PSM Veterinary Research
2017 | Volume 2 | Issue 1 | Pages 6-9
ISSN: 2518-2714 (Online)

www.psmpublishers.org

Research Article **Open Access**

Efficacy of Various Botanical and Chemical Insecticides against Flea Beetles on Maize (*Zea maize* L.)

Kashif Ali[1], Muhammad Shuaib[2], Muhammad Ilyas[3], Firasat Hussain[4], Muhammad Arif[5], Sajjad Ali[6], Nawaz Jang[6], Fida Hussain[7]

[1]Department of Botany, Islamia College University Peshawar, Pakistan.
[2]School of Ecology and Environmental Science, Yunnan University, NO.2 North Cuihu road, Kunming, Yunnan, 650091, PR. China.
[3]Department of Entomology, The University of Agriculture Peshawar, Pakistan
[4]Yunnan Institute of Microbiology, School of Life Science, Yunnan University, Kunming, 650091, PR China.
[5]Department of Microbiology, Abasyn University Peshawar, Pakistan.
[6]Department of Botany, Bacha Khan University Charsadda, Pakistan
[7]School of Resources, Environmental and Chemical Engineering Nanchang University, Nanchang Jiangxi China

Received: 21.Feb.2017; Accepted: 15.Apr.2017; Published Online: 01.May.2017
***Corresponding author: Muhammad Shuaib; Email: zeyadz44@yahoo.com**

Abstract
Vulnerability to the vast majority of insect pests is one of the main factors which severely restrict the scope of production and development of *Zea maize* L. Flea beetle is considered an important pest that cause huge losses to *Zea maize* L. yields. The present study was conducted at new development farm (NDF), the University of Agriculture Peshawar Pakistan during 2014 and 2015 to determine the efficacy of various chemical and botanical insecticides against Flea beetles on *Zea maize* L. plant. The number of Flea beetles was recorded a day before and 1, 2 and 8 days after the application of every spray material on the plant. The results showed that least number of Flea beetles was reported in the Emamectin benzoate treatment while among the plant extracts, *Datura stramonium* was the most important and effective treatment which reduces the population of white Flea beetles, which was followed by *Azadirachta indica* seed extract. The large numbers of pest were reported on untreated check plots. The present reports showed that plant extract have the ability to be utilized for the successful control of Flea beetles on *Zea maize* L.
Keywords: Botanical, Chemical, Insecticides, Flea beetles, *Zea maize* L.

To cite this article: Ali, K., Shuaib, M., Ilyas, M., Hussain, F., Arif, M., Ali, S., Jang, N., Hussain, F., 2017. Efficacy of Various Botanical and Chemical Insecticides against Flea Beetles on Maize (*Zea maize* L.). PSM Vet. Res., 2(1): 6-9.

INTRODUCTION

Zea maize L. is a vital source of maize grain and edible oils. The strength of *Zea maize* L. is, far from being exploited, the productivity levels in Pakistan were lower as related to various developing countries due to many abiotic and biotic factors as well (AshaZoll). As increase in the population will need more maize and edible oil, our county already pays a huge import bill to fulfill the maize consumption needs; which become harder as the population increase. The yield production has been consistently reducing, because of its poor cultivation and management process among all of these, pest are the main limiting factor for huge production in maize crop for number of years. Majority of these insects pests cause huge reduction in maize production throughout the world (Carl, 1990). Flea beetle is a vital insect's pest of many crops (Brown, 2000; Perring, 2001). Several genetic features like high ability of reproduction, carrying capacity of mint plant microbes and ability to tolerate a wide range of environmental stress to a broad range of pesticides enhances its pest perspectives (Gelling and Mayar, 1996). Presently, the flea beetle has emerged as important sucking insect's pest on *Zea maize* L. These features of Flea beetle attract the attention of entomologists and pathologist (Katti, 2007) to explain these entire problems; it is of prime importance to focus on pesticides for the control of many pests on our crops. Ethnopharmacological and chemical research on *Withania somnifera* proves that plant extracts have a wide range of applications (Ali *et al.,* 2017). Insecticides which are prepared from plants were not only safe ecologically and economically but free of residual problem, for the last several years the value of the botanical insecticide has increased. Plant extracts have also been used for their antimicrobial properties (Amin *et al.,* 2017; Iqbal *et al.,* 2016; Kalim *et al.,* 2016; Hussain *et al.,* 2016) . The present study demonstrated the efficacy of

various plant extracts and industrial insecticides against Flea beetles on *Zea maize* L. crop.

