The Ecoscan 10(1&2): 29-31, 2016
AN INTERNATIONAL QUARTERLY JOURNAL OF ENVIRONMENTAL SCIENCES
www.theecoscan.com

EFFECT OF BOTANICALS ON FERTILITY PARAMETERS OF *MYZUS PERSICAE* (SULZER)

URVI SHARMA*, R. P. S. CHANDEL AND P. L. SHARMA
Department of Entomology,
Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan -173 230 (HP), INDIA
e-mail: urvi.urvi.sharma.sharma@gmail.com

ABSTRACT

The effect of aqueous extracts of two botanicals namely, neem seed kernels and darek drupes, on fertility parameters of *Myzus persicae* (Sulzer) were evaluated under laboratory conditions using capsicum as host plant. The fertility parameters of the adults developed from treated nymphs were adversely influenced by both NSKE (2.5%) and darek drupe extract (10%). The growth and fertility parameters like net reproductive rate (R_o), true intrinsic rate of increase (r_m), true generation time (T), finite rate of increase (λ), doubling time (DT) and weekly multiplication rate (WE) were 8.4, 0.257, 8.26 days, 1.29, 2.69 days and 6.06 for individuals treated with NSKE (2.5%) and 6.14, 0.217, 8.34 days, 1.24, 3.18 days and 4.59 for darek (10%) treated insects as against 42.7, 0.308, 12.15 days, 1.36, 2.24 days and 8.68 for untreated aphids. The findings of the study can be exploited as environmentally safe options for the management of *M. persicae*.

KEY WORDS
Fertility parameters
Myzus persicae
Neem seed kernel and darek drupe extracts

Received : 14.03.2014
Revised : 11.01.2016
Accepted : 23.02.2016

***Corresponding author**

INTRODUCTION

Myzus persicae (Sulzer) (Hemiptera: Aphididae), commonly known as the green peach aphid or greenfly is an extremely polyphagous pest of worldwide distribution. It has been reported to feed on more than five hundred species of plants in over 40 plant families, including a wide range of vegetables and ornamental crops grown in both field and in greenhouses (Blackman and Eastop, 2007). Besides causing direct loss by sucking vital cell sap from various plant parts, it vectors more than one hundred and fifty plant viruses in different hosts. Also, this pest is supposed to attain very high population densities on young plant tissue due to its short generation time and tremendous fecundity. In view of its economic importance, efficacy of a large number of insecticides including some novel compounds have been evaluated and found promising under laboratory and field conditions (Gavkare *et al*., 2013). However, this pest is now gaining importance in global concern since it has developed resistance to a number of insecticides, including carbamates, neonicotinoids, organophosphates and pyrethroids around the world (Foster *et al*., 2007). Thus, the critical effects of conventional pesticides including the deleterious effects on beneficial insects and humans, development of resistance, secondary pest outbreaks, excessive pesticide residues, and soil and water pollution have led the growers to adopt more environmentally friendly approaches. Azadirachtin based bio-products such as neem and darek extracts have been reported to cause deletarious effects on different aphid species and are thus promising in the present scenerio of integrated pest management exploiting various novel biopesticides. Meena *et al*. (2013) have evaluated various bio-products against *Lipaphis erysimi* (Kaltenbach) and reported that the NSKE @ 5% resulted in 83.2 per cent reduction of aphid population after 10 days of spray. Similarly, the effects of aqueous extracts of neem powder when evaluated against *Aphis gossypii* Glover proved effective in causing nymph mortality and reducing their survival rate and fecundity (Santos *et al*., 2004). But very few studies have been conducted on this aspect from Himachal Pradesh. By keeping this in view, the present studies were planned with an objective to evaluate the effects of botanicals *viz*., neem seed kernel and darek drupe extracts on fertility parameters of *M. persicae*.

MATERIALS AND METHODS

The laboratory study was conducted during 2011-13 in the Department of Entomology, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh.

Raising of capsicum plants and *M. persicae* culture

The seedlings of capsicum were raised regularly in pots to ensure the availability of plants throughout the study period. Adults and nymphs of *M. persicae* were reared on these capsicum plants and kept in screened cages under laboratory

conditions.

Preparation of aqueous extracts

The aqueous extracts of neem seed kernels and darek drupes were prepared under laboratory conditions as per the method adopted by Sharma and Gupta (2009) and a stock solution of 20 per cent was prepared. For this purpose 20g of powered material (seed kernels in case of neem and drupes in case of darek) was soaked in about 50 ml distilled water in a beaker and kept for 24 hours. The extract was passed through the muslin cloth which was further filtered through filter paper (Whatman no.1) and final volume was made to 100 ml with the help of distilled water. Triton-X was added as an emulsifier to these extracts at a rate of 0.05 per cent. The stock solution was further diluted with emulsified (0.05%) distilled water to get working solutions of desired concentrations for the respective extracts.

