



## **Survey on pesticide usage pattern in bhendi (*Abelmoschus esculentus* L.)**

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### **ABSTRACT**

The survey on pesticide usage pattern was carried during the year 2014-15 among the bhendi growing farmers based on the questionnaire prepared to assess their knowledge on various parameters such as type of pesticides used at different crop growth stages, target pests and commonly occurring pests, general awareness on pesticide recommendations and their use, waiting period followed for harvesting after application of pesticides and other socio economic aspects. Majority of the farmers (66.66%) were not aware about recommended pesticides against different pests and 86.66% of the farmers were not aware about the pesticide classification based on toxicity and toxicity symbols on packing. About 33.33% of the farmers had awareness on recommended pesticides against different pests. In general, 70% of the farmers contacted pesticide dealers for recommendations and only few farmers i.e. 16% preferred to contact Agricultural Officers. Majority of the farmers (73.33%) are using pesticide mixtures. Most of the farmers (70.00%) were aware of the ban on endosulfan in agriculture and (60%) were also aware on the ban of monocrotophos on vegetables. Very few farmers know about pesticide residues and related issues, but knew that washing helps to reduce contamination. As a regular practice, majority of the farmers (66.66%) followed washing of vegetables with tap water and 33.33% of the farmers followed washing with salt water as the decontamination methods. About (33.33%) of the farmers are having awareness regarding pre harvest intervals and very few farmers (20.00%) had awareness on pesticide residues in vegetables. Among the respondents, only 20% of them have observed pesticide effects on the health of spraying men during the spray and the most common health problems observed during the spray were skin irritation (40%), breathlessness (20%), head ache (20%), eye irritation (13.33%), and cough (6.66%). The major first aid techniques followed were washing the affected area with water followed by soap water.

**Key words:** Bhendi (*Abelmoschus esculentus* L.), Pesticide usage pattern, Pesticide Residues, Pesticides

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### **INTRODUCTION**

Vegetables play a major role in Indian agriculture by providing food, nutritional and economic security and more importantly, producing higher returns per unit area and time. Okra (*Abelmoschus esculentus* L.) is an important vegetable crop grown throughout the year in India. The productivity of our country is low compared to other countries due to yield losses caused by insect pests, diseases and nematodes. The crop is attacked by more than 72 insect pests and infestation is observed from seedling to harvest stage. Farmers cannot tolerate any loss to the vegetables either by insects or diseases and resort to chemical control. Pesticide use has increased rapidly over the last two decades at the rate of 12 % per year (Thacker *et al.* 2005). About 13% of total pesticides used in agriculture are consumed by vegetable crops which cover only 3% of total cropped area. The wide spread use of pesticides resulted in the presence of their toxic residues in various environmental components/commodities (Kumari *et al.* 2002, 2008; Srivastava *et al.* 2011 and Wang *et al.* 2011).

Indiscriminate and improper use of pesticides on vegetables and negligence to follow proper waiting periods make marketed vegetables very often contaminated with pesticides (Lakshminarayana and Menon, 1975). Many farm gate vegetable samples showed presence of insecticide residues (Singh *et al.* 1999). Literature reveals that vegetables which contain the residues of pesticides above their respective maximum residue limit MRL may pose health hazards to consumers (Elliion *et al.* 2000; Mukherjee and Gopal, 2003). Thus, contamination of vegetable crops is sometimes more than the prescribed tolerance limits.

Hence, the survey on pesticide usage pattern in bhendi crop in 3 different villages of Karimnagar district was undertaken. Jeyanthi and Kombairaju (2005) studied the pesticide use in important vegetable crops, viz. chillies, cauliflower, brinjal and bhendi. Average pesticide usage has been estimated at 5.13, 2.77, 4.64 and 3.71 kg a.i. per hectare on chillies, cauliflower, brinjal and bhendi crops, respectively. May Lwin *et al.* (2012) studied farmer's knowledge and perception on pest management and pesticides, their practices on pesticide usage. Godfred *et al.* (2013) conducted a survey to assess the knowledge of pesticides handling by crop farmers along River Oyansia in Ghana.

## MATERIAL AND METHODS

Survey on pesticide use pattern was conducted during the year 2014-15 at farmer's fields in 3 different villages of Karimnagar district to generate information on the existing plant protection practices and elicit farmer's views on plant protection approaches. A questionnaire was prepared to collect the data scientifically for statistical analysis on various parameters such as type of pesticides used at different crop growth stages, target pests and commonly occurring pests, waiting period followed for harvesting after application of pesticides and other socio economic aspects.