MATERIALS AND METHODS

Field experiment on the advantages of different plants and a chemical insecticide (Emamectin benzoate ZOEC) against Flea beetles on *Zea maize* L. was conducted at new development farm (NDF) of university of Agriculture Peshawar, Pakistan for growing season i.e. two growing seasons' spring and summer of 2014 and 2015. The field work was laid out in Randomized replications. Each replication was composed of seven treatments. *Zea maize* L. was grown up as test crop in plot measuring $4\times4m^2$ having a space of 50 and 30cm between plant and rows, respectively. Each row has 12 plants with a total of 54 plants in every plot. Sowing of maize plants at the rate of 2.8 kg per hectare was completed by hand on ridges by dibbling 4 seeds per kg hill to a 4cm depth. All the suitable agronomic techniques were used uniformly, for best growth of crop during the experimental period.

After progress in germination, hand thinning was completed for getting the normal plant number in the field. Different solutions of botanical (*Withania somnifera* extract, *Calotropis procera*, *Azadirachta indica*, *Chenopodium botrys*, *Euphorbia helioscopia*, *Datura stromarium*) and industrial insecticides treatment were made and sprayed on every plot of experimental plants. Notices on number of Flea beetles with maize were reported and all insecticides application was done according to instructions.

Botanical insecticides preparation

Industrial insecticide, Enamectin benzoate and a *Withania somnifera* extract of leaves was premised from market, while the producer for the making of botanical insecticides is as below.

***Calotropis procera* stem extract**

About 1kg of *Calotropis procera* (stem) was dried, crushed and placed in water for 20 hours, the water was then poured through a fine cloth and the volume were from up to 7 liter, to get 10% solution. About 10 g of soap was added before use (Munir, 2006).

***Azadirachta indica* extract**

Pieces of *Azadirachta indica* were dried and placed in a small amount of water for 48 hrs, after filtrations the extract was obtained.

Chenopodium extract

Pieces of *Chenopodium* were dried and placed in small amount of water for 35 hrs. After filtration the extract was obtained.

***Euphorbia helioscopia* extract**

For the preparation of *Euphorbia helioscopia* extract 0.5 kg of the plant pieces were crushed and chopped. After chopping it was added to boiled water which gives euphorbia solution.

***Datura stramorium* extract**

About 1.5 kg leaves and seed were crushed and then placed in boiling water for 15 hours. The solution was kept for 3 hours to cool down. The soap was also added in a solution.

Making of concentration

The concentration of extract which was required were made by using the following formula

$C1V1 = C2V2$

Where C1= given concentration of sock solution
V1= Volume of water sock
C2= Required concentration of working solution.
V2=Volume of water of working solution.

By this way 2% concentration of *Withania somnifera* extract and 3.5% concentration for each *Euphorbia helioscopia*, *Datura stramorium*, *Chenopodium botrys, Calotropis procera, Azadirachta indica* extract and 0.05% concentration of Emamection benefate was made.

Flea beetle Population

For observation on flea beetles incidence, 8 plants were chosen in every treatment, and the flea beetle number was observed on four leaves from top, mid and base of the plant. The analysis on number of flea beetle was made a day before spray, at the end, flea beetle number was calculated and for drawing the inference, statistical analysis of data were done.

Statistical Analysis

The data for randomized complete block design was analyzed by using software, Gen-stat third edition.

RESULTS AND DISCUSSION

Flea beetle numbers were found non-significant a day before application of various insecticide treatments (Table 1). However, important change after one day of first spray application was noted, the low number was reported on Emametic benzoate and *Datura stramorium* treatments. However, their population was different. The 2nd botanical pesticide treatment was *Calotropis procera* and *Chenopodium botrys* extracts, where mean number of flea beetles were reported per plant leaf, respectively.

