



Research Paper

Studies on Pesticide Usage Pattern and Farmers Knowledge On pesticide Usage and Technologies in Open Field and Poly House Conditions

Shashi Vemuri, Ch.Sreenivasa Rao, S.Swarupa and K.Kavitha

All India Network Project on Pesticide Residues, Prof.Jayashankar Telangana State Agricultural University, EEI Premises, Rajendra nagar, Hyderabad

Received 10 August, 2016; Accepted 24 September, 2016 © The author(s) 2016. Published with open access at www.questjournals.org

ABSTRACT: The survey on pesticide use pattern was carried out by interviewing farmers growing capsicum in open fields and poly houses based on the questionnaire prepared to assess their knowledge and practices on crop cultivation, general awareness on pesticide recommendations and use. Education levels of poly house farmers are high compared to open field farmers, where 57.14% poly house farmers are high school educated, whereas 35% open field farmers are illiterates. Majority farmers use nursery of 35 days and grow in <0.5 acre poly house in summer and rabi and <1 acre in open field during kharif. Awareness on pesticide related issues is varying among poly house and open field farmers with some commonality, where 28.57% poly house farmers know about recommended pesticides while only 10% open field farmers are aware of this issue. However, in general, all farmers contact pesticide dealer for recommendations, poly house farmers prefer to contact scientists (35.71%) and open field farmers prefer to contact agricultural officers (33.33). Most farmers are unaware about pesticide classification and toxicity symbols on packing. Farmers are aware about endosulfan ban, but only 21.42% poly house and 11.66% open field farmers know about ban of monocrotofos on vegetables. Very few farmers know about pesticide residues and related issues, but know that washing helps to reduce contamination.

I. INTRODUCTION

Capsicum has become an important component of vegetables and food safety issues are very essential. In recent years due to the support of the Government under National Horticulture Mission (NHM), Capsicum is widely cultivated under poly house conditions. As per insecticides Act of 1968 (www.cibrc.nic.in), very few insecticides are registered and recommended for use on capsicum in open field conditions targeting various pests. However the pesticide use at farm level by growers varies based on pest status, local recommendations, and in most cases at higher dosage without following the pre harvest intervals (PHI) and also use of non recommended pesticides which is a common phenomenon at farmers' level. Study conducted in Amritsar and Mohali districts of Punjab revealed spraying of pesticides at short intervals especially by vegetable growers in this area without following pre harvest intervals (Singh and Singh, 2008). Indiscriminate use of synthetic pesticides causes severe ecological consequences like destruction of natural enemy fauna, effect on non-target organisms, secondary pest outbreaks. In addition it leads to pesticide residues in food and contaminates the environment which may lead to deleterious impacts not only on human health, but also on other biota (Sreelatha and Diwakar, 1997). Maximum Residue Limits (MRLs) are set by Codex Alimentarius Commission (CAC) at international level and by Food Safety and Standards Authority of India (FSSAI) of Ministry of Health and Family Welfare, Government of India, as per Food Safety and Standards Act, 2006 (Food Safety and Standards Regulation, 2011) at national level based on the Good Agricultural Practices. As per Central Insecticides Board and Registration Committee (CIBRC), dimethoate, lambda cyhalothrin, phosalone and flubendiamide are not recommended for use on capsicum and no MRLs are set. Hence studies were conducted to monitor the pesticide usage on Capsicum.

II. MATERIALS AND METHODS

Survey on pesticide use pattern was conducted at farmers' fields in 6 villages of Karimnagar district for open field survey and 10 villages in five districts of Telangana state for poly house survey 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 by utilizing a questionnaire. Based on considerable area under capsicum cultivation, six villages of three mandals of Karimnagar districts namely Karimnagar, Husnabad and Mahadevapur were selected for open field survey (Table-1). For polyhouse survey, availability of poly houses and cultivation of capsicum under poly house played important role in selecting villages and based on this criteria, 10 villages from five districts were selected (Table-2) simple statistical tools like frequency and percentage are used to analyse the data. To meet the objectives of the study, farmers growing capsicum in open fields and in poly houses (controlled environment) were interviewed based on the questionnaire prepared to assess their knowledge and practices on crop cultivation, general awareness on pesticide recommendations and use, pesticide classifications, toxicity, pesticide residues and disposal mechanisms.

