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Pesticide use behavior of chilli growing farmers in Southern districts of Tamil Nadu

M Nagulananthan, G Ravi, N Balakrishnan and D Lenin Raja

Abstract
A survey was conducted in four districts of Southern Tamil Nadu *Viz.* Tirunelveli, Thoothukudi, Kanyakumari and Tenkasi during the year 2020-2021 to know the pesticide use behavior of the farmers mainly relies on pesticides as a key component in pest management. For the study, 50 farmers were identified through local pesticide suppliers. The socio-economic status of the target farmers revealed 32 per cent of them are of the 40 to 50 age group and 36per cent of them are middle age group (30 to 40 years) and 92 per cent of them are from the nuclear family system. Yellow mite, *Polyphagotarsonemus latus* (92%) and chilli thrips, *Scirtothrips dorsalis* (88%) as a regular pest. The Gram caterpillar, *Helicoverpa armigera* (84%), Tobacco cutworm, *Spodoptera litura* (54%) and green peach aphid, *Myzus persicae* (46%) were also pest constraints in this region. Regarding pesticide use 14 insecticides belonging to organophosphate, synthetic pyrethroids, neonicotinoids, diamide groups are used either alone or as tank mix combination. Awareness on pesticide use and safe handling of pesticides indicated around 56 per cent of chilli farmers were aware of the recommended pesticide. About 64 per cent of the farmers use pesticides cocktail spray through tank mix. The measuring cap supplied with pesticide containers is used by 96 per cent of farmers for insecticide measurement and 4 per cent uses pesticide approximately. The commonly used spray appliances in this area are power sprayer. The majority of the farmers get technical guidance for their filed pest problem from local dealers (66%) and 24 per cent of them consult either extension officials for pesticide prescription. The study indicates an urgent need for creating awareness among this pesticide intense farmer to have sensible use of pesticide form minimizing pesticide residue preserving the chilli ecosystem.

Keywords: chilli, *Capsicum annum*, pesticide use behavior, Tamil Nadu

Introduction
Chilli (*Capsicum annum* Linn) is a popular spice and vegetable crop in India, where it is grown on approximately 8.01 lakh hectares under both rainfed and irrigated conditions. India is the world's largest producer of chillies, followed by China and Pakistan. For their great colour value and minimal pungency, Indian chillies are in high demand around the world (Mathur *et al.*, 2000) [5]. India has a diverse range of chilli cultivars with varying quality factors. Chilli is utilized in pharmaceuticals, cosmetics and beverages, in addition to its conventional uses as vegetables, spices, condiments, sauces and pickles (Tiwari *et al.*, 2005) [7]. The pest range of chilli is extensive, with over 293 insect and mite species debilitating the crop both in the field and in storage (Anonymous, 1987) [1]. According to the findings of an Asian Vegetable Research and Development Centre (AVRDC) investigation, the major insect pests that attack chilli were aphids (*Myzus persicae* Sulzer, *Aphis gossypii* Glover), mites (*Polyphagotarsonemus latus* Banks) and thrips (*Scirtothrips dorsalis* Hood). In Tamil Nadu thrips, yellow mite, gram caterpillar, whitefly and tobacco caterpillar are considered as key constraints. The indiscriminate use of synthetic pesticides causes serious environmental effects, such as the destruction of natural enemy species, the effect on non-target organism's and secondary pest outbreaks. Furthermore, it causes pesticide residues in food and pollutes the environment, both of which may have negative consequences not only for human health but also for other biotas (Divakar, 1997) [3]. The current study was designed to survey the pesticide use patterns of farmers who depend largely on pesticides for pest and disease management and to identify the gap in sensible use of pesticides and to suggest ways and means for policy support and adoption.

Material and Methods
This study was carried out in four southern districts of Tamil Nadu *viz.*, Tirunelveli, Thoothukudi, Kanyakumari and Tenkasi during the year 2020-2021 using a set of

questionnaires. A total of 50 farmer who relies on pesticide for their pest management were selected. The farmers were identified through the local pesticide dealers as well as by the help of extension officials. The data related to target pests, type of pesticides used at different crop growth stages, dose, time of pesticide application, type of plant production appliances used, source of knowledge for recommended pesticides and socio-economic aspects are collected and documented. The simple statistical method of frequency and percentage were used for representing the data and interpretation. The list of the villages selected for the study in different districts is indicated in Table 1.

Table 1: Details on farmers interviewed for pesticide usage pattern studies in Chilli

District	Block	Village	No. of farmers contacted
Tirunelveli	Palayamkottai	Sivanthipatti	5
	Valliyoor	Kavalkinaru	3
Thoothukudi	Kayathar	Akilandapuram	4
	Ottapidaram	Savarimangalam	2
	Vilathikulam	T. Subbiahpuram	3
		Vallinayagapuram	2
Tenkasi	Tenkasi	Elathur	4
		Achanputhur	3
		Vadakarai	4
	Pavoorchatram	Vellakal	2
		Aandipatti	4
	Sankarankovil	Vannikonendal	2
	Shenkottai	Puliyarai	2
Kanyakumari	Thuckalay	Karumparai	4
		Perunchilambu	3
	Thiruvattaru	Kesavapuram	3
Total			50

Result and Discussion

The results of the study conducted on pesticide usage patterns of chilli farmers of four districts in southern Tamil Nadu are discussed here. The data collected in respect of socioeconomic characteristics, the package of practices adopted, pest scenario, pesticide usage patterns and general awareness on pesticide use were interpreted for drawing the conclusion.