Studies on fertility table parameters

To determine the effect of botanical extracts on aphid fertility table parameters, seedlings of capsicum (about 45 days old) were dipped for 30 seconds in the botanical extracts solutions prepared as LC_{50} concentrations (*i.e.* 2.5% for NSKE and 10% for darek) and are shade dried. For the control, seedlings were dipped in emulsified distilled water. The age-specific survival and fecundity of 20 neonate nymphs which began their life together (cohort) is studied by individualizing them on the leaf of each seedling with the help of camel hair brush for treated as well as untreated aphids. Each of these pots was then covered with the glass chimney and these were kept at constant temperature (25 ± 0.5°C) and relative humidity of (60 ± 5 %) conditions. Neonates produced by each female were counted daily and removed in order to avoid their mixing with next days layings. Data on various parameters of life-fertility table for untreated and treated cohorts were constructed to study the effect of these botanical extracts on the fertility parameters of *M. persicae* as per method given by Watson (1964), Wyatt and White (1977) and Takalloozadeh (2010). The following parameters were worked out (Table 1).

RESULTS AND DISCUSSION

The present study revealed that both NSKE (2.5%) and darek (10%) extracts resulted in significant reduction in various parameters of fertility table that included the net reproductive rates (R_o) and the intrinsic rate of increase (r_m) etc of *M. persicae* over control (Table 2). The net reproductive rate was minimum (6.14) in aphids treated with darek (10%) followed by NSKE (2.5%) (8.4). The R_o of untreated aphids was as high as 42.4. Intrinsic rate of increase (r_m) was also least i.e. 0.217 for aphids treated with darek drupe extract (10%). The respective values of r_m for insect treated with NSKE (2.5 %) and untreated were 0.257 and 0.308 nymphs/female/day. Similar trend was observed when the finite rate of increase of treated and untreated aphid was compared. Treated insects multiplied at slower rate than untreated ones. Aphids treated with darek (10%) and NSKE (2.5%) doubled their population in 3.18 and 2.69 days, respectively as against 2.24 days by untreated aphids. Similarly the weekly multiplication rate of darek extract and NSKE treated aphids was 4.59 and 6.06, respectively, which was lower than 8.68 obtained for untreated insects.

Table 1: Different fertility table parameters

Parameters	Formula	Identification
Gross reproductive rate (GRR)	$GRR = \Sigma m_x$	Total number of female nymphs laid per female (female nymphs / female)
Net reproductive rate (R_0)	$R_0 = \Sigma lx.m_x$	Rate of multiplication of the population in each generation, measured in terms of females produced per generation (female produced / female)
Approximate generation time (T_c)	$T_c = \Sigma x.lx.mx/R_0$	Mean length of a generation (birth to weighted mean reproductive age of the adult)
Innate capacity for natural increase (r_c)	$r_c = \log_e R_0 / T_c$	Capacity of a species to increase in number
True intrinsic rate of increase (r_m)	$r_m = 0.738 (\log_e Md/d)$	Actual rate of increase of population under specified constant environmental conditions in which space and food are unlimited
True generation time (T)	$T = \log_e R_o / r_m$	Mean period elapsing from the birth of parents to the birth of offspring, calculated by the formula
Finite rate of natural increase (λ)	$\lambda = e^{rm}$	Number of times the population increases per unit time
Weekly multiplication rate	$(WE) = e^{7.rm}$	Number of times the population multiplies/increases in a week
Doubling time (DT)	$DT = \log_e 2/r_m$	Time (days) taken by a species to double its population

Here, x = age of the individuals in days (pivotal age), mx is the number of females produced per female at age x; and lx is the survival rate at age x; d is the time from birth to first reproduction (days), Md is the number of young ones produced by adult in first d days of reproduction after the adult moult and 0.738 is correction factor (Wyatt and White, 1977).

Table 2: Fertility parameters of untreated and treated (2.5 % NSKE & 10 % darek extract) *M. persicae*

Parameters	Control (Untreated)	NSKE (2.5%)	Darek extract (10 %)
Gross reproductive period (GRR)	48.94	16.80	11.40
Net reproductive rate, R_o	42.70	8.40	6.14
Approximate generation time, Tc (days)	16.97	11.81	11.74
Innate Capacity to increase, r_c	0.221	0.180	0.154
True intrinsic rate of increase, r_m	0.308	0.257	0.217
True generation time,T (days)	12.15	8.26	8.34
Finite rate of increase,	1.36	1.29	1.24
Doubling time, DT (days)	2.24	2.69	3.18
Weekly multiplication rate (WE)	8.68	6.06	4.59

These findings corroborate with those of Santos *et al*. (2004), who reported that neem extracts adversely influenced the reproduction, net reproductive period and the intrinsic rate of increase of *A. gossypii*. According to these workers, r_m value was zero for aphids treated with neem seed powder at 1410 mg/100 ml of water. In the similar studies conducted by Barati *et al*. (2013) on *B. tabaci*, the results revealed that the net reproductive rate and r_m values were quite lower (8.23 and 0.09, respectively) for insects exposed to azadiractin than untreated individuals where the respective values were 49.66 and 0.177.

Thus, the present studies undertaken revealed that neem and darek extracts were effective in decreasing the cohort growth parameters and they may thus be exploited as an effective tool in the current scenario of sustainable pest management. However, final evaluation of the utility of these compounds should be reserved until semi-field and field trials have been conducted.