III. RESULTS AND DISCUSSION

Based on the survey, it can be summarized that majority of the farmers growing capsicum in poly house were in the age group of 40-50 years (57.14%) similarly in case of open fields, 60% of farmers were in the age group of 40-50 years. Majority of poly house capsicum growers (57.14%) studied upto high school, while 35% of open field capsicum farmers are illiterates. More than 80% of sample farmers belonged to nuclear family. In both poly houses (71.14%) and open fields (78.33%) farmers, preferred seedlings of 35 days old for planting purpose. Most of the poly house growers are cultivating capsicum in area of < 0.5 acre (92.86 %) and in case of open fields, most of them are cultivating in <1 acre area (45.00 %). Most of the poly house farmers preferred to cultivate capsicum in *summer* (92.86 %) and *rabi* (64.29%) seasons, whereas, open field growers preferred to cultivate crop only in *kharif* (100%). More than 75% of poly house farmers preferred to grow crop up to 5 months, similarly 75% of farmers in open fields preferred to grow crop 5 months. Based on the survey, it is clear that most of the farmers are regular capsicum growers, growing capsicum for more than 3 years both in poly house and open fields. (Tables 3,3 a and 4)

Majority of the farmers both in poly houses (71.42%) and open fields (90.00%) were not aware about recommended pesticides against different pests, similarly 96.67% of open field and 85.71% of poly house farmers were not aware about the pesticide classification based on toxicity. (Table 3) Majority of poly house farmers measured required chemical quantity using bottle cap (85.71%) whereas, only 55% of open field farmers measured required chemical by bottle cap.. When interviewed, 85.71% of open field and 95% of poly house farmers disclosed that they do not follow safe methods while storing / mixing / spraying pesticides.. All farmers agreed that bad odor of the chemical is the criteria for selection of pesticide for spray in capsicum, and responded that odorless chemicals are highly preferred. Farmers are aware of the ban of endosulfan in agriculture (95% of open field and 92.86% of poly house farmers), while most of the farmers (78.57% in poly house and 88.33% in open field) are not aware about ban of monocrotophos use on vegetables. Majority of poly house (85.71%) and open field (75%) farmers use pesticide mixtures rather than spray of single chemical to save the money. Most of the farmers had poor awareness regarding pesticide residues in vegetables and pre harvest intervals.

As a regular practice, majority of the farmers follow decontamination of vegetables with tap water and very less number of farmers are aware of salt water wash. Majority of farmers (91.67% in open fields and 85.71 % in poly houses) are not aware about food exports rejections due to pesticide residues in international trade. Majority of farmers (92.86 % in open fields and 91.67% in poly houses) think pesticides are helpful in getting good returns and 64.29% of poly house farmers 70.00% of open field farmers believe that the dose recommended is not sufficient for pest control and most of the respondents think that integrated pest management practices are the alternative to pesticides. Majority of poly house farmers (85.71%) and more than 50% open field farmers think high pesticide will not give high yield. But few open field farmers (45%) believe high pesticide dose will give higher yield. According to farmers' perception high pesticide dose will help to rapidly control the pest and most of the poly house farmers apply recommended doses. From the survey, it is clear that majority of farmers (more than 80%) do not use empty bottles for house / farm purpose and most common method of disposal of these empty bottles was by throwing in to trash. From the results it is very clear that farmers prefer to contact pesticide dealers (100%) for recommendations, Poly house (35.71%) farmers prefer contact with scientists whereas, open field (33.33%) farmers prefer contact with agricultural officers. Majority of farmers (60% in open fields and 78.57% in poly houses) confirmed that they apply pesticides at weekly interval. Most of open field (88.33%) farmers follow waiting period of 2 days after pesticide spray, whereas 71.42 % poly house farmers follow waiting period of one week. Based on the survey and interaction with farmers to know about the pest occurrence and intensity, poly house farmers felt that the major pest is

