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Farmer Perception and Pesticide usage Pattern in Snake gourd and Ridge gourd grown in Tamil Nadu

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ABSTRACT: An extensive survey was conducted to determine the extent of pesticide usage patterns and farmers' knowledge on pesticides and their use in snake gourd and ridge gourd cultivated in Tamil Nadu, India. Farmers relied on pesticides majorly for the management of leaf miner, fruit fly, aphid, and thrips. The highly used insecticides were acephate 50% WP + imidacloprid 1.8% SP(40%), flonicamid 50% WG (35%), thiamethoxam 25% WG (27.5%) and lambda-cyhalothrin 5 % EC (22.5%). Around 67.5% farmers trusted the local pesticide retailers for pesticide recommendations. Only a meagre number of farmers (15%) sprayed the recommended dose and paid attention to pesticide labels (10%). A knowledge gap was observed among farmers pertaining to waiting period after pesticide spray and followed a spray interval of 10-14 days (45%). The survey revealed the lack of knowledge among farmers on the recommended dosage of pesticide, safe harvest interval, label claim, and personal protection measures during spray operation, but their knowledge was adequate on pesticide container disposal, mixing, and measurement.

Keywords: Snake gourd, Ridge gourd, pest, pesticide**.**

INTRODUCTION

The Cucurbitaceae family is the second-largest vegetable family and one of the most genetically diverse groups of plants. This family includes snake gourd and ridge gourd, both of which are common in tropical areas (Devi, 2017). Snake gourd, *Trichosanthes cucumerina* is native to India or the Indo-Malayan region of tropical Asia (Roy *et al.*, 1991) and is widely distributed throughout Asia (Ojiako & Igwe 2008). Ridge gourd, *Luffa acutangula* also known as angled loofah, is a domesticated vegetable native to Asia's subtropical regions, such as India, Japan and China (Pessarakli, 2016). It is commonly used in traditional medicine in India to treat jaundice, urinary bladder stones, ulcers, and sores (Arunachalam *et al.,* 2012). During the growth period, the snake gourd and ridge gourd crops are affected by various pests including insects. The most common insect pests found are fruit fly, aphids, leaf miner, pumpkin beetle, thrips, and semilooper, which have a significant impact on productivity (Atwal & Dhaliwal 1997). These pests destroy nearly half of the world's food crops every year. As a result, plant protection chemicals must be used to mitigate the infestation's severity. However, these pesticides are frequently applied indiscriminately and inappropriately, resulting in deleterious effects on environment and food quality. According to the World Health Organization, developing countries account for 20 per cent of global pesticide use, posing a risk to human health and the environment (Hurtig *et al*., 2003). Literature on insect pest dynamics and pest management measures pertaining to ridge gourd and snake gourd in Tamil Nadu is meagre. With this context in mind, a survey was carried out to observe the major insect pests attacking these crops, examine farmers' knowledge of pesticide use and its harmful effects, and determine pesticide usage patterns.

MATERIALS AND METHODS

A. Selection of study area

Coimbatore, Dharmapuri, Salem, and Tiruppur districts (Fig. 1) were chosen for surveying based on the extent of snake gourd and ridge gourd cultivation. Furthermore, significant snake gourd and ridge gourd growing blocks and villages were chosen within each district with the data obtained from region specific state Dept. of Horticulture Offices. Table 1 shows the locations of the snake gourd and ridge gourd growing fields surveyed in Tamil Nadu.