Socioeconomic characteristics of the farmers

The socioeconomic status of the data collected from the chilli farmers who depends on pesticide for pest management revealed that around 32 per cent of them are of the 40 to 50 age group and 36 per cent of them are middle age group (30 to 40 years) and 92 per cent of them from the nuclear family system (Table 2). The major portion of the farmers interviewed were engaged in chilli cultivation for 10 to 20 years and farmers had experience 20 to 30 years and less than 10 years in equal proportion (26%).

Information regarding chilli cultivation

With reference to landholding, 34 per cent of the respondents are having five to ten acres and 28 per cent of them have less than five acres (Table 3). In this area, popular chilli variety grown is K2 (56%) followed by hybrid variety CO1. In addition to chilli, the farmers are also cultivating tomato, Bhendi, Brinjal.

Occurrence of insect pests in chilli observed by farmers

Information gathered on insect pest problems faced in chilli cultivation revealed that 92 per cent and 88 per cent of them felt yellow mite, *Polyphagotarsonemus latus* (Banks) (92%) and chilli thrips, *Scirtothrips dorsalis* (Hood) (88%) as a regular pest respectively (Table 4& Figure 1). The gram caterpillar, *Helicoverpa armigera* (Hubner) (84%), Tobacco cutworm, *Spodoptera litura* (Fabricius) (54%) and green peach aphid, *Myzus persicae* (Sulzer) (46%) were also pest constraints in this region. The chilis grown for vegetable and dry chilli purposes in Tenkasi, Tirunelveli and Kanyakumari districts are more susceptible than the Mundu chilli grown in Thoothukudi district. There is no published information available on pest scenarios in chilli crops cultivated in this region. However, thrips, yellow mite, gram caterpillar, whitefly and tobacco caterpillar are indicated as key constraints elsewhere in chilli crop by (Chintkuntlawar *et al.*, 2015) [2] and (Kumar *et al.*, 2021) [4].

Pesticide usage pattern

The pesticide application in Chilli crop is targeted on the above five pest complex. Information gathered on types and kind of pesticide used by the farmers for the management of the haustellate and mandibulate insect complex indicated that there were 14 insecticides belonging organophosphate, synthetic pyrethroids, neonicotinoids, diamide groups are used either alone or as tank mix combination (Table 5 & Figure 2). The insecticides used were in the order of Imidacloprid 36 SL (76%) > Dimethoate 50 EC (64%) > Profenophos 18.5 SC (58%) > Chlorantraniliprole 20 SP (54%) > Ethion 20 EC (50%) > Fipronil 25 EC (36%) > Cypermethrin 30 EC (34%) > Acetamiprid 10 G (28%) > Thiamethoxam 5 EC (28%) > Flubendiamide 76 EC (20%) > Thiacloprid 35 EC (18%) > Quinalphos 17.8 SL (10%) > Diafenthiuron (8%) > Acephate (6%).

General awareness on handling of pesticide in chilli

Information gathered on awareness on pesticide use and safe handling of pesticides indicated around 56 per cent of chilli farmers were aware of the recommended pesticide due to the special training programmes undergone through National Horticultural Mission (NHM) organized by Horticulture Department and the remaining 44 per cent of them were unaware of correct pesticides for specific pest and they are all from non-traditional chilli belt (Table 6). Information gathered on insecticide application frequency indicated that the farmers used to apply insecticides at least two times in a month in early stage of the crop to compact mite and thrips problem and *Helicoverpa* and *Spodoptera* in later stage of the crop. The fungicide carbendazim and mancozeb used in reproductive stage of the crop for compacting anthracnose disease. It is also recorded that 64 per cent of the farmers uses pesticides cocktail spray through tank mix. The measuring cap supplied with pesticide containers is used by the 96 per cent of farmers for insecticide measurement and 4 per cent uses pesticide approximately without using any measurement device. The commonly used spray appliances in this area are power sprayer. Around 70 per cent of farmers used power sprayer and 30 per cent of them used knapsack sprayers. The majority of the farmers get technical guidance for their filed pest problem from local dealers (66%) and 24 per cent of them consult either extension officials or local KVK for pesticide prescription.

It is apparent that the farmers in this region have poor awareness on the safe handling of pesticides and disposal of used containers. However, 54 per cent of them were aware of

pesticides risks and effects associated with human health and the environment. The farmers in this region were not habitual of wearing protective clothing while pesticide application and most of them hire labour for pesticide application and the hired labours mostly (92%) wore full sleeve shirts. Around 28 per cent of the farmers use the pesticide containers for their household and farm use and a minimum proportion (16%) sell the containers to the buyers and the majority of them (56%) throw the containers in open space. The present study was in line with (Reddy *et al.*, 2011) [6].