thrips followed by mites, fruit borer (*Helicoverpa armigera*), leaf hopper, leaf eating caterpillar (*Spodoptera litura*) for which pesticides are sprayed. Similarly in open fields also thrips is the major pest followed by mites, fruit borer, leaf hoppers and leaf eating caterpillar (*Spodoptera litura*) (Table -5). But compared to open field conditions pest infestation is less in poly houses due to covered structure. Major pesticides used by the poly house farmers are Thiomethoxam 25%, Fipronil 5% SC, Chlorfenapyr 10% SC, Abamectin 1.9% EC, Imidacloprid 17.8% SL, Chlorantraniliprole 18.5% SC, Novaluron 5.2% + Indaxacarb 4.5 % SC, Spionsad 48% SC and Dicofof, whereas open field farmers used pesticides like Fipronil 5%SC, Thiomethoxam 25%, Chlorfenapyr 10% SC, Novaluron 5.2% + Indaxacarb 4.5 % SC, Imidacloprid 17.8% SL, Chlorantraniliprole 18.5% SC, Spionsad 48% SC, Dicofof 18.5% EC and Flubendiamide 48%SC. In poly house conditions frequency of pesticide application is less compared to open fields due to less pest infestation.

Data pertaining to types of pesticides used by capsicum growers is presented in table 6. In the present study 7.14% and 33.33% of poly house and open field respondents contacted agricultural officers for suggestions which is in line with work done by Nagendra (2009) who reported that only 5.8% of respondents contacted agricultural officers for suggestions on pest control. Open field farmers prefer contact with agricultural officers where as the poly house farmers are highly educated compared to open field farmers, and are also progressive in their crop management and hence it is observed that poly house farmers usually contact specialist instead of local Agricultural Officer for suggestions. In the present study 28.57% of poly house growers and 10% of open field growers had awareness of pesticide recommendations which are in conformity with the findings of Hosamani (2009), Nagendra (2009) and Jana et al. (2012a) who reported that 8.33%, 11.6and 25% of respondents were aware of pesticide recommendations, respectively. Usually, very few farmers have knowledge on pesticide recommendations as per Act and GAPs of ICAR and SAUs, and are fully dependent on neighbour farmer, local dealer or press / media reports, and in most cases on pesticide dealers except in case of progressive farmers and also vegetable growers for export purposes, who follow GAPs to avoid the pesticide residues.

The present study revealed that 3.33% of open field and 14.29% poly house growers had awareness of pesticide classification based on toxicity, which indicates that very few farmers look at the colour code triangle on the pesticide bottle, and similar results were reported by Hosamani (2009) and Nagendra (2009) who reported 14.17% and 27.50% of respondents had awareness of pesticide classification based on toxicity, respectively. Such reports depend on place, crop, purpose of product, use of the product, size of the pack etc. 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.

In present study it is observed that 96.66% of open field and 100% of poly house growers mixed pesticide with wooden stick and not with bare hands and these results are in agreement with the findings of Hosamani (2009) and Patil et al. (2012) who reported 64.17% and 57% of respondents mixed pesticide with wooden stick and not with bare hands. This study gives very pleasing information that farmers are taking care to avoid the pesticide contamination on to their body parts.

Present investigation revealed 92.86% and 90.00% of poly house growers have not used empty pesticide bottles for house/farm purpose, which is in line with the findings of Nagendra (2009) and Jana et al. (2012a) who reported 85% and 53% of respondents have not used empty pesticide bottles for house/farm purpose, respectively. This information is important which shows that most farmers are aware that empty pesticide bottles are not good for use at both farm / house level, and further it was noticed that very few farmers try to sell the empty bottles to rag buyers, but no farmer was aware about the scientific disposal procedures for used packs / bottles.

