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Effect of Irrational Use of Pesticides on Insect Pests and Yield of Okra

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Abstract
The present study on irrational use of pesticides on okra crop was carried in order to focus overall environment degradation and adverse effect on human health at Tando Jam, District Hyderabad, Sindh, Pakistan during spring season, 2009. The four different farms v/z Muhammad Ismail Sehto, Noor Muhammad Sehto (Village Hakim Ali Khatian), Abdul Karim Khaskheli (Village Moosa Khatian) and Ghulam Serwar Sheikh (Village Shaman Ali Sheikh) were kept under observation during whole period of study. The okra crop was sown on ridge and drill method under natural conditions. All the practices were followed by the farmers, from sowing to harvesting. The farmers were interviewed and data was collected on name and number of pesticides applied, mean population of insect pests and number of pesticides and yield of okra crop under irrational use of pesticides at each farm. Overall jassid, whitefly, spotted boll worm, mites, crickets and cutworm were observed infesting okra crop in all fields. Their population varied with one another and fluctuated differently through out the cropping season. The maximum pickings (25) and yield (1793.22 kg per hectare) was recorded at Noor Muhammad farm, followed by 23 pickings and 1721.59 kg yield per hectare at G. Sarwar farm, 20 pickings and 1625.26 kg yield per hectare at M. Ismail and 16 pickings and 1321.45 kg yield per hectare at A. Karim farm, respectively.
Keywords: Okra, Irrational, Pesticides, Insect pest and Yield

1. Introduction

Okra (Abemoschus esculentus L.) is one of the most important and delicious vegetable crop belonging to family Malavaceae and is thought to be native to Africa, South East Asia and North Australia in the Pacific. It is herbaceous annual plant and widely cultivated in the tropical and sub-tropical regions of the world in home gardening and commercial market purpose (Khoso, 1994).

Okra is locally called as “Bhindi” and considered as a main kharif vegetable crop of Pakistan grown in all parts of the country. The climatic condition of Sindh province is highly suitable for the cultivation of okra crop; therefore, it is grown twice a year; in spring and summer seasons (Mangrio, 2004). It is good source of vitamins A, B and D, protein, starch, salts and also rich in minerals like Ca, Mg and Fe and iodine which play a significant role in human diet. Its fruits can be cooked in a variety of ways; fried in butter or oil and cooked with other ingredients. The stem of this plant provides fiber which is used in the paper industry (Yadav and Dhankhar, 2001 and Baloch, 1996).

Inspite of all efforts, the average yield is very low as compared to other countries of the world due to various biotic and abiotic factors including insect pest and diseases. Insect pest plays a significant role in suppressing the yield of okra. The damage caused by different insect pests varies from year to year depending upon weather conditions and the intensity of insect pest attack (Hashmi, 1994). It is reported that okra plants are attacked by all those insect pests that harm the cotton which almost is attacked by approximately 145 species of insect pests (Huque, 1994, Kumar, 2004)

The chemical control measures have been used since long time and were given emphasis to minimize these injurious pests and crop losses. The pest has developed resistance, due to indiscriminate use of pesticides. Besides that, the pesticides are hazardous to human health also, reduces density of eco-friendly insects and soil microorganisms. According to the WTO, more than 3 million people are severely sickened and 220,000 die from pesticides each year worldwide. Moreover, 60 to 70 million birds are killed each year from Pesticide poisonings. Fish and other wildlife are also at risk from pesticide misuse and accidents. Activities of wild bees and honey bees, which are essential for pollination of many crops, are being suffered due to pesticide exposure that showed the irrational use of pesticides to manage pests (Parveen and Dhandapani, 2001). Inspite of the hazardous effects of pesticides on human and animal health, eco-friendly organism and agro-ecosystem, their use for the control of pests is still prevailing. Therefore present studies were planned to know the position of irrational use of pesticides on okra. The result will be beneficial for all those who are busy to improve overall environment and human health.