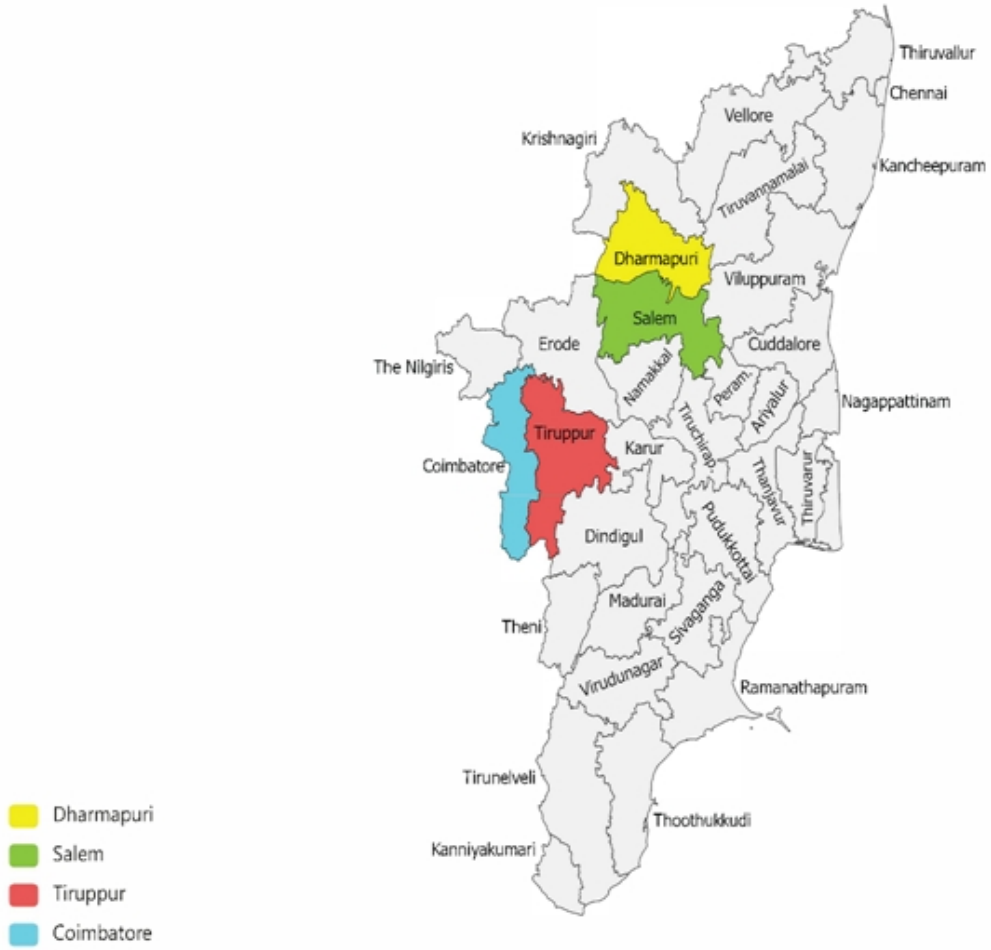

Fig. 1. Surveyed areas for pesticide usage patterns of snake gourd and ridge gourd in Tamil Nadu.

Table 1. Details of snake gourd and ridge gourd fields surveyed in Tamil Nadu.

S. No	District	Block	Village	Number of respondents per village	Number of respondents per village
1	Coimbatore	Thondamuthur	Narasipuram	6	10
			Madampatti	4	
2	Dharmapuri	Pennagaram	Papparapatti	3	10
		Palacode	Vellichandai	3	
			Chikkardanahalli	4	
3	Salem	Omalur	Thumbipadi	3	10
			Kattamperiyampatti	2	
		Ayothiapattinam	Vedapatti	2	
			Valaiyakaranur	3	
4.	Tiruppur	Udumalaipettai	Kanamanaikanoor	5	10
			Mukkonam	5	

B. Nature and source of data

Data on insect pest status and pesticide usage patterns were gathered from a group of 10 progressive farmers in each district. As a result, a total of 40 farmers from Tamil Nadu's major snake gourd and ridge gourd growing areas were surveyed. Based on the objectives of the study, an interview schedule was designed in a meaningful pattern and was used to collect data by interviewing individual farmers. The questionnaire consisted of three portions.

Section 1: Pertaining to socio-economic status (farmer name, address, age, education, family particulars).

Section 2: Questions related to major pesticides used (chemical name, trade name, dose, manufactured company).

Section 3: Pesticide usage pattern (source of information on recommended pesticides, attention towards labels, measurement and mixing of pesticide, safety methods followed, dosage of insecticides, type of sprayer used, time of spraying, number of sprays, waiting period followed, spray intervals, handling and disposal of pesticide containers).

The interview was held during November to December, 2021. Questions were asked in numerical order, giving farmers enough time to consider the question and respond appropriately. As most of the farmers were illiterate or educated only up to primary level, it was necessary to clarify the questions. Farmers were selected based on their willingness and had the option to refuse to provide responses, if necessary. However, no farmers refused to participate in the interview conducted in an interactive mode.

C. Data Analysis

To draw relevant findings, the survey data was classified according to the needed information and analysed using numerous descriptive statistical techniques such as mean, per centage, and standard deviation to examine the factors impacting pesticide use and consumption pattern.

