



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; SP-8(6): 50-53

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Received: 19-09-2020

Accepted: 22-10-2020

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An explorative study on usage pattern of pesticides among tomato growing farmers in Anantapur district of Andhra Pradesh

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DOI: <https://doi.org/10.22271/chemi.2020.v8.i6a.10917>

Abstract

Tomato is the most important vegetable in the culinary tables of India. Tomato is cultivated widely across the regions. A study was conducted in Anantapur district of Andhra Pradesh to understand the pest incidence in tomato crop and how the farmers address this problem with application of pesticides. Pesticides on vegetables have a direct ill health effect on consumers. A total of ninety tomato cultivating farmers were interviewed for the purpose in the district. Descriptive analysis, factor analysis and Garette ranking techniques were used for analyzing the collected information. The usage pattern examined included the nature and type of pesticide used, major pest occurrence, length of usage, seasons of usage, method of pesticide application, timing of application, dosage and source of information for purchase of pesticides. The factors influencing the preference of the farmers towards pesticides were analyzed through factor analysis and four important factors like promotional attributes, flexibility, innovativeness and product acceptance were identified.

Keywords: Usage Pattern, Preference, Dosage, Loyalty, flexibility, innovativeness

Introduction

Tomato is the world's largest vegetable crop and known as protective food because of its special nutritive value and its wide spread production. Tomato is one of the most important vegetable crops cultivated for its fleshy fruits. Tomato is considered as important commercial and dietary vegetable crop and is a protective supplementary food. As it is short duration crop and gives high yield, it is important from economic point of view and hence area under its cultivation is increasing day by day. Tomato is also rich source of minerals, vitamins and organic acid, essential amino acids and dietary fibers.

During the year 2016, Andhra Pradesh stood first in terms of total area under cultivation of tomato (76.50%), followed by Bihar (46.00%) and Chhattisgarh (29.20%). Andhra Pradesh stood first in production (14.53%) followed by Karnataka (12.70%) and Orissa (11.21%). (www.nhb.gov.in). during 2015-16, Anantapur district contributed to 33 per cent of the state's total Area under tomato. However, it accounted for 24.78 per cent of state's total tomato Production. The average productivity of tomato in Andhra Pradesh is 19 (t/ha). (www.nhb.gov.in).

Table 1: Area, Production and Productivity of Tomato (2016)

S. No	Particulars	Area (In'000 Hectare)	Production (In'000 MT)	Productivity (MT/ha)
1	India	767.30	16385.0	21.40
2	Andhra Pradesh	54.20	1473.50	27.20
3	Anantapur district	2659 (ha)	26590(tones)	10.00

Source: www.indiastat.com

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There are several diseases on tomato caused by fungi, bacteria, viruses, nematodes and abiotic factors. Among the fungal diseases, early blight also known as target spot disease incited by *Alternaria solani* and groud is one of the world's most catastrophic disease. The causal organism is air borne also survive in soil and is responsible for early blight and fruit rot of tomato. The disease appears on leaves, stems, petiole, twig and fruits under favorable conditions resulting in defoliation, drying off twigs and premature fruit drop and thus causing loss from 50 to 86 percent in fruit yield. Late blight is a pandemic disease in world it causes up to 100 per cent yield loss. The major constraints identified in tomato cultivation were Non availability of institutional support, disease and pest attack, high cost of seeds, high cost of pesticides and high cost of labours during peak season etc(Agarwal and Banerjee (2019) [1].

Pesticides are agricultural technologies that help farmers to control pests and weeds and considered as an important input when producing a crop (Kateregga 2012 [2]; Skevas *et al.* 2013; [3] Jansen and Dubois 2014 [4]). The tomato growing farmers in Anantapur district used various agrochemicals to control the pest incidence. Kesavareddy *et al.* (2018) [5]. analyzed the perception and pesticides usage practices by the small tomato growers in Ramanagara district of Karnataka and reported that farmers use more than 25 pesticides in tomato ecosystem. It was surprising to note that farmers had no preference for a particular product and dealers/retailers could easily influence the pattern of buying pesticides. Leading companies like DuPont, Syngenta, Bayer, Dhanuka, Nagarjuna, Pi, Sarala (a local company), Rallis, Krishi Rasayana, UPL and BASF, were present in the study area.

Pesticides act as a protective umbrella for the other inputs and they play an important role in crop production by way of controlling insect pests, diseases and weeds, which in turn help in avoiding huge losses in farm produce. Shakirullah *et al.* (2006) [6]. studied the nature and extent of adoption of pesticides among small, medium and large farmers in Union Council Palosi, District, Peshawar. The results revealed that the pesticides were used by 78.75 per cent of the farmers and majority of the farmers (41.25 percent) started using pesticides 6-15 years ago for different pests. The per annum average cost of pesticide purchase was significantly higher at 1 per cent level for large farmers than medium and small farmers. This shows that the larger farms applied more pesticides. Hence this study was taken up to analyze the usage pattern of pesticides used in tomato in Anantapur district of Andhra Pradesh.

