(16.32)	(14.18)	(15.23)	(13.50)	(12.25)	(12.92)	(11.09)	(9.81)	(10.47)	(8.33)	(6.29)	(7.49)
Arka Abha	7.82	5.97	6.89	5.31	4.31	4.81	3.49	2.71	3.10	2.02	1.11	1.56
	(16.22)	(14.06)	(15.23)	(13.31)	(11.97)	(12.66)	(10.78)	(9.46)	(10.14)	(8.13)	(6.02)	(7.27)
Control	8.87	6.93	7.90	6.33	5.63	5.98	4.62	3.21	3.91	2.53	1.91	2.22
	(17.36)	(15.23)	(16.32)	(14.54)	(13.69)	(14.06)	(12.39)	(10.31)	(11.39)	(9.10)	(7.92)	(8.53)
S. E. (D) I	0.96	0.91	0.92	0.88	0.82	0.86	0.73	0.69	0.71	0.61	0.59	0.60
C.D. at 5%	2.68	2.61	2.66	2.58	2.52	2.57	2.36	1.31	1.33	1.29	1.23	1.25



4.0 Conclusion: It is concluded from data presented in table 1 and figure 1that fruit infestation in tomato after 1st spray of Sahajan, ranged maximum in Pant Bahar (6.98%) and minimum in Pusa Gaurav (6.61%). In 2nd spray, it varied from 5.00%- 4.37%. In 3rd spray, the maximum damage noticed in Pant Bahar (3.35%) and minimum in Ratna (3.10%) respectively. After 21- 28 days, minimum fruit infestation observed in Ratna (1.33%) followed by Pusa Gaurav (1.36%) and Arka Saurabh (1.43%) respectively while maximum in Pant

Bahar (1.66%). It is clearly concluded from the data that after 4th spray of sahajan, Ratna variety of tomato is most resistant against *Heliothis armigera* while Pant Bahar is most susceptible.

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