RESULTS AND DISCUSSION

A. Socio-economic factors of snake gourd and ridge gourd growing farmers

Socio economic status of snake and ridge gourd farmers, with an emphasis on educational status, land holding size, farming experience, family size, and other socioeconomic aspects are presented in Table 2.

Table 2: Socio-economic factors of snake gourd and ridge gourd farmers.

S. No.	Variables	Mean ± SD
1.	**Age (Years)**	
	Young (Under 25 years)	7.50 ± 3.17
	Middle (Above 25 to 45 years)	35.00 ± 11.75
	Old (More than 45 years)	57.50 ± 18.38
2.	**Gender**	
	Male	85.00 ± 12.91
	Female	15.00 ± 12.91
3.	**Education (Years)**	
	Illiterate	20.00 ± 8.16
	Primary level	30.00 ± 8.16
	Secondary level	25.00 ± 5.17
	Higher Secondary level	15.00 ± 5.17
	Graduation level	10.00 ± 8.16
4.	**Size of land holding**	
	Marginal (<2.5 acres)	47.50 ± 9.57
	Medium (2.5 -10 acre)	45.00 ± 10.00
	Large (>10 acres)	7.50 ± 9.57
5.	**Farming experience (Years)**	
	Low (Up to 5 years)	5.00 ± 5.77
	Medium (Above 5 to 10 years)	15.00 ± 5.77
	High (More than 10 years)	80.00 ± 8.16
6.	**Family size (No)**	4.57 ± 0.39

According to the findings of the survey, 85 per cent of snake gourd and ridge gourd growers were male, whereas only 15 per cent of farmers were female. This result was in accordance with (Berni *et al.,* 2021) reported that of the 402 farmers surveyed, 90.3% were male and 9.7 % were female. It revealed that the majority of males are interested in pest management practise, techniques, and management than females.

Education is very important because it broadens farmers' perspectives and exposes them to various aspects and opportunities related to agriculture fields. In this study, farmers are classified into five categories

on the basis of their level of education. Out of 40 farmers, 20% had no education, 30% had primary level education, 25% had secondary education, 15% had higher secondary education, and 10% had graduate level of education. This results are in line with (Nyakundi *et al.,* 2012) reported that among 100 farmers, 50% had attended secondary school, 15% had attended college, and 8% had had no schooling. Though a majority of the farmers surveyed were literate, knowledge acquirement on scientific practices of pest management was found to be less. In comparison, under the national Integrated Pest Management (IPM) program, farmers in Indonesia (91.1%) who had completed secondary school could reduce pesticide consumption by nearly half without compromising rice yields (Indraningsih *et al.,* 2005).

Majority of farmers (80%) had a high level of farming experience followed by medium and low with 15 per cent and 5 per cent respectively. This study found that older farmers have more farming experience than younger farmers.

Farmers are classified into three categories on the basis of their size of land holding. According to the survey, marginal farmers with less than 2.5 acres accounted for 47.5 percent, Medium farmers with 2.5 to 10 acres accounted for 45 percent, and large farmers with more than 10 acres accounted for only 7.5%. In the same way, the majority of farmers in Tamil Nadu are considered to be "marginal farmers" by the All-India Report on Agricultural Census (AIRAC) for 2015-2016.

Majority (57.25%) of the farmers comes under old age group (more than 45 years) followed by middle (Above 25 to 45 years) and young (under 25 years) age groups with 35 per cent and 7.5 per cent respectively and their average family size was 4.57 ± 0.39 member in family. The findings revealed that, despite owning land, younger age groups do not prefer farming. Furthermore, farmers who make agriculture their primary occupation do not involve their children in farming. This could explain why there are fewer young farmers.

B. Pest status

A detailed survey was conducted in all of the above-mentioned Tamil Nadu districts to identify major pests. Among the noted pests, fruit fly *Bactrocera cucurbitae* (Coquillett) and leaf miner *Lyriomyza trifolii* (Burgess) were recorded as a major pest in all the districts studied. Other major pests recorded were thrips *Thrips palmi* (Karny) in Coimbatore; whitefly *B. tabaci* (Gennadius) in Dharmapuri; and pumpkin beetles *Aulacophora foveicollis* (Lucas) in Coimbatore, Dharmapuri, and Tiruppur districts. The pest such as aphid *Aphis gossypii (*Glover), red spider mite *Tetranychus urticae* (Koch), and snake gourd semilooper *Diaphania indica* (Saunders) are of minor importance in the snake gourd and ridge gourd ecosystems of Tamil Nadu (Table 3, Fig. 2). The variation in pest dynamics between districts may be due to differences in cultivar/hybrids, sowing time, crop stage, geographical location of the study area, climatic differences, particularly temperature and rainfall, which influences pest population (Meenambigai *et al.,* 2017).