Euphorbia helioscopia and *Withania somnifera* treated plots were reported with huge incidence of flea beetle. However, their population did not differ from one another. After 2 days of application of spray, Emamection benzoate was found to be more effective; this shows low population per plant, different from remaining treatments. Following industrial insecticides, *Datura stramorium* treated plot was also reported with low number of flea beetle per plant, whereas mentioned time duration as against control plot. Botanical insecticide, *Datura stramorium* was found to be

the most significant and effective treatment after industrial insecticide.

Azadirachta indica treated plot was also reported with a low number of flea beetle per plant whereas mentioned time duration as against control plot. The present research is in line with that of Isman (2006), who presented that botanical insecticide could be effectively utilized for successful control of insect pests. Plant extracts were naturally very slow acting substances but most safe to non-target organism and to ecological environment as related to industrial insecticides. Research on advantages of various botanical insecticides is also in line with that of Zhang et al. (2004), who reported that botanical insecticides have a lot of benefits.

The botanical pesticides have a very complicated composition as compared to newly utilized chemical insecticides for the control of various insects, there is low possibility of resistance development of insect species. These important extracts have the ability to meet the need of present era of insecticides for the control of different insect pests on crop. Ghani (1998) also reported the application of different botanical insecticides for the improvement of crops. Extracts of plants are naturally slow acting substances and are mostly safer to non-target organisms and to the environment as compared to synthetic insecticides. This report on efficacy of various botanical insecticides is supported by previous studies (Zhang *et al.,* 2004; Ghani, 1998; Isman, 2006).

The present report showed that *Euphorbia helioscopia* and *Withania somnifera* did not control flea beetles effectively. This may be one of the reasons that these botanical pesticides alone are not able in suppression of sucking pest on *Zea mays* L. crop. Ladayi (2004) and Vijayyalaskm et al. (1996) documented that different botanical insecticide with various plant products as most effective for plant pests which are in line with current research.

Table 1. Efficacy of different botanicals and a new chemistry insecticide (mean values) against flea beetle on *Zea maize* L. after 1st spray.

Treatments	1 DBS	1 DAS	2 DAS	WAS
Emamectin benzoate	3.58	1.03	0.12	0.01
Datura stramorium	3.46	2.02	1.01	1.54
Azadirachta indica	3.01	2.00	1.00	1.23
Calotropis procera	3.38	2.33	2.21	1.13
Chenopodium botrys	3.27	3.01	3.11	2.21
Euphorbia helioscopia	3.28	3.04	2.03	3.14
Withinia somnifera	3.09	1.13	2.16	0.43
Control	3.53	4.36	4.02	4.01

DBS = Day before spray, DAS = Day after spray, WAS = Week after spray

Table 2. Efficacy of different botanicals and a new chemistry insecticide (mean values) against flea beetle on Zea maize L. after 2nd spray.

Treatments	1 DBS	1 DAS	2 DAS	WAS
Emamectin benzoate	3.78	1.23	0.22	0.34
Datura stramorium	3.56	2.12	1.31	1.43
Azadirachta indica	3.21	2.01	1.01	1.23
Colotropis procera	3.48	2.23	2.11	1.11
Chenopodium botrys	3.37	3.11	3.21	2.13
Euphorbia helioscopia	3.28	3.34	2.13	3.12
Withinia somnifera	3.29	1.43	2.16	0.11
Control	3.43	4.56	4.32	5.01

DBS = Day before spray, DAS = Day after spray, WAS = Week after spray

After one day of second application of the spray, it was revealed that Emamectin benzoate treated plot gives the significantly low population of Flea beetles which was followed by *D. stramonium* shown in (Table 2). Other effective treatments were *Calotropis procera* and *Chenopodium botrys*. This report also showed similarity with previous findings (Zhang et al., 2004; Katti, 2007; Ladaji, 2004). According to Ghani (1998), plant-based crude extracts are encouraged for the control of insect pests of different stored commodities and many other pests on different crops.