Methods and Tools Used

Anantapur district was purposively selected for this study as it is one of the important tomato cultivating areas in Andhra Pradesh. It is the second largest district with a highest production of tomato in Andhra Pradesh. Stratified simple random sampling technique was used for the collection of data from thirty tomato farmers in each of the three taluks and totally 90 farmers cultivating tomato were selected for the survey. The collection of data from the sample respondents was taken up during the month of March and April 2017.

Descriptive analysis was used to analyze some of the responses of the farmers. The sample respondents were asked to rank the source of information for purchase the constraints faced by them in purchase and use of pesticides and was analyzed using the Garrett ranking technique.

Results and Discussion

The results from subjecting the data with various analysis to meet the objectives of the study is presented and discussed in the following paragraphs.

Pesticide usage pattern among tomato farmers

Pests are known to negatively impact crop production as well as the health of communities and nations. Farmers have long sought ways to control pests and plant diseases. In Cameroon, farmers have traditionally used wood ash and animal droppings (mixed with water) to control pests and plant disease. However, these methods are ineffective and do not improve crop production

Usage of pesticides of different companies among sample farmers

The farmers preference of different pesticide companies varied with the quality of the pesticide, the promotional activities of the company, price aspects and recommendation of the dealer.

Table 2: Usage of pesticides of different companies among sample farmers

S. No.	Pesticide company	Number of Farmers	Per cent (%)
1	DuPont	19	21.00
2	Syngenta	12	13.00
3	Bayer	11	12.00
4	Dhanuka	10	11.00
5	Nagarjuna	9	10.00
6	Pi	8	9.00
7	UPL	7	8.00
8	Sarala	4	5.00
9	Rallis	4	4.00
10	BASF	4	4.00
11	Krishi Rasayana	2	2.00
Total		90	100.00

Table 2 Shows that in Anantapur district most of the tomato growing farmers preferred DuPont (21 percent), Syngenta (13 percent), and Bayer (12 percent) which were preferred first, second, third by the farmers respectively. The remaining companies were Dhanuka, Nagarjuna, PI, UPL, Sarala, BASF, Rallis and Krishi Rasayana.

Major pest and diseases in tomato crop in Anantapur district

It can be inferred from Table 3 that leaf miner, aphids and Spodoptera were the major pests affecting tomato crop in Anantapur district. Damping off, Jasids and Early and Late blight were the major diseases reported in tomato crop by the farmers of Anantapur district.

Table 3: Major Pest and diseases in tomato crop in Anantapur district

S. No.	Pest and Diseases	Recommended chemical	Dosage	Company name	Number of respondents
1	Damping off	Blue copper	½-1kg/ac	Byer	12
2	Leaf curl(thrips)	Tolfenpyrad	250 ml/ac	Pi	10
4	Bacterial canker	Casidon mysilin	¼ lit/ac	Dhanuka	11
5	Sucking pest(might)	Fenazaquin 10% EC	½ lit / ac	Rallis	8

6	Leaf miner	Profenophos	250ml/ac	Nagarjuna	7
7	Aphids	Acephate	¼ kg/ac	UPL	5
8	Jasids (mosaic virus)	thaiyomethagin	100 grm/ac	DuPont	17
9	Spodoptera	Fosetyl AL 80% WP	100 grm/ac	Krishi Rasayana	6
10	Early & late blight	Hexaconazole	250ml/ac	Syngenta	14
Total					90

Length of usage of pesticides from the same company

The sample farmers used the same company's pesticides for longer period of time. The continuous preference for the same company pesticide was analyzed and the results are presented in Table 4.

Table 4: Length of Usage of particular company pesticide

S. No.	Length of usage (Years)	Number of Farmers	Per cent (%)
1	1-2	12	13.00
2	2-4	23	26.00
3	5-6	38	42.00
4	7-9	9	10.00
5	Above 10	8	9.00
Total		90	100.00

Among the respondents, 42 per cent used the particular product for the past 5-6 years, while 26 percent of the farmers were using the same product for last 2-4 years, 13 percent of sample farmers used the same pesticide for last 1- 2 years and (10%) used the same for the pesticides for past 7-9 years and the remaining (9 percent) farmers continuously used the same company's product of the more than 10 years.

Seasons of pesticide usage

From Table 5 it is evident that pesticides for tomato crop were used across all seasons. Seasons reported by the farmers cultivating tomato crop included Rabi, Kharif, summer and combination of the three seasons.

