

Comparative Toxicity of Nitenpyrem and Neem Oil Against *Amrasca biguttula biguttula* in Okra

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Abstract

Sajid, Z., M.A. Ul Haq, Q. Farooq, Y. Sultan, U. Sher, M. Tayyeb and M. Ramzan. 2021. Comparative Toxicity of Nitenpyrem and Neem Oil Against *Amrasca biguttula biguttula* in Okra. Arab Journal of Plant Protection, 39(3): 210-214. <https://doi.org/10.22268/AJPP-039.3.210214>

The Jassid, *Amarasca biguttula biguttula* is an important sucking pest of the okra crop. An experimental study was conducted during 2018 to check the comparative toxicity of nitenpyrem and neem oil against jassid under okra field conditions. The study revealed that 24 hours after treatment, nitenpyrem was found more toxic and effective with maximum reduction of jassid population (72.15%). Whereas, 120 hours after treatment with 4% neem oil, 15.05% jassid reduction was observed. The mortality rate of the jassid was increased with increasing in time after application of chemical insecticides. The study concluded that insecticide was most toxic and gives higher mortality of jassid as compared to neem oil.

Keywords: *Abelmoschus esculentus*, Malvaceae, *Amarasca biguttula biguttula*, botanicals, insecticides, Pakistan.

Introduction

Okra (*Abelmoschus esculentus* L.) belongs to Malvaceae family, is grown as a main vegetable (Kumar *et al.*, 2010) grown in tropical and subtropical countries of the world including Pakistan (Schippers, 2000), in two growing seasons annually (Mahmood *et al.*, 2014). Okra is an important source of energy, vitamins, protein, carbohydrate, iodine and mineral (Kahlon *et al.*, 2007; Saifullah & Rabbani, 2009). Its production is dependent on various factors such as varieties, irrigation and balanced fertilizer, in addition to many other factors such as insect pest, plant viruses, diseases and poor soil fertility (Dhaliwal, 2004) which can decrease its production in various places of the world.

More than 48 insect species have been recorded as a pest infesting okra (Fajinmi & Fajinmi, 2010). Okra could be infested by both biting insect pests like fruit worms and sucking pests that that feed on cell sap (Fajinmi & Fajinmi, 2010). The main serious sucking and chewing insect pests of okra are *Amrasca devastans*, *Aphis gossypii*, *Thrips tabaci*, *Bemisia tabaci* and *Helicoverpa armigera*, *Earias vittella* (Anaso & Lale, 2001; Singh *et al.*, 2013).

Among all insect pests, (Singh *et al.*, 2013) the Jassid (*Amrasca devastans*) is considered as major and serious pest of okra throughout the world (Dhandapani *et al.*, 2003). Both adults and nymph jassid stages suck the cell sap from the ventral surface of plant leaves. During severe infestation, jassid inject toxic chemicals (toxin) to the crop, which cause

curling and stunting of crop (Ramzan *et al.*, 2020; Singh *et al.*, 2008).

Severe jassid attack can lead to 54.04% yield loss. Several management strategies have been adopted to control this notorious pest throughout the world. Among all adopted methods, chemical control is mostly used as principle strategy against insect pest due to quick action toward the target insect pests. However, the chemical method has proved harmful for many non-targeted fauna (Hassan *et al.*, 2007), in addition to its negative impact on the environment (Malik *et al.*, 2015). Furthermore, the intensive application of the same group of insecticides against the target pest can enhance the development of resistance to the chemicals used (Murtaza *et al.*, 2019; Rajput, 2004).

On the other hand, plant natural extracts are considered as ecofriendly, species specific, biodegradable, nontoxic to humans, animals, birds and nontarget species. These could be derived from barks, seed, roots, leaves and fruits of various plants, and many of them are now being used to control insect pests and proved to be effective in managing insect pests in many countries. The various biopesticides such as *Azadirachta indica* showed to have repellent and anti-feeding properties were tested against insect pests (Khattak *et al.*, 2006; Senthil Nathan *et al.*, 2009).

Integrated pest management (IPM) which is the most important eco-friendly and cost-effective method to control insect pests (Memon *et al.*, 2004). Using biopesticides as a control component in the IPM strategy proved to be effective, economical, and not harmful to natural enemies (Sharma & Ortiz, 2002). For this purpose, the current study

was conducted in okra field to check the comparative toxicity of neem oil with Nitenpyrem against the okra Jassid.