Most farmers reported that they feel that bad odour of pesticides is harming people and noticed common health problems like skin irritation, cough, eye irritation, head ache, breathlessness in the spray men during and after spray operations at farm level. Similar observations were also noticed by farmers growing capsicum in open fields, and few felt that headache was also observed in some people. These findings are in agreement with the findings of Patil et al. (2012) who reported 97.43% skin irritation. Nagendra (2009) reported 51.67% of skin irritation followed by eye irritation and head ache at 44.17 and 35.83%, respectively. Jana et al.(2012b) reported that 70.00% of the respondents experienced bad odour followed by 22.00% head ache, among the farmers who were engaged in spraying of pesticide.

Table.1. Details of locations for open filed survey

SL.No	Mandal	Village	Sample farmers
1	Karimnagar	Thimmapur	10
		Parlapally	10
2	Husnabad	Gunturpalle	10
		Pandilla	10
3	Mahadevapur	Ambatpalle	10
		Suraram	10
Total			6

Table.2. Details of locations for polyhouse survey

SL.No	District	Mandal	Village	Sample farmers
1	Ranga Reddy	chevella	Basthepur	1
		Saroor nagar	Jalpally	2
2	Medak	Jagadevapur	Erravalli	2
		Jagadevapur	Gollapalle	1
3	Warangal	Mahaboobabad	Banjara	1
		Ghanpur	Chilpur	1
		Bhupalpally	Gorlaveedu	2
5	Karimnagar	Mahadevapur	Ambatpalle	1
		Husnabad	Gandhi nagar	1
6	Guntur	Narakodur	Chebrole	2
Total				14

Table. 3 General awareness of farmers on pesticides and their use

Particulars		Poly house (n=14)				Open field (n=60)			
SL.No	Particulars/comments	Frequency		Percentage		Frequency		Percentage	
		Yes	No	Yes	No	Yes	No	Yes	No
1	Are you aware about recommended pesticides against different pests	4	10	28.57	71.42	6	54	10	90
2	Are you aware about the pesticide classification based on toxicity	2	12	14.29	85.71	2	58	3.33	96.67
3	Do you follow safe methods while storing / mixing / spraying pesticides	2	12	14.29	85.71	3	57	5	95
4	Do you observe pesticide effect on health of spray men during spray	13	1	92.86	14.29	58	2	96.66	3.33
5	Are you aware that endosulfan is banned for use	13	1	92.86	7.14	57	3	95	6.67
6	Are you aware that Monocrotophos is banned for use on vegetables	3	11	21.42	78.57	7	53	11.66	88.33
7	Do you use pesticide mixtures	12	2	85.71	14.29	45	15	75	25
8	Are you aware that for each pesticide, pre-harvest interval is recommended	1	13	7.14	92.86	0	60	0	100
9	Are you aware that pesticide residues are found in vegetables	2	12	14.29	85.71	4	56	6.66	96.66

10	Do you know that pesticide residues in food enter into body and accumulate	1	13	7.14	92.86	3	57	5	95
11	Are you aware about pesticide decontamination method	13	1	92.86	7.14	55	5	91.67	8.33
12	Are you aware that food exports are rejected due to pesticide residues	2	12	14.29	85.71	5	55	8.33	91.67
13	Do you think the quantity of pesticides used as adequate	5	9	35.71	64.29	18	42	30	70.00
14	Do you think that pesticides are helpful in getting good returns	13	1	92.86	7.14	55	5	91.67	8.33
15	Do you think high pesticide dose gives higher yields	2	12	14.29	85.71	27	33	45.00	55.00
16	Use of empty bottles for house / farm purpose	1	13	7.14	92.86	6	54	10.00	90.00