1.1 Materials and Methods 2

The four different farms v/z Muhammad Ismail Sehto and Noor Muhammad Sehto (Village Hakim Ali Khatian), Abdul Karim Khaskheli (Village Moosa Khatian) and Ghulam Sarwar Sheikh (Village Shaman Ali Sheikh)

exist in the surroundings of Tando Jam, District Hyderabad. The farms were surveyed for examining irrational use of pesticides during spring season, 2009. The okra crop was sown on ridge and furrow method at all farms, under natural conditions. All the practices were followed by the farmers, from sowing to harvesting. The farmers were interviewed and data was collected on name and number of pesticides applied.

The nine okra plants randomly were selected from each farmer's field. Six leaves per plant (two from top, two from middle and two from bottom) were observed to record the insect pest population, whereas the yield production was also recorded from first to the final picking to asses the total yield/hector thus obtained were subjected to statistical analysis using statistical computer software package, Statistix 8.0.

1.1.1 Results and Discussion

Pesticides Used At Different Farms

The maximum number of pesticides (06) was applied at Ghulam Sarwar Sheikh farm, followed by Noor Muhammad, Muhammad Ismail, and Abdul Karim Farm (05, 05, 03), respectively (Table 1).

Table 1. Pesticides/chemicals (Dose/16 liter tank and no of applications) used in okra crop at different farms in the surroundings of Tando jam.

Grower name	Number of pesticide	Name of pesticide	Dose / 16 liter tank	Number of application
G.Sarwar Sheikh	6	Imedaclopride	20grams	18
		Super Tonic	50cc	12
		Polidole	50cc	8
		Emamectin Benzoat	25cc	4
		Confidor	5grams	2
		Imedachlorophas	40 cc	2
M. Ismail	5	Confidor	40cc	15
		Helper	40cc	11
		Karaty	40cc	7
		Emamectin Benzoat	30cc	4
		Well Plus	30cc	1
Noor Muhammad	5	Karaty	40cc	10
		Leaf Green	30cc	7
		Confidor	40cc	7
		Imedaclopride	20grams	6
		Helper	40cc	1
A. Karim	3	Thiodan	50cc	15
		Emamectin Benzoat	50cc	14
		Confidor 70%	8g	10

Imedaclopride was applied 18 times, with Tonic (12 times), Polidole (08 times), Emamectin Benzoat (4 times), and Confidor (2 times) at Ghulam Sarwar farm, The Thiodan (15 times), Confidor (10 times) and Emamectin Benzoate (4 times) was applied at Abdul Karim Khaskheli farm. Karate (10 times), Confidor (7 times), with Leaf Green (7 times), Imedaclopride (6 times) and Helper (1 time), at Noor Muhammad farm, Confidor (15 times) Helper (11 times), Karate (7 times), Emamectin Benzoat (4 times) and Well Plus (1 times), on Muhammad Ismail farm (Table 1)

The results are in accordance with other researchers. Al-Haj et al., (2005) conducted a survey, through interviews and a questionnaire, with 100 oat farmers who used and applied different kinds of pesticides in Dhale' and Yafe' districts of Yemen. Similarly, Khan et al. (2006) conducted a field survey regarding the use of pesticides by local farmers in major fruits and vegetables growing areas on the basis of the questionnaires concerning the types of pesticides used, the frequency and dose of application and the time of pesticide application. Different pesticides brand/product were used against various insect pests on okra crop by Lohar et al. 1996; Gul, 1998; Suryawanshi et al. 2000; Mohamed, 2002; Kumar et al. 2002; Arora and Singh, 2004 and Sunitha et al. 2005.

Effect of Irrational Use of Pesticides on Population of Insect Pest

The data showed highly significant difference between the target parameters, from the first to last observation (Feb. 22 to May 17, 2009). Overall, jassid, whitefly, spotted boll worm, mites, crickets and cut worm were observed infesting okra crop in all fields. Their population varied with one another and fluctuated differently through out the cropping season (Table 2).