Materials and Methods

Experimental design

An experimental trial was conducted in a farmer's field in Multan, Pakistan to check the comparative toxicity of neem oil and the insecticide (Nitenpyrem 50% WG) for ecofriendly management of jassids which attack the okra crop. Randomized complete block design (RCBD) was used with four replications each with seven treatments, including control. The size of individual plots was 3 × 3 meters. Okra variety, Sada Bahar was sown on ridges. The rows were 60 cm apart and the distance between plants in the rows was 30 cm. The routine management practices were applied throughout the trial.

Source of neem oil and insecticide

Neem oil was brought from Department of Entomology, University of Agriculture, Faisalabad, whereas the chemical insecticide was purchased from a nearby pesticide shop.

Bioassay of the neem oil and the chemical insecticides

Different concentrations of neem oil were prepared and applied to the crop when the pest population reached the economic threshold (ETL) level. Neem oil with 1, 2, 3, 4, 5 percent concentrations and Nitenpyrem 50% WG were applied to the crop @ 100 ml/ha by using a knapsack sprayer.

Data collection

Jassid population was recorded weekly for each treatment. Data was documented 24, 48, 72, 96 and 120 h after treatment. For this purpose, six plants were randomly selected from the central two rows in each treatment and upper, middle and lower leaves of selected plants were examined to count pest population. Mean and percent reduction of pest population was calculated according to Rehman *et al.* (2015).

Statistical analysis

Data was statistically analyzed by using statistical analysis package MSTATC. F ratio was also determined by least significance difference (LSD) test at 0.05 probability level to record the statistically significant difference among treatments.

Results

Toxicity of nitenpyrem and neem oil against the okra jassid in the field after the first spray is presented in Table 1. After 24 hours of treatment, the insecticide Nitenpyrem (T6) was found the most effective with maximum reduction of jassid population reached to (70.42%). While neem oil at 1% (T1) was least effective against jassid population. The maximum reduction of jassid was 74.56% recorded after 48 hours, post treatment. Pest population was reduced with increase in chemical percentage in neem oil. After 96 hours of treatment, the maximum jassid reduction was (66.78) observed at T4 treatment.

It was observed that jassid reduction in T5 and T4 was found significantly different from T1, T2, T3 and T7 at 5% level of significance. The reduction in jassid population was decreased at all treatment and reached to 30.35%, with Nitenpyrem after 120 hours of treatment. The pest population was higher in control treatment as compared to treated plots. All treatments were found most effective and showed best control against pest population after 72 hr. of treatment.

Toxicity of nitenpyrem and neem oil against jassid in okra field after 2nd spray is given (Table 2). After 24 hours of treatment, nitenpyrem (T6) was found more toxic and effective with maximum reduction of jassid (72.15%). while Neem oil at 1% (T1) was least effective treatment against jassid. The maximum reduction (72.15%) of jassid population was found in treatment T6 I was statistically similar with T4 and T5 treatment with 63.66 and 65.77% reduction after 24 hours. After 48 hours of application, all treatments were significantly different from control. After 96 hours, T6 was most effective followed by T5, T4, T3, T2 and T1 treatment.

Table 1. Reduction (%) in okra jassid population following the first spray of different treatments.

Treatment code	Treatments	Period after first spray				
		24 hours	48 hours	72 hours	96 hours	120 hours
T ₁ Neem oil	1%	30.34 d	34.42 d	42.30 d	49.73 d	6.97 d
T ₂ Neem oil	2%	34.57 c	47.72 c	45.76 bc	54.62 c	8.63 d
T ₃ Neem oil	3%	40.62 b	52.35 b	55.66 b	57.78 b	6.88 d
T ₄ Neem oil	4%	60.52 a	67.36 a	68.15 a	66.78 a	12.98 c
T ₅ Neem oil	5%	66.53 a	69.16 a	70.01 a	64.99 a	19.55 b
T ₆ Nitenpyrem	Nitenpyrem	70.42 a	74.56 a	78.02 a	58.15 a	30.35 a
T ₇ Water	Control	4.33 e	13.44 e	11.67 e	-1.06 e	-10.43 e
LSD value		4.12	4.23	4.10	5.11	4.00

Means followed by the same letters in the same column are not significantly different at P=0.05.

Values with “-” symbol represent an increase in the pest population.

Table 2. Reduction (%) in okra jassid population following the second spray of different treatments.