Table 3: Insect pests of snake gourd and ridge gourd recorded in surveyed area of Tamil Nadu.

S. No.	Common name	Scientific name	Family; Order	Stage of crop	Status of pest*			
					CBE	DMP	SLM	TRP
1	Fruit fly	*Bactrocera cucurbitae*	Drosophilidae; Diptera	Fruiting	Major	Major	Major	Major
2	Thrips	*Thrips palmi*	Thripidae; Thysanoptera	Vegetative & flowering	Major	Minor	Minor	Minor
3	Whitefly	*Bemisia tabacii*	Aleyrodidae; Hemiptera	Vegetative	Minor	Major	Minor	Minor
4	Aphid	*Aphis gossypii*	Aphididae;Hemiptera	Vegetative	Minor	Minor	Minor	Minor
5	Leaf miner	*Lyriomyza trifolii*	Agromyzidae; Diptera	Vegetative	Major	Major	Major	Major
6	Red spider mites	*Tetranychus utricae*	Tetranychidae; Trombidiformes	Vegetative	Minor	Minor	Minor	Minor
7	Pumpkin beetles	*Aulacophora foveicollis*	Chrysomelidae; Coleoptera	Vegetative	Major	Major	Minor	Major
8	Snake gourd semi looper	*Diaphania indica*	Crambidae: Lepidoptera	Vegetative	Minor	Minor	Minor	Minor

*Mean observation of ten plants. Major pest - > 10 per cent damage; minor pest- < 10 per cent damage CBE – Coimbatore; DMP – Dharmapuri; SLM - Salem; TRP – Tiruppur

Batroceracuc urbitae and damage on fruit

Lyriomyza trifolii and damage on leaves

Thrips palmif and damage on flowers

Fig. 2. Insect pests of snake gourd and ridge gourd recorded in surveyed area of Tamil Nadu.

Temperature and relative humidity were important factors influencing fruit fly infestation, which increased as temperature and relative humidity increased and vice versa. Based on the information provided by the farmers during survey, it was inferred that major pests of snake gourd and ridge gourd were leaf miner (97.5%) followed by fruit fly (95%), pumpkin beetles (70%), thrips (62.5%), and whitefly (55 %), while minor pests like aphid (35%), red spider mites (10%), and snake gourd semi-looper (7.5%) (Table 4) were also observed. This is consistent with the reports of Dhillon *et al.* (2005) that melon fruit fly causes damage to over 81 plant types. Similarly, Allwood *et al.* (1999) and Doharey (1983) also reported that Cucurbitaceae family are the most preferred host of fruit fly. Approximately 23 *Liriomyza* sp. have been reported to be economically important, with *L. trifolii* dominating in vegetable crops such as tomato, cucurbitaceous crops and vegetable pea and said to have the potential to infest over 250 crop species (Sharma, 1994). Several pests attack cucurbits, reducing the quality and quantity of produce. Most insect pests cause damage during the crop growth period, but some insects such as the red pumpkin beetle, leaf miner, and flea beetle are particularly damaging at the seedling stage, while fruit fly appears at the fruiting stage.

C. Status of pesticides

The results of the survey on pesticide usage patterns in snake gourd and ridge gourd in studied districts of Tamil Nadu are presented in Table 5. The overall pesticide usage profile showed that use of acephate 50% WP + imidacloprid 1.8% SP was maximum (40%). Acephate is commonly sprayed by farmers to control insect pests on vegetables such as tomato, brinjal, and cucurbits.

Table 4: Pest incidence in snake gourd and ridge gourd in surveyed area as per farmer's perception.

S. No.	Pest	Coimbatore		Dharmapuri		Salem		Tiruppur		Mean %± SD
		No	PI	No	PI	No	PI	No	PI	
1	Fruit fly	10	100	10	100	10	100	8	80	95± 10.00
2	Thrips	8	80	9	90	5	50	3	30	62.5± 27.54
3	Whiteflies	6	60	4	40	7	70	5	50	55± 12.91
4	Aphid	3	30	4	40	2	20	5	50	35± 12.91
5	Leaf miner	10	100	10	100	9	90	10	100	97.5± 5.00
6	Red spider mites	1	10	0	0	1	10	2	20	10± 8.16
7	Pumpkin beetles	6	60	8	80	6	60	8	80	70± 11.55
8	Snake gourd semi looper	2	20	1	10	0	0	0	0	7.5± 9.57

No- Number of respondents; PI – Percentage of incidence

Table 5: List of pesticides used in snake gourd and ridge gourd ecosystem of Tamil Nadu.