Table 3. General awareness of farmers on pesticides and their use

Particulars		Poly house		Open field	
SI. No	Particulars/comments	Frequency	Percentage	Frequency	Percentage
17	Since how long you are growing chilli crop				
	< 3 years	4	28.57	4	6.67
	>3years	10	71.43	56	93.33
18	How do you measure the chemical				
	Bottle cap	12	85.71	33	55.00
	Approximately	2	14.29	27	45.00
19	How do you mix the chemical				
	Bare hands	0	0.00	2	3.33
	Stick	14	100.00	58	96.66
20	Most common health problem observed during spray				
	Skin irritation	7	50	27	45
	Cough	3	21.42	10	16.66
	Breathlessness	0	0.00	4	6.66
	Eye irritation	5	35.71	18	30
	Bad odour	12	85.71	51	85

	Head ache	2	14.29	11	18.33
21	Best first aid you follow				
	Induce vomiting if swallowed	13	92.85	54	90
	Washing the affected area with water	12	85.71	53	88.33
	Washing the affected area with soap water	11	78.57	48	80
22	Whom you contact, for pesticide recommendations				
	Agricultural officer	1	7.14	20	33.33
	Dealer	14	100.00	60	100.00
	Scientist	5	35.71	9	15

Particulars		Poly house		Open field	
Sl.No	Particulars/comments	Frequency	Percentage	Frequency	Percentage
23	How frequently you apply the pesticides				
	2 Days	0	0.00	3	5
	4 days	2	21.43	21	35
	Week	12	78.57	36	60
24	Common waiting period you follow after pesticide spray				
	1 Day	0	0	2	3.33
	2 Day	1	7.14	47	88.33
	4 Day	3	21.42	5	6.67
	Week	10	71.42	6	0.00
25	What type of bad effects you heard due to pesticide residues in food				
	Cancer	1	7.14	2	3.33
	Physical impairments	2	14.28	5	8.33
	Not heard any bad effects	11	78.57	54	90
26	Common method of decontamination followed				
	Salt water wash	4	28.57	12	20
	Water wash	13	92.85	49	81.66

27	Best alternative for pesticide use				
	Crop change	0	0.00	0	0.00
	Natural control	2	14.29	7	11.66
	Integrated pest management	4	28.57	14	23.33
28	What is the disposal method you follow for empty pesticide bottles				
	Bury in soil	0	0.00	0	0.00
	Sell	2	14.29	11	18.33
	Throw in to trash	12	85.71	49	81.66

Table 6 Types of pesticides used by Capsicum growers

Particulars				Poly house (n=14)		Open field (n=60)	
Sl.NO	Chemical name	Trade name	Price (Rs per lit / kg)	Frequency	Percentage	Frequency	Percentage
1.	Imidacloprid 17.8% SL	Confidor	2400	8	57.14	44	73.33
2	λ-Cyhalothrin 5% EC	Karate	712	5	35.71	25	41.66
3	Monocrotophos 36% SL	Monophos	466	4	28.57	14	23.33
4.	Thiomethoxam 25% WG	Actara	4040	12	85.71	49	81.67
5.	Chlorantraniliprole 18.5% SC	Coragen	15000	8	57.14	43	71.67
6	Emamectin benzoate 5 % SG	Proclaim	8900	5	35.71	19	31.67
7.	Novaluron 5.2 % +Indaxacarb 4.5% SC	Plethora	2600	9	64.29	44	73.33
8.	Chlorfenapyr 10% SC	Interprid	2500	10	71.42	48	80.00
9.	Spionsad 48 % SC	Tracer	13500	7	50.00	41	68.33
10	Acetamaprid 20% SP	Pride	1600	5	35.71	16	26.67

11.	Fipronil 5 SC	Regent	1200	11	78.57	55	91.66
12.	Flubendiamide 48% SC	Fame	15000	5	35.71	38	63.33
13	Lufenuron 5.4% EC	Cigna	2776	4	28.57	15	25.00
14.	Abamectin 1.0% EC	Abacin	280	9	64.29	35	58.33
15.	Dicofol 18.5% EC	Kelthane	250	6	42.85	39	65.00

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