The whitefly observed from first to last weekly observation (during last week of February up to the 2nd week of

May) on okra crop. Peak activities of whitefly were recorded in the 2nd week of April. During peak activities, the population of whitefly was 3.65/ plant followed by 2nd week of March (2.38), 1st week of April (1.97), 3rd week of April (1.38) and 4th week of March (1.05)/ plant, respectively. Whereas, the minimum population of whitefly was observed in the 1st week of May (0.13) followed by 2nd week of May (0.25), last week of February (0.50), last week of March (0.74), and last week of April (0.80) per plant, respectively. The maximum population of whitefly was recorded at the farm of Ghulam Sarwar (1.75), followed by Noor Muhammad farm (1.10) per plant. The minimum whitefly population was found in the farm of Abdul Karim khashkeli (0.61) followed by Muhammad Ismail farm (1.09) per plant (Table 2). Basu (1995) reported that the white fly Bemesia tabaci damage okra crop directly by feeding and indirectly by producing honeydew on leaf sheaths and more alarmingly inflicting severe crop losses by transmitting a fairly large number of viral diseases. The results are in conformity with Arora et al. (1996) showed various insect pests found attacking on okra. Similarly Dubey et al. (1999) reported that sucking pests such as whitefly attack okra crop from sowing till harvest and is the most serious sucking pest of okra plant throughout the world. Kumawat et al. (2000) investigated the seasonal incidence of whitefly (Bemisia tabaci) populations on okra and their correlation with a biotic factor. The infestation of whiteflies started in the fourth week of July and reached peaks in the second and fourth weeks of September, respectively.

The first time appearance of jassid on okra crop was observed during 1st week of March and continues up to the 3rd week of May. Its peak activities were recorded in the 4th week of April with the population of 31.29 jassids /plant, followed by 2nd week of May (21.55), 1st week of May (19.66), 1st week of April (18.33) and 3rd week of April (14.33) per plant, respectively. The minimum population of Jassid was observed in the 3rd week of May (2.25), followed by 1st week of March (2.73), 2nd week of March (5.34), 3rd week of March (8.77), and 4th week of March (11.72) per plant, respectively. The maximum population of jassid on okra crop was recorded at the farm of Abdul Karim Khaskheli (18.37), followed by Muhammad Ismail farm (13.8) per plant. The minimum jassid population was found in Ghulam Sarwar farm (7.684), followed by Noor Muhammad farm (9.94) per plant (Table 2). The results are compared with Arora et al. (1996) showed various insect pests found attacking on okra. Dubey et al. (1999) reported that similar to whitefly; jassid is the most serious sucking pest of okra plant throughout the world and attack okra crop from sowing till harvest. Similarly, Kumawat et al. (2000) investigated the seasonal incidence of jassid (Amrasca biguttula biguttula) on okra. The infestation of jassid started in the fourth week of July and reached peaks in the second and fourth weeks of September, respectively. Bhargava et al. (2001) reported jassid (Amrasca biguttula biguttula) as a major pest on okra.

Table 2. Mean population of insect pests in okra crop under irrational use of pesticides, at different farms near Tando jam.

Grower	JASSID	WHITE FLY	SPOTTED BOLL WORM	MITES	CRICKET	CUT WORM
Ghulam Sarwar Sheikh	13.876 ab	1.0982 ab	1.8162 a	6.799 ab	0.000 b	0.1751 a
M.Ismail Sehto	9.949 bc	1.1023 ab	2.4615 a	10.590 ab	0.000 b	0.1538 a
Noor M. Sehto	7.684 c	1.7523 a	0.8544 b	14.777 a	0.231 a	0.1538 a
Abdul Karim Khaskheli	18.376 a	0.6154 b	0.7690 b	2.000 b	0.000 b	0.2392 a
SE	2.7986	0.3385	0.4546	5.0683	0.0682	0.1072
CV= 0.05	5.5299	0.6689	0.8982	10.014	0.1348	0.2119

The spotted bollworm starts its appearance from 2nd week of March up to the 3rd week of May on okra crop. Its peak activities were recorded in the last week of May, showed the higher population of 4.30% followed by 2nd week of May (3.90%), 1st week of May (3.02%), last week of April (1.97%) and last week of March (1.43%). The minimum population of spotted bollworm was observed in the 4th week of March (0.50%), followed by 3rd week of March (0.54%), 2nd week of March (0.58%), 1st week of April (0.94%) and 3rd week of April (1.16%). The maximum population of spotted bollworm was recorded at the farm of Noor Muhammad (2.46), followed by Muhammad Ismail farm (1.81%). The minimum pest population was found at Abdul Karim Khaskheli farm (0.76%), followed by Ghulam Sarwar farm (0.85%) (Table 2). Ahmed et al. (2000) assessed the average infestation of fruit borer in okra crop. Similarly, Kumar et al. (2004) reported that spotted bollworm (Earias sp.) is the key pest and causing economic losses of okra crop.