SI. No.	Pesticides used	Chemical group	Per centage respondents				Mean (%)
			Coimbatore	Dharmapuri	Salem	Tiruppur	
Pesticide mixtures							
1	Chlorpyriphos 50% + Cypermethrin 5 % EC	Organophosphate + Synthetic pyrethroid	40	0	0	30	17.5
2	Acephate 50% WP + Imidacloprid 1.8% SP	Organophosphate + Neonicotinoid	50	60	50	0	40
3	Beta cyfluthrin 8.49% + Imidacloprid 98%	Synthetic pyrethroid + Neonicotinoid	20	50	10	20	25
4	Azoxystrobin 18.2% + Difenoconazole 11.4 SC	Strobilurin + Triazole	30	40	0	30	25
5	Propiconazole 13.9% EC + Difenoconazole 13.9 % EC	Triazole	40	0	30	20	22.5
6	Metalaxyl 8 % + Mancozeb 64% WP	Acylalanine + Sulphur	30	0	20	0	12.5
Insecticides							
7	Phenthoate 50 % EC	Organophosphate	40	0	0	0	10
8	Acetamiprid 20% SP	Organophosphate	30	60	20	20	32.5
9	Emamectin Benzoate 5% SG	Organophosphate	20	50	0	0	17.5
10	Propargite 57% EC	Sulphur Ester	0	10	10	0	5
11	Cyantraniliprole 10.20 % W/W	Diamide	30	20	10	30	22.5
12	Thiamethoxam 25 % WG	Neonicotinoid	60	0	40	10	27.5
13	Flonicamid 50 % WG	Undefined group	70	0	50	20	35
14	Alphamethrin 10 % EC	Synthetic pyrethroid	40	10	50	0	25
15	Lambda cyhalothrin 5 % EC	Synthetic pyrethroid	50	0	20	20	22.5
16	Spinetoram 11.7% SC	Spinosyn	30	20	20	10	20
Fungicides							
17	Thiophanate Methyl 70% WP	Thiourea	20	10	0	20	12.5
18	Propiconazole 25% EC	Triazole	40	20	10	0	17.5
19	Mancozeb 75% Wp	Sulphur	70	60	50	80	65

Greenhouse-grown brinjal contained high levels of residues of acephate and its metabolite, methamidophos (Sharma *et al.* (2012). Acephate usage was followed by flonicamid 50% WG (35%), acetamiprid 20% SP (32.5%), thiamethoxam 25% WG (27.5%), alphamethrin 10% EC and beta cyfluthrin 8.49% + imidacloprid 98% (25%), cyantraniliprole 10.20% W/W (22.5%), lambda cyhalothrin 5% EC (22.5%), spinetoram 11.7% SC (20%), emamectin Benzoate 5% SG and chlorpyriphos 50% + cypermethrin 5% EC (17.5%), phenthoate 50% EC (10%), and propargite 57% EC (5%) for the management of sucking pests, leaf miner, fruit fly and mites.

Farmers also used a variety of fungicides to control diseases such as powdery mildew, downy mildew, and mosaic infestations. The fungicides predominantly used were mancozeb 75% WP, azoxystrobin 18.2% + difenoconazole 11.4 SC, propiconazole 13.9% EC + difenoconazole 13.9% EC, propiconazole 25% EC, metalaxyl 8% + mancozeb 64% WP, and thiophanate methyl 70% WP.

Insecticides were the most commonly used pesticides by farmers in the surveyed area (68.5%), followed by fungicides (31.5%). This finding is in accordance with the current pesticide use pattern in India with insecticides (51%) dominating the pesticide group, followed by fungicides + bactericides (33%), and herbicides (16%) (FAOSTAT, 2018). This supports the farmers general perception that insecticides were chosen primarily for insect management and fungicides are used rarely for disease control. Farmers desire to satisfy consumer preference and to get high yields from unit area force them to grow market driven hybrids that are cultivated throughout the year. During the growth period, the crop is subjected to attack by pests which might account for the high proportions of insecticides and fungicides used.