CONCLUSION

As a result of present report it can be shown that plant insecticides were found to be most effective in reducing the number of flea beetles, which enhance the yield of *Zea mays* L. Therefore, these medicinal plants can be used as an alternative to synthetic chemical for the control of flea

beetles. However, further research should be carried out to confirm the effects of these plant extracts regarding its practical efficiency under natural environments to protect the maize crop products without any side effects.

ACKNOWLEDGEMENT

We all authors are very thankful to the University of Agriculture Peshawar for providing the opportunity to do the current research work.

AUTHOR'S CONTRIBUTION

KA carried out the field work, analyzed data and draft of the manuscripts. MS, MI, MA and FH revised the whole manuscripts and contributed to the editing and interpreting of the data. KA, MS conceptualized and designed the study. While SA, FH and NJ helped in the initial drafting of the manuscripts and helping in writing analyzing the data. All authors read and approved the manuscript.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

REFERENCES

Ali, K., Shuaib, M., Ilyas, M., Hussain, F., Hussain, F., 2017. Medicinal Uses of Chemical Extracts from *Withania somnifera* and Its Antimicrobial Activity: A Mini-Review. PSM Microbiol., 2(1): 20-23.

Amin, R.A., Edris, S.N., 2017. Grape Seed Extract as Natural Antioxidant and Antibacterial in Minced Beef. PSM Biol. Res., 2(2): 89-96.

Brown, J.K., 2000. Molecular markers for the identification and global tracking of whitefly vector-Begomovirus complexes. Virus Res., 71: 233-260.

Carl, D.P., 1990. Managing insect pests of Taxas Sunflower. Taxas Agricultural Extension.

Gerling, D., Mayer, R.T., 1996. Bemisia 1995: Taxonomy, Biology, Damage, Control and Management, Intercept Limited, Andover, UK. Germination of okra seed. Seed Tech. News., 28(1-4): 68-69.

Ghani, A., 1998. Medicinal plants of Bangladesh. Chemical constituents and uses, 2nd edn. Asiatic Society of Bangladesh, Dhaka, 301-302.

Hussain, F., Kalim, M., Ali, H., Ali, T., Khan, M., Xiao, S., Iqbal, M.N., Ashraf, A., 2016. Antibacterial Activities of Methanolic Extracts of Datura inoxia. PSM Microbiol., 01(1): 33-35.

Iqbal, M.N., Anjum, A.A., Wang, S., Ali, M.A., Ashraf, A., Yunus, F.N., Ali, S., Muhammad, A., Shahzad, M.I., 2016. A Mini Review on Microbiological Quality of Commercial Fruit Juices in Pakistan. PSM Microbiol., 01(1): 26-32.

Isman, M.B., 2006. Botanical insecticides, deterrents, and repellents in modern agriculture and in increasingly regulated world. Ann. Rev. Entomol., 51: 45-66.

Kalim, M., Hussain, F., Ali, H., Iqbal, M.N., 2016. Antifungal activities of Methanolic Extracts of *Datura inoxia*. PSM Biol. Res., 01(2): 70-73.

Katti, P., 2007. Sucking pests of sunflower with special reference to Thrips palmi Karny, its relation with necrosis virus and management. Ph.D. Thesis, Univ. Agric. Sci. Dharwad, India. 108-112.

Ladaji, R., 2004. Management of chickpea pod borer Helicoverpa armigera (Hubner) using indigenous materials and newer insecticides, M. Sc. (Agri.). Thesis, University of Agric. Sci. Dharwad, India.

Munir, K., 2006. Efficacy of different Plant crude extracts for the control of insect pests of okra. M.Sc. Hons. (Agri.) Thesis, KPK Agricultural University, Peshawar.

Perring, T.M., 2001. The *Bemisia tabaci* species complex. Crop Protec., 20: 725-737.

Vijayalaksmhi, K., Subhashini, B., Shivani, V.K., 1996. Plant in pest control: garlic and onion, Centre for Indian Knowledge System, Chennai, pp. 120.

Zhang, H.Y., Deng, Y.X., Wang, J.J., Liu, H., 2004. Studies on the fumigation activities of essential oils against *Rhizopertha dominica*. J. Southwest Agric. Uni., 26: 423-425.