The mites started their activities in 4th week of March. Its peak population was recorded during 3rd week of May, with the population of 59.9 mites (per plant), followed by 2nd week of May (41.29) and 1st week of May (8.39), respectively (Table 2). The minimum population of mites was observed in the 1st week of April (0.16), followed by 4th week of March (0.25) and last week of April (1.02), respectively. The maximum population of mites was recorded at the farm of Ghulam Sarwar (14.77), followed by Noor Muhammad farm (10.59) / plant.

The minimum mite population was found at Abdul Karim Khashkeli farm (2.00), followed by Muhammad Ismail farm (6.79) / plant (Table-2). Kumar et al. (2002) conducted a field trial to find out resurgence of the mite pest against the use of acaricides.

Field cricket started its appearance in okra crop, only at the farm of Ghulam Sarwar, with 0.23 cricket mean population, from last week of February and infested up to 4th week of March. During starting time, the population was 0.25%, followed by 1st week of March (0.25%) and 4th week of March (0.25%) (Table 2).

Cutworm started their activities in last week of February and infested up to 1st week of April. The Peak activities of cut worm were recorded in the 2nd week of April. During peak activities, the population of cut worm was 0.77% followed by 1st week of March (0.56%), and 2nd week of March (0.25%). Whereas, the minimum population of cutworm was observed in the 1st week of April (0.25%) followed by 4th week of March (0.25%), and 3rd week of March (0.25%). The maximum population of cut worm was recorded from Abdul Karim Khaskheli farm (0.23%) followed by Muhammad Ismail's farm (0.17%). Whereas the minimum pest population was found in Ghulam Sarwar's farm (0.15%) followed by Noor Muhammad's farm (0.15%) (Table 2). Similarly, Ahmed et al. (2000) described the status of pests and management of cutworm, H. armigera one of the most important pest of major crops.

Effect of Irrational Use of Pesticide on Okra Yield

The maximum pickings (25) and yield (1793.22 kg per hectare) was recorded at Noor Muhammad farm, followed by 23 pickings and 1721.59 kg yield per hectare at G. Sarwar farm, 20 pickings and 1625.26 kg yield per hectare at M. Ismail and 16 pickings and 1321.45 kg yield per hectare at A. Karim farm, respectively (Table 3). The results showed highly significant difference with reference to pickings and yield. Gowri et al. (2002) evaluated the effect of nine neem [Azadirachta indica] formulations against the insect pests of okra. All the formulations were relatively safe to coccinellids. In agriculture ecosystem the synthetic pesticides are used primarily for the control of the pests of crops in order to increase the yield per hectare. But their indiscriminate use has resulted in killing of natural enemies and environmental pollution problem on the large scale. Besides contaminating food and food products, pesticides are being accumulated in the soil, water and air to a critical level (Khan et al. 2002). Gandhi et al. (2006) reported that application of neem product minimized the attack of insect pests and also improved the yield of okra.

Table 3. Okra crop duration under irrational use of pesticides at different farms near Tando jam.

GROWER	DATE OF SOWING	DATE OF LAST PICKING/ HARVESTING	CROP DURATION IN DAYS
Muhammad Ismail	08 Feb., 2009	16-May-2009	98
Noor Muhammad	11 Feb., 2009	15-May-2009	94
Ghulam Sarwar	15 Feb., 2009	16-May-2009	91
Abdul Karim	20 Feb., 2009	09-May-2009	79
Mean			90.500
SE			4.0927
CV = 0.05/P value			0.0002

Conclusions

It was concluded that: The irrational uses of pesticides were applied by the farmers on their own experience, without any consulting/suggestion of agriculture experts to get the maximum yield/hector on their farms. The farmers applied different pesticides as alone, as well as in combinations, without confirming their compatibility. The farmers decided that how many sprays be applied to control pest. The farmers were un-aware about ETL and selection of pesticides, dose, time and repetition. The irrational use of pesticides reduced the insect pests populations and also decrease the natural enemies numbers. The okra production was not improved due to irrational use of pesticides, the crop come under stresses and yield decreases.

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