Central Insecticides Board and Registration Committee (CIB&RC) of India has not approved any insecticide for use in snake gourd or ridge gourd. However, farmers used CIB & RC recommended pesticides for other crops (cotton, rice, brinjal, chilli, Pomegranate, cabbage, and tomato) such as flonicamid 50% WG, acetamiprid 20 SP, thiamethoxam 25 WG, phenthoate 50% EC, and emamectin benzoate 5 SG for the management of sucking insect pests; lambda cyhalothrin 5 % EC and alphamethrin 10% EC for the management of fruit fly; spinetoram 11.7% SC for management of leaf miner and propargite 57% EC for the management of red spider mite. Farmers used six

pesticide mixtures and thirteen individual pesticides. If the trend of using non-recommended pesticide combinations is continued, snake gourd and ridge gourd infesting insects may develop cross resistance. Farmers aren't aware of less persistent but effective insecticide molecules. Despite most farmers being literate, this had little influence on insecticide selection.

D. Pesticide usage pattern

In the current study, it was found that 67.50 per cent of farmers contacted pesticide retail shops and 15 per cent contacted other farmers for information on pesticide recommendations. Extension officers (7.5 per cent) and Tamil Nadu Agricultural University (TNAU) (7.5 per cent) were contacted by fewer farmers (Table 6). These results were similar with previous works done by Jamali *et al.* (2014), Naveen Prakash *et al.* (2021), Kumar *et al.* (2017), and Shetty *et al.* (2010) reported that the major source of knowledge for pesticide application in vegetable crops were obtained from pesticide dealers. This is not surprising given that the majority of farmers are unable to differentiate between different pest and disease pathogens, as well as control measures such as insecticides and fungicides, and instead rely on information and advice provided by local retail shops to make decisions.

This study also found that 90% of growers did not read the pesticide label before spraying. Farmers may not know the target crop and pest, proper dose, toxicity level, waiting period, and other important information unless they read the label. If the insect damage is not correctly identified, improper dosage and frequency may be ineffective, useless, and a waste of time and money. As a result, farmers must be educated in order to be protected on the farm and at home (World Report, 2005). Devi (2010) also reported that 99.5 per cent of farmers were unable to determine the toxicity level from the hazard colour code printed on pesticide containers.

Only about 15% of farmers sprayed pesticides at the recommended dose, with the rest spraying at approximations. The main reason is that very few farmers are aware of pesticide recommendations made by the CIB & RC and State Agricultural Universities (SAUs), while others relied entirely on local dealers, fellow farmers, and, in most cases, pesticide dealers, as previously reported. This is also true in many developed countries, where farmers' choices of pesticides are influenced by retailers in the farmers neighborhood (Epstein & Bassein 2003). Almost all of the respondents used chemical pesticides at various intervals. The majority of respondents (45%) applied pesticides at 10-14 days interval, followed by 32.5 per cent who applied pesticides based on pest occurrence, and only 22.5 per cent applied pesticides at 7-day intervals. Pesticide use is hazardous to both the environment and human health.

Table 6: Knowledge level of farmers about pesticides applied on snake gourd and ridge gourd grown in Tamil Nadu.

S. No.	Parameters	Per centage respondents				
		Coimbatore	Dharmapuri	Salem	Tiruppur	Mean %
Source of information on pesticide recommended						
1	Pesticide retail shop	50	60	70	90	67.5
2	Fellow farmers	20	20	10	10	15
3	Extension officers	10	0	20	0	7.5
4	TNAU	20	20	0	0	10
Attention towards label						
5	Reading label before use	20	0	0	20	10
6	No attention towards labels	80	100	100	80	90
Measurement of pesticide						
7	Bottle cap	100	100	80	90	85
8	Approximately	0	10	0	10	15
Dosage application						
9	Recommended dose	30	10	0	20	15
10	Approximate dose	70	90	100	80	85
Mixing of chemical						
11	Stick	100	100	100	100	100
12	Hand	0	0	0	0	0
Total number of sprays						