Treatment code	Treatments	Period after second spray				
		24 hours	48 hours	72 hours	96 hours	120 hours
T ₁ Neem oil	1%	29.60 d	33.51 d	35.56 d	41.42 d	8.12 c
T ₂ Neem oil	2%	31.00 c	38.45 c	40.26 c	43.78 c	8.64 c
T ₃ Neem oil	3%	37.12 b	40.32 b	44.01 b	46.83 b	12.77 b
T ₄ Neem oil	4%	63.66 a	69.74 a	70.25 a	67.77 a	15.05 a
T ₅ Neem oil	5%	65.77 a	71.97 a	71.56 a	64.35 a	14.81 a
T ₆ Nitenpyrem	100ml/Ha	72.15 a	73.01 a	71.55 a	64.71 a	12.67 a
T ₇ Water	Control	4.05 e	3.87 e	4.66 e	-5.08 e	-1.65 d
LSD Value		1.35	1.12	1.99	2.80	1.84

Means followed by the same letters in the same column are not significantly different at P=0.05.

Value with “-” symbol represent an increase in the pest population.

Discussion

Different plant extracts and chemical insecticides such as thiomethoxam, neonicotinoid, imedacloprid, Fipronil, fipronil and lambda Cyhalothrin were tested earlier for their toxicity against jassid and whitefly pests which attack okra fields (Begum *et al.*, 2016; Pawar *et al.*, 2016). Researchers reported that imedacloprid was the most effective insecticides as compared to all others tested (Ali *et al.*, 2005; Preetha *et al.*, 2009), whereas dimethoate was reported to be the most effective insecticide against jassids (Dabhi & Koshiya, 2014).

In the current study, an experiment was conducted to check the comparative toxicity of neem oil and nitenpyrem using different concentrations against the okra jassid population. The significant variation of pest population was recorded in okra plant after chemical application. It was found that all doses of neem oil and nitenpyrem used were found effective against the jassid. The lowest concentration

of neem oil (1%) was least effective in reducing the jassid population, whereas the 5% concentration was the most effective. All tested concentrations were found toxic against jassid as compared to control. The study findings are in line with the results reported by previous workers (Rehman *et al.*, 2015). The application of botanical extracts and chemical insecticides can influence insect pest population and total fruit weight (Ali *et al.*, 2005; Indira Gandhi *et al.*, 2006).

Neem oil is ecofriendly and effective botanical extract to control jassid in okra field, and it is recommended for application by farmers at the inception of pest population increase and proved to be an effective component of the integrated pest management strategy.

Acknowledgement

Authors are highly thankful to the farmer Mr. Masood Maqbool, for providing his field to conduct the study.

المخلص

ساجد، ذو النورين، محمد أنور الحق، قاسم فاروق، يعقوب سلطان، أسامة شاعر، محمد طيب ومحمد رمضان. 2021. مقارنة سمية المبيدات نايتتبيريم وزيت النيم ضد نطاط الأوراق *Amarasca bigutulla bigutulla* الذي يصيب محصول البامياء. مجلة وقاية النبات العربية، 39(3): 210-214.

<https://doi.org/10.22268/AJPP-039.3.210214>

يعتبر نطاط الأوراق من الآفات الماصة المهمة على محصول البامياء. تم إجراء دراسة مقارنة عملية خلال العام 2018 لمعرفة كفاءة سمية المبيدات نايتتبيريم وزيت النيم لمكافحة نطاط الأوراق على محصول البامياء تحت الظروف الحقلية. أظهرت الدراسة أن بعد 24 ساعة من رش المبيد، وجد بأن المبيد نايتتبيريم أكثر سمية وسبب خفض أعداد الآفة بـ 72.15%. بينما وجد بأنه بعد 120 ساعة من رش زيت النيم 4% تم خفض أعداد نطاط الأوراق بنسبة 15.05% فقط. وازدادت نسبة موت النطاطات مع زيادة الوقت بعد رش المبيدات. كما تبين بأن المبيد الكيماوي كان أكثر سمية وأدى إلى نسبة موت أعلى لنطاط أوراق البامياء مقارنة بزيت النيم.

كلمات مفتاحية: بامياء، نطاط الأوراق، العائلة الخبازية، مبيدات، مبيدات نباتية، باكستان.

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Received: December 28, 2020; Accepted: September 15, 2021

تاريخ الاستلام: 2020/12/28؛ تاريخ الموافقة على النشر: 2021/9/15