Table 5: Seasons of pesticide usage

S. No.	Seasons of pesticide usage	Number of Farmers	Per cent (%)
1	Rabi	12	13.00
2	Kharif	17	19.00
3	Summer	23	25.00
4	Rabi + Kharif	9	10.00
5	Kharif + Summer	14	16.00
6	Rabi + Summer	15	17.00
Total		90	100.00

Among the ninety respondents, 25 percent used the pesticides particularly during summer season followed by Kharif season (19 percent), 13 percent used the pesticides in Rabi season, 17 percent used the pesticides Rabi +summer, 16 percent used Kharif + Summer and 10 percent used the pesticides during Rabi + Kharif seasons.

Method of pesticide application

One of the most common forms of pesticide application, especially in conventional agriculture, is the use of hydraulic sprayers. Hydraulic sprayers consist of a tank, a pump, a lance (for single nozzles) or boom, and a nozzle (or multiple nozzles). Sprayers convert a pesticide formulation, with a mixture of water (or another liquid chemical carrier, such as fertilizer) and chemical, into droplets, which can be large rain-type drops or tiny almost-invisible particles.

Table 6: Method of pesticide application

S. No.	Method of application	Number of Farmers	Per cent (%)
1	Knapsack sprayer	47	52.00
2	Power operated & Sprayer	43	48.00
Total		90	100.00

Table 6 indicates that majority of the respondents (52 percent) applied the pesticides using the knapsack sprayer and remaining respondents (48 percent) used power operated sprayer. The results of the study was found to be similar as reported by keshavareddy *et al.* (2018) [5].

Mode of application

Application of pesticide is very successful when applied at the most susceptible stage of the pest. If the timing of pesticide application is carefully considered and followed, it would result in good pest control and economy. Therefore, for large area treatment, careful selection of equipment becomes necessary so that within the available 'time' the area could be treated.

Table 7: Mode of pesticide application in Tomato

S. No.	Mode of application	Number of Farmers	Per cent (%)
1	Prophylactic spray	25	28.00
2	Post infection spray	22	24.00
3	Both prophylactic and Post infection spray	43	48.00
Total		90	100.00

Table 7 indicates that majority of the respondents (43 percent) applied the pesticides as both prophylactic and in Post incident situation, About 28 percent of the farmers applied the pesticides in prophylactic spray and the remaining respondents (24 percent) used the pesticide post infection.

Dosage of pesticide application in tomato

Dosages that are suitable are recommended for pesticide application in tomato crop, dosages are increased/ decreased based upon the need of the crop. The amount of water that needs to be mixed/ added with the pesticide varied with the dosage level of pesticide.

Table 8: Dosage of pesticide application in tomato

S. No.	Dosage of pesticide application	Number of Farmers	Per cent (%)
1	Recommended dose	45	50.00
2	Higher dosage	25	28.00
3	Lower dosage	20	22.00
Total		90	100.00

It could be seen from the table that most of the sample respondents (50%) used the recommended dosage followed by higher dosage (28%) and then lower dosage (22%).

Source of information on Pesticide purchase

The most common source of procurement of pesticides was through local agricultural input supply dealers. The dealers played an important role not only in the distribution of pesticides but also acted as an important source of information about the pesticide products and their usage. Dealers involved in distribution function may influence the quantity and types of pesticides that were used by farmers for their production operations.

Table 9: Sources of Information on Pesticide purchase

S. No.	Sources of information	Garret score	Rank
1	Retailers	79	I
2	Dealers	65	II
3	Company representatives	62	III
4	Advertisement	57	IV
5	Co-farmers	54	V
6	Krishi Vignan Kendra (KVK)	49	VI
7	Agri /horticulture office	42	VII
8	Rythu Samparka Kendra (RSK)	39	VIII
9	University	32	Ix

The Table 9 indicated that source of information on pesticides for the tomato farmers. Retailers advise was ranked as first and foremost source of information with the average score of 79 followed by dealers, company representatives, advertisement, co-farmers, KVK, Agri/Horti office, RSK and the university were ranked serially by the respondents.

Conclusion

Higher level of pesticide use was found during summer season and only 50 percent of the farmers used recommended dosage. About 28 per cent of the farmers used more than the recommended dosage which would lead to higher level of toxicity in ripen tomatoes. The major source of information regarding the product and recommended dosage were the dealers. Hence the officials of the Department of Agriculture must ensure enforcement of strict regulations for supply of right quantity of pesticides to the farmers.

Four factors namely promotional attributes, flexibility, innovativeness and product acceptance were found to be most important factors influencing preference for pesticides by the tomato farmers of Anantapur district.

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