13	3 Times	30	65	25	15	33.75
14	5 Times	50	35	60	75	55.00
15	7 Times	20	0	15	10	11.25
Temporal frequency of pesticide application						
16	Weekly interval (7 days)	40	20	0	30	22.5
17	Fortnight interval (10-14 days)	60	50	40	30	45
18	Coinciding with pest infestation	0	30	60	40	32.5
Waiting period / Harvest interval						
19	No waiting period	80	90	80	10	87.5
20	Waiting period followed	20	10	20	0	12.5
Type of sprayer used						
21	Hand sprayer	0	10	0	0	2.5
22	Power sprayer	100	90	100	100	97.5
Safety precautions while spraying						
23	No safety method followed	70	90	60	90	77.5
24	Use of mouth and nose cover and Gloves	30	10	40	10	22.5
Disposal of pesticide containers						
25	Buried in soil	10	0	20	0	7.5
26	Thrown in neglected area	90	100	80	100	92.5
27	Left randomly in the field	0	0	0	0	0
Time of application of pesticides						
28	Morning	80	80	90	80	82.5
29	Afternoon	0	0	0	10	2.5
30	Evening	20	20	10	10	15

Farmers frequent use of pesticides may be due to a lack of understanding about pesticides negative effects. The majority of surveyed farmers (77.5%) did not use any safety precautions when spraying. The same result was reported by Azmi *et al.* (2006), but there was disagreement with Tripathi *et al.* (2020) findings that only 30% of them did not use any protective measures. The current study demands intervention for educating farmers on proper pesticide use and handling, as well as the health risks associated with pesticide application. According to the current investigation, none of the farmers used empty pesticide containers for house/farm purposes, with the majority simply throwing them in neglected areas (92.5%) and some farmers (7.5%) leaving them randomly in the field. No farmer buried pesticide containers in soil, which contradicts the findings of Reddy *et al.* (2011), who found that 50% of empty pesticide containers were buried in the field itself. According to Jana *et al.* (2012), respondents did not use empty pesticide containers for household (85%) or farm (53%) purposes. This data shows that while most farmers are aware that empty pesticide containers should not be used on the farm or in the home, none are aware of the scientific disposal procedures for used packs/containers. In this context, farmers should be advised to follow the triple-rinse method when disposing of empty pesticide containers (FAO, 2008) to avoid environmental contamination. Majority of farmers (87.25%) were unaware of the waiting period after pesticide application, paving the way for pesticide residue in market vegetable samples. All of the pesticide usage pattern findings revealed that a lot of interventions are needed to promote the safe and secure use of insecticides.

CONCLUSION

Snake gourd and ridge gourd being the most consumed and cheap vegetable crops in Tamil Nadu, we should be more concerned about pesticide use and its residues. Farmers are misapplying pesticides because they are unaware of the dangers they pose to environment and human health. As a result, farmers attitudes must be changed through awareness programmes. In addition, training should be conducted about integrated crop and pest management practises to reduce pesticide application for safer vegetable production by farmers.

FUTURE SCOPE

Considering the importance of pests in snake gourd and ridge gourd, suitable, broad spectrum, and less persistent pesticides should be applied based on supervised field trails.

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REFERENCES

Allwood, A., Chinajariyawong, A., Kritsaneepaiboon, S., Drew, R., Hamacek, E., Hancock, D., Hengsawad, C., Jipanin, J., Jirasurat, M., & Krong, C. K. (1999). Host plant records for fruit flies (Diptera: Tephritidae) in Southeast Asia. *Raffles Bulletin of Zoology*, *47*(Supplement 7), 1-92.

Arunachalam, A., Selvakumar, S., & Jeganath, S. (2012). Toxicological studies on ethanol extract of *Luffa acutangula* in albino wistar rats. *Int J Curr Pharm Clin Res*, *2*(1), 29-33.

Atwal, A., & Dhaliwal, G. (1997). Agricultural pests of South Asia and their management. *Journal of Entomological Research*, *21*, 389-390.

Azmi, M. A., Naqvi, S., Azmi, M. A., & Aslam, M. (2006). Effect of pesticide residues on health and different enzyme levels in the blood of farm workers from Gadap (rural area) Karachi—Pakistan. *Chemosphere*, *64*(10), 1739-1744.

Berni, I., Menouni, A., El, I. G., Duca, R.-C., Kestemont, M.-P., Godderis, L., & Jaafari, S. E. (2021). Understanding farmers' safety behavior regarding pesticide use in Morocco. *Sustainable Production and Consumption*, *25*, 471-483.

Devi, N. (2017). Medicinal values of *Trichosanthus cucumerina* L.(snake gourd)-a review. *British Journal of pharmaceutical research*, *16*(5), 1-10.