Selection of villages:

Based on considerable area under bhendi cultivation, three villages falling under three different mandals of Karimnagar district were selected for field survey. The details of locations for field study are presented in Table 1. In each village, 10 farmers were selected at random and interviewed.

Nature and source of data:

As a part of the survey, the farmers were interviewed personally using a questionnaire.

Analytical tools and techniques employed

Simple statistical tools like frequency and percentage were used to analyze the data.

## RESULTS AND DISCUSSION

Survey on pesticide use pattern was conducted at farmer's fields in three villages of Karimnagar district. For the field survey, the data was collected from the sample farmers of 3 villages representing Kamanpur, Malharrao and Peddapalli mandals of Karimnagar district. The data was subjected to various statistical tools and techniques to draw meaningful conclusions.

### General awareness of farmers regarding usage of pesticides

#### Awareness on pesticide recommendation and classification:

About 33.33% of the farmers were aware of recommended pesticides against different pests and only 13.33% of the farmers were aware of pesticide classification based on toxicity. It may be due to illiteracy and literate's negligence that had led the farmers for the application of pesticide at improper dosage. Majority of the farmers were also unaware of pesticide classification based on toxicity which might be attributed to low literacy level, insufficient extension activities and negligence of farmers. Data pertaining to general awareness of farmers in using pesticides is **presented in** Table 2.

**Awareness of safe methods while storing / mixing / spraying pesticides:** About 66.66% of the farmers followed safe methods while storing or mixing or spraying of pesticides. About 86.66% of the farmers measured chemical by pesticide container cap and all the farmers i.e., 100% mixed the chemical by using stick and not with bare hands. It can be concluded that majority of the farmers have followed safe methods while storing or mixing or spraying pesticides which may be due to awareness of pesticides effect on health and majority of the farmers measured chemical by pesticide container cap as they were habituated to its usage. All the farmers mixed the chemical with stick and not with hand because they were concerned about pesticide ingestion from hands along with the food they eat.

**Table 1: Details of locations for field survey conducted in Karimnagar district**

.S.No	Mandal	Village	Sample farmers
1	Kamanpur	Kalvacherla	10
2	Malharrao	Thadicherla	10
3	Peddapalli	Kasulapalli	10

**Table 2. General awareness of farmers on pesticides and their use**

S.No	Particulars/comments	Field (n=30)			
		Frequency		Percentage	
		Yes	No	Yes	No
1	Are you aware about recommended pesticides against different pests	10	20	33.33	66.66
2	Are you aware about the pesticide classification based on toxicity	04	26	13.33	86.66
3	Do you follow safe methods while storing / mixing / spraying pesticides	20	10	66.66	33.33
4	Do you observe pesticide effect on health of spray men during spray	06	24	20.00	80.00
5	Are you aware that endosulfan is banned for use	21	09	70.00	30.00
6	Are you aware that monocrotophos is banned for use on vegetables	18	12	60.00	40.00
7	Do you use pesticide mixtures	22	08	73.33	26.66
8	Are you aware that for each pesticide, pre-harvest interval is recommended	10	20	33.33	66.66
9	Are you aware that pesticide residues are found in vegetables	6	24	20.00	80.00
10	Do you know that pesticide residues in food enter into body and accumulate	2	28	6.66	93.33
11	Are you aware about pesticide decontamination method	10	20	33.33	66.66
12	Are you aware that food exports are rejected due to pesticide residues	5	25	16.66	83.33
13	Do you think the quantity of pesticides used as adequate	22	08	73.33	26.66
14	Do you think that pesticides are helpful in getting good returns	18	12	60.00	40.00
15	Do you think high pesticide dose gives higher yields	08	22	26.66	73.33
16	Use of empty pesticide containers for house / farm purpose	04	26	13.33	86.66

**Table 2. General awareness of farmers on pesticides and their use (contd...)**

S.No	Particulars/comments	Field	
		Frequency	Percentage
17	<b>Since how long you are growing brinjal crop</b>		
	< 3 years	06	20.00
	>3years	24	80.00
18	<b>How do you measure the chemical</b>		
	Pesticide container cap	26	86.66
	Approximately	04	13.33
19	<b>How do you mix the chemical</b>		
	Bare hands	0	0
	Stick	30	100
20	<b>Most common health problem observed during spray</b>		
	Skin irritation	12	40.00
	Cough	02	6.66
	Breathlessness	06	20.00
	Eye irritation	04	13.33
	Head ache	06	20.00
21	<b>Best first aid you follow</b>		
	Induce vomiting if swallowed	05	16.66
	Washing the affected area with water	15	50.00
	Washing the affected area with soap water	10	33.33
22	<b>Whom do you contact, for pesticide recommendations</b>		
	Agricultural officer	05	16.66
	Dealer	21	70.00
	Scientist /Agricultural magazine	4	13.33