REFERENCES

Barati, R., Golmohammadi, G., Ghajarie, H., Zarabi, M. and Mansouri, R. 2013. Effects of some botanical insecticides and pymetrozine on life table parameters of silver leaf whitefly *Bemisia tabaci* Gennadius (Hemiptera: Aleyrodidae). *Pesticides and Phytomedicine*. **28(1):** 47-55.

Blackman, R. L. and Eastop, V. F. 2007. Taxonomic Issues. **In**: *Aphids as Crop Pests*. H.F. van Emden and R. Harrington (Eds.). CABI, UK., pp. 1-29.

Gavkare, O., Kumar, S., Sharma, N. and Sharma, P. L. 2013. Evaluation of some novel insecticides against *Myzus persicae* (Sulzer). *The Bioscan*. **8(3):** 1119-1121.

Foster, S. P., Devine, G. and Devonshire, A. L. 2007. Insecticide resistance. In: *Aphids as Crop Pests*. H.F. van Emden and R. Harrington (Eds.). CABI, UK. pp. 261-285.

Meena, H., Singh, S. P. and Nagar, R. 2013. Evaluation of microbial agents and bio-products for the management of mustard aphid, *Lipaphis erysimi* (Kalt.). *The Bioscan*. **8(3):** 747-750.

Santos, T. M. D., Costa, N. P., Torres, A. L. and Junior, A. L. B. 2004. Effect of neem extract on the cotton aphid. *Pesquisa Agropecuaria Brasileira Brasilia*. **39:** 1071-1076.

Sharma, A. and Gupta, R. 2009. Biological activity of some plant extracts against *Pieris brassicae* (Linn.). *J. Biopesticides*. **2(1):** 26-31.

Takalloozadeh, H. M. 2010. Effect of host plants and various temperatures of population growth parameters of *Aphis gossypii* Glover (Hom.: Aphididae). *Middle-east J. Scientific Research*. **6(1):** 25-30.

Watson, T. F. 1964. Influence of host plant condition on population increase of *Tetranychus telarius* Linn. *Hilgardia*. **35:** 273-322.

Wyatt, I. J. and White, P. F. 1977. Simple estimation of intrinsic increase rates for aphids and tetranychid mites. *J. Applied Ecology*. **14:** 757-766.

NATIONAL ENVIRONMENTALISTS ASSOCIATION

AND ITS OFFICIAL ORGAN

National Environmentalists Association
NEA
Save Nature to Survive

The Bioscan

An International Quarterly Journal of Life Science

The Ecoscan

An International Biannual Journal of Environmental Science

Started in 1988, the National Environmentalists Association has been reorganized in 2006 and now is an association functioning with full vigour and new impetus to meet its objectives with the co-operation of like minded environment conscious academicians from different parts of the nation.

MEMBERSHIP OF THE ASSOCIATION

Any graduate having interest in environmental conservation and protection of nature and natural resources can be the member of the association.

To be the member of the association the application form given below should be duly filled up and sent to the Secretary of the association along with a demand draft of Rs. 500/- for annual membership and Rs. 5000/- for life membership.

FELLOWSHIP OF THE ASSOCIATION

The Association is awarding FELLOWSHIP to deserving academicians / researchers /scientists who are LIFE MEMBERS of the Association after reviewing their bio-data by the Fellows and the Executive Members of the association. The Fellows are privileged to write **F.N.E.A.** after their names **.**The prestigious Fellowship also includes a citation in recognition of their contribution to society in general and the endeavour for the noble cause of environment in particular.

AWARDS OF THE ASSOCIATION

The Association in its Seminars and Conferences provides the following category of awards on annual basis.

1. **The young scientists award** : It is given to the researchers below the age of 35 years.
2. **The senior scientists award** : It is awarded to the academicians above the age of 35 years.
3. **The best paper award**: It is awarded to the contributor of the Journal **The Bioscan** during the year.
4. **The best paper presentation award** : It is awarded to the scholar whose presentation is the best other than the young scientist category.
5. **The best oration award** : It is awarded to the scholar who delivered invited speech.
6. **The recognition award** : It is awarded to those senior scholars who have contributed to the subject through their continued research .
7. **The environmental awareness award** : It is awarded to those who, apart from their research contribution, have done commendable extension work for environmental betterment.

The number of recipients of award in each category will vary depending upon the recommendation of the panel of judges and the executive committee. The association has the provision to institute awards in the name of persons for whom a with desired sum is donated in consultation with the executive body.

PUBLICATION OF THE ASSOCIATION

In order to provide a platform to a vast group of researchers to express their views and finding of research as well as to promote the attitude of quality research among the scholars of younger generation the association publishes two journals **1.THE BIOSCAN (ISSN:0973-7049) -** an international quarterly journal of Life Science **2. THE ECOSCAN (ISSN: 0974-0376)** -an international biannual journal of Environmental Science. For the benefit of the potential contributors **instructions to authors** is given separately in this journal. However, the details regarding the journal and also the association can be seen on our website *www.thebioscan.in*. **Cont. ..... P 40**