Devi, P. I. (2010). Health risk perceptions, awareness and handling behaviour of pesticides by farm workers. *Agricultural Economics Research Review*, *22*(347-2016-16847), 263-268.

Dhillon, M., Singh, R., Naresh, J., & Sharma, H. (2005). The melon fruit fly, *Bactrocera cucurbitae*: A review of its biology and management. *Journal of insect science*, *5*(1): 40.

Doharey, K. (1983). Bionomics of fruit flies (Dacus spp.) on some fruits. *Indian Journal of Entomology*.

Epstein, L., & Bassein, S. (2003). Patterns of pesticide use in California and the implications for strategies for reduction of pesticides. *Annual Review of Phytopathology*, *41*(1), 351-375.

FAO. (2008). Guidelines on Management Options for Empty Pesticide Containers. In: Food and Agriculture Organization (FAO) Rome, Italy.

FAOSTAT, F. (2018). Disponível em: http://www.fao. org/faostat/en/# home. *Acesso em*, *30*.

Hurtig, A. K., Sebastián, M. S., Soto, A., Shingre, A., Zambrano, D., & Guerrero, W. (2003). Pesticide use among farmers in the Amazon basin of Ecuador. *Archives of environmental health: an international journal*, *58*(4), 223-228.

Indraningsih, I., Sani, Y., & Widiastuti, R. (2005). Evaluation of farmers appreciation in reducing pesticide by organic farming practice.

Jamali, A. A., Solangi, A. R., Memon, N., & Nizamani, S. M. (2014). Current scenario of pesticide practices among farmers for vegetable production: A case study in Lower Sindh, Pakistan. *International Journal of Development and Sustainability*, *3*(3), 493-504.

Jana, H., Kole, R., Basu, D., & Maity, S. (2012). Vegetable growers extent of precautions in application of pesticides in Nadia district of West Bengal. *Pestology*, *36*(7), 29-33.

Kumar, B. A., Ragini, K., Padmasri, A., Rao, K. J., & Shashibhushan, V. (2017). Survey on pesticide usage pattern in bhendi (*Abelmoschus esculentus* L.). *Bulletin of Environment, Pharmacology and Life Sciences*, *6*(1), 182-188.

Meenambigai, C., Bhuvaneswari, K., Mohan, K., & Sangavi, R. (2017). Pesticides usage pattern of okra, *Abelmoschus esculentus* (L) Moench in Tamil Nadu. *Journal of Entomology and Zoology Studies*, *5*(6): 1760-1765.

Naveen Prakash, P., Suganthi, A., Bhuvaneswari, K., & Senthil Kumar, M. (2021). Insect pests, Pesticide use and Usage Pattern in Beetroot Crop Cultivated in Tamil Nadu. *Biological Forum – An International Journal*, *13*(4), 719-727.

Nyakundi, W., Magoma, G., Ochora, J., & Nyende, A. (2012). A survey of pesticide use and application patterns among farmers: a case study from selected horticultural farms in rift valley and central provinces, Kenya. Scientific Conference Proceedings,

Ojiako, O., & Igwe, C. (2008). The nutritive, anti-nutritive and hepatotoxic properties of *Trichosanthes anguina* (snake tomato) fruits from Nigeria. *Pakistan journal of nutrition*, *7*(1), 85-89.

Pessarakli, M. (2016). *Handbook of Cucurbits: growth, cultural practices, and physiology*. CRC Press.

World Report (2005). World Report from Boll to Bobbin March, 2005. *Cotton International*.

Roy, R., Saran, S., & Dutt, B. (1991). Cytogenetics of the cucurbitaceae. *Developments in Plant Genetics and Breeding*, *2*, 181-199.

Sharma, D. (1994). American pest-Threat to Indian crops. *Pesticides News*, *25*, 14.

Sharma, D., Hebbar, S., Divakara, J. V., & Mohapatra, S. (2012). Residues of pesticides acephate and methamidophos in capsicum grown in greenhouse and open field. *Quality Assurance and Safety of Crops & Foods*, *4*(5), e33-e37.

Shetty, P., Murugan, M., Hiremath, M., & Sreeja, K. (2010). Farmers' education and perception on pesticide use and crop economies in Indian agriculture. *Journal of Experimental Sciences*, *1*(1), 3-8.

Tripathi, S., Shah, K. K., Tiwari, I., & Shrestha, J. (2020). Farmers' perception about major insect pests of cucurbits and their management. *Indonesian Journal of Agricultural Research*, *3*(3), 153-170.

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