**Table 2. General awareness of farmers on pesticides and their use (contd...)**

S.No	Particulars/comments	Field	
		Frequency	Percentage
23	<b>How frequently you apply the pesticides</b>		
	2 Days	0	0
	4 days	3	10.00

	Week	10	33.33
	10-15 days	13	43.33
	15-20 days	4	13.33
24	<b>Common waiting period you follow after pesticide spray</b>		
	1 Day	0	0
	2 Day	5	16.66
	4 Day	7	23.33
	Week	18	60.00
25	<b>What type of bad effects you heard due to pesticide residues in food</b>		
	Cancer	1	3.33
	Physical impairments	4	13.33
	Not heard about any bad effects	25	83.33
26	<b>Common method of decontamination followed</b>		
	Salt water wash	10	33.33
	Water wash	20	66.66
27	<b>Best alternative for pesticide use</b>		
	Crop rotation	16	53.33
	Natural control	10	33.33
	Integrated pest management	4	13.33
28	<b>What is the disposal method you follow for empty pesticide containers</b>		
	Bury in soil	8	26.66
	Sell	0	0
	Throw into trash	22	73.33

Note: Figures in percentage are with respect to their respective frequency

#### **Pesticide effect on the health of spraying men and first aid followed:**

Among the farmers, only 20 % have observed the pesticide effect on the health of spraying men during spray. Most common health problems observed during spray included were skin irritation (40.00%), breathlessness (20.00%), head ache (20%), eye irritation (13.33%), and cough (6.66%). To combat these effects, majority of the farmers used first aid methods like washing the affected area with water (50.00%), washing the affected area with soap water (33.33%) and induced vomiting if pesticide is swallowed (16.66%).

It is noticed that less percentage of the farmers have experienced the bad effects of pesticide exposure and it may be due to improper protective coverings, eating or smoking during pesticide application and not having proper bath after pesticide application. Farmers usually followed simple and easy first aid practices which are helpful to the victim until he was taken to the hospital.

#### **Awareness on banned insecticides:**

About 70 % of the farmers had good awareness on the ban of endosulfan in agriculture and about 60% of the farmers were aware that monocrotophos is banned for use on vegetables. Majority of the farmers were aware about endosulfan ban and monocrotophos ban in agriculture and vegetables respectively.

#### **Contact person for pesticide recommendations:**

Farmers preferred to contact pesticide dealers (70 %) followed by agricultural officers (16.66%) and scientists (13.33%) for pesticide recommendations. It is because of easy and convenient accessibility of the dealers followed by agricultural officers and finally the agricultural magazines/ scientists.

#### **Pesticide mixtures and frequency of pesticide application:**

About 73.33% of the farmers used pesticide mixtures rather than applying single pesticide at a time, basically to save time, labour, money and to combat two or more pests with a single spray and 26.66% of the farmers did not use any pesticide mixtures which indicate their knowledge in using pesticides. About 43.33% of the farmers applied pesticides at 10-15 days interval, one week interval (33.33%) and 4 days interval (10%). It is observed that most of the farmers applied pesticides at 10-20 days interval which shows that farmers are following proper time for the application of pesticides and allowing the pesticides to act upon pests and are also not spraying the pesticides until the pest population build up is noticed again.

**Awareness on pesticide residues:**

About 20 % of the farmers were aware that pesticide residues are found in vegetables and just 6.66% of the farmers knew that pesticide residues in food enter into body and accumulate. About 33.33% of the farmers were aware that for each pesticide, pre-harvest interval is recommended. Most of the farmers followed common waiting period of 7 days (60%) followed by 4 days (23.33%) and 2 days (16.66%). About 83.33% of the farmers responded that they did not hear about any kind of bad effects due to pesticide residues, 13.33% reported about physical impairments due to pesticide residues. Majority of the farmers were unaware of pesticide residues, their bad effects, pre harvest intervals and this might be attributed to illiteracy level of the farmers and insufficient extension activities.

**Awareness of decontamination methods:**

Only 33.33% of the farmers were aware about decontamination methods. About 66.66% of the farmers followed washing of vegetables with water and 33.33% of the farmers followed salt water washing as the decontamination methods to remove pesticide residues. Majority of the farmers were unaware of various decontamination methods, but as a regular kitchen practice they wash vegetables under tap water.

**Perception of farmers about pesticides and alternative methods of pest control:**

Among the farmers, 73.33% of the farmers said that the quantity of pesticides used at their farm is adequate and about 40 % of the farmers had perception that pesticides are helpful in getting good returns. About 53.33% of the farmers are following crop rotation as an alternative for pesticide use, while 33.33% of the farmers are following natural control as an alternative to pesticides and only 13.33% of the farmers are implementing IPM (Integrated Pest Management) as an alternative for pesticide use.

About 26.66% of the farmers said that high pesticide dose gives higher yields and 73.33% of farmers reported that high pesticide dose will not give higher yield and pesticides are used only to control the pest. Majority of the farmers (60.00%) thought that pesticides are helpful in getting good returns and only 46% of the farmers felt that integrated pest management practices and natural control measures are alternative to pesticides. This might be due to unavailability of natural pest control / management components, slow knock down of pests in alternative pest control methods when compared to chemical pesticides and lower yields in initial years in case of natural control.

**Use of empty pesticide containers and their disposal:**

About 13.33% of the farmers are using empty pesticide containers for house or farm purposes. Majority of the farmers i.e., 73.33% are simply throwing empty containers in trash and 26.66% of the farmers burying the empty containers in soil. Proper disposal of empty pesticide containers without using them for house or farm purpose is essential in order to avoid health hazards due to pesticides. Few farmers were using pesticide containers for house or farm purposes as they were unaware of bad effects of pesticides. Disposal of these empty pesticide containers was not carried out in a satisfactory way, as majority of the farmers simply threw containers in trash.

In the present study, it was found that 70% of the farmers preferred to contact the pesticide dealers followed by agricultural officers (16.66%) and scientists (13.33%) for pesticide recommendations which is in line with work done by Asif Jamali *et al.* (2014) who reported that the major source (81%) of farmer's knowledge of insecticides was from the pesticide dealers. Nagendra (2009) found that 43.33 % of farmer's obtained information on pest management from pesticide dealers. Mahantesh and Alka Singh (2009) reported that, about 36.5 per cent of farmers were mainly dependent on the advice of pesticide dealers as a source of information on pest management.

In the present study, 33.33% of farmers had awareness of pesticide recommendations which is in disagreement with the findings of Nagenthirajah (2008) who reported that about 60% of respondents were aware of pesticide recommendations. Usually, very few farmers had knowledge on pesticide recommendations as per Insecticide Act and GAPs of ICAR and SAUs, and are fully dependent on neighbour farmer, local dealer or press / media reports, and in most cases pesticide dealers except in case of progressive farmers and also vegetable growers for export purposes, who followed GAPs to avoid the pesticide residues.

In the present study, it was found that 66.66% of the farmers followed safe methods while storing or mixing or spraying of pesticides and these results are in agreement with the findings of Mahantesh and Alka Singh (2009) who reported that about 34 per cent of the farmers had used facemasks / hand gloves, while applying the pesticides as a main safety measure. This study gives very pleasing information that farmers are taking care to avoid the pesticide contamination on to their body parts. In the present study, the most common health problems observed during and after spray operations at farm level included were skin irritation (40.00%), breathlessness (20.00%), head ache (20%), eye irritation (13.33%) and cough (6.66%). Similar observations were also noticed in agreement with the findings of Dhanraj *et al.* (2012) who reported 97.43% of skin irritation and eye-irritation (82.05 per cent) problems. Pujara and Rajkhanal (2002) reported that the people in Nepal, Kathmandu area have experienced several

health problems such as headache, nasal bleeding, vomiting, neck and eye pains, body ache, dizziness and other respiratory and skin problems due to mishandling of pesticides. Nagendra (2009) reported 51.67% of skin irritation followed by eye irritation and head ache symptoms at 44.17 and 35.83% respectively.

Present investigation revealed that 86.6% of the farmers had not used empty pesticide containers for house/farm purpose, 73.33% simply throw empty containers in trash and 26.66% of the farmers buried the empty containers in soil which is in line with the findings of Gurava Reddy *et al.* (2011) who reported that about 50% of empty pesticide containers were buried in the field itself and rest either buried or crushed and thrown in the field. Nagendra (2009) reported that 85% and 53% of respondents have not used empty pesticide containers for house/farm purpose, respectively. This information is an important piece of information that most farmers are aware that empty pesticide containers are not good for use at both farm / house level, and no farmer was aware about the scientific disposal procedures for used packs / containers.

The present study revealed that only 13.33% of the growers had awareness of pesticide classification based on toxicity, which indicates that very few farmers look at the colour code triangle on the pesticide container and similar result was indicated by Indira Devi *et al.* (2009) where in 99.5 per cent farmers could not understand the toxicity level after reading the colour code on the bottle and it gives clear message to all those concerned to educate the farmers about the toxicity codes of pesticides and care to be taken while using the same at both farm and home level.

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