Most of them were having pesticide usage experience for more than 5 years and few farmers have awareness of pesticide recommendations for different pests and their classification of using different pesticides for different pests. The commonly used spray appliances in this area power sprayer. They don't have awareness related to the use of botanicals and bio-pesticides. Less number of farmers have awareness of the pesticide residues and their effects on health conditions. Main proposes on the harvest time spraying leads to concern for transfer of pesticide residue into produce it needs further study and there is an urgent need for creating awareness among this pesticide intense farmer to have sensible use of pesticide form minimizing pesticide residue preserving the chilli ecosystem.

Table 2: Socio-economic characteristics of the respondents (Chilli)

S. No.	Particulars	Frequency (N=50)	Percentage (%)
1.	**Age (Years)**		
	20-30	9	18
	30-40	18	36
	40-50	16	32
	>50	7	14
2.	**Type of family**		
	Nuclear	46	92
	Joint	4	8
3.	**Gender**		
	Male	48	96
	Female	2	4
4.	**Farming experience (Years)**		
	< 10	13	26
	10-20	24	48
	20-30	13	26

Table 3: Information regarding Chilli cultivation

S. No.	Particulars	Frequency (N=50)	Percentage (%)
1.	**Crop area (acres)**		
	<5	14	28
	5-10	17	34
	11-20	9	18
	>20	5	10
2.	**Variety**		
	K2	28	56
	CO 1 hybrid	14	28
3.	**Planting**		
	Seedlings	50	100

Table 4: List of key pests in Chilli recognized by respondents

S. No.	Name of the pest	Frequency (N=50)	Percentage (%)
1.	Chilli Thrips (*Scirtothrips dorsalis*)	44	88
2.	Yellow mite (*Polyphagotarsonemus latus*)	46	92
3.	Green peach aphid (*Myzus persicae*)	23	46
4.	Gram caterpillar (*Helicoverpa armigera*)	42	84
5.	Tobacco cutworm (*Spodoptera litura*)	27	54

Table 5: List of pesticide used for pest management in Chilli in southern districts

Particulars				Frequency (N=50)	Percentage (%)
S. No.	Insecticides	Type of formulation	Trade name		
1.	Acephate	75 SP	Acetone, Ace Gold	3	6
2.	Acetamiprid	20 SP	Green Pride	14	28
3.	Cypermethrin	25 EC	Cyper, Super killer	17	34
4.	Chlorantraniliprole	18.5 SC	Coragen	27	54
5.	Dimethoate	30 EC	Rogar, Tafgor	32	64
6.	Diafenthiuron	50 WP	Solo	4	8
7.	Ethion	50 EC	Fosmite, Celemite	25	50
8.	Flubendiamide	39.35 SC	Fame	10	20
9.	Fipronil	5 SC	Result, Molgent	18	36
10.	Imidacloprid	17.8 SL	Confidor, Gaucho	38	76

11.	Quinalphos	25 EC	Krush, Ekalux	5	10
12.	Profenophos	50 EC	Curacron	29	58
13.	Thiamethoxam	25 WG	Actara	14	28
14.	Thiacloprid	21.7 SC	Alanto	9	18
Fungicides					
15.	Carbendazim + Mancozeb	12 WP + 63 WP	Saaf	42	84

Table 6: General awareness on handling of pesticides in Chilli

S. No.	Particulars	Frequency (N=50)	Percentage (%)
1	**Period of activity in using pesticides on paddy crop**		
	<5 Years	33	66
	>5 Years	17	34
2	**Awareness on recommendations of pesticides**		
	With Awareness	28	56
	Without Awareness	22	44
3	**Farmers desire to mix different pesticides**		
	Insecticide + Insecticide	11	22
	Insecticide + Fungicide	32	64
4	**Measurement of Pesticides**		
	Bottle cap (Correct dosage)	48	96
	Approximately (More or less dosage)	2	4
5	**Mixing of pesticides with water to prepare spray solution**		
	Stick	50	100
6	**Source of Technical information**		
	Agricultural officer	12	24
	Dealer	33	66
	Scientists	5	10
7	**Frequency of application**		
	Twice per month	24	48
	More than twice per month	26	52
8	**Disposal method followed for empty pesticide bottles**		
	Used for house or farm purpose	14	28
	Sell	8	16
	Throw into trash	28	56
9	**Spraying equipment**		
	Knapsack sprayer	15	30
	Power sprayer	35	70
10	**Time of pesticide application**		
	Morning or evening hours	45	90
	Day-night hours	5	10
11	**Precautions while application of pesticides**		
	Face mask	14	28
	Shirts with full hands	46	92
	No precaution	21	42
12	**Farmers perception of pesticide risk and occupational health hazards**		
	With perception	23	46
	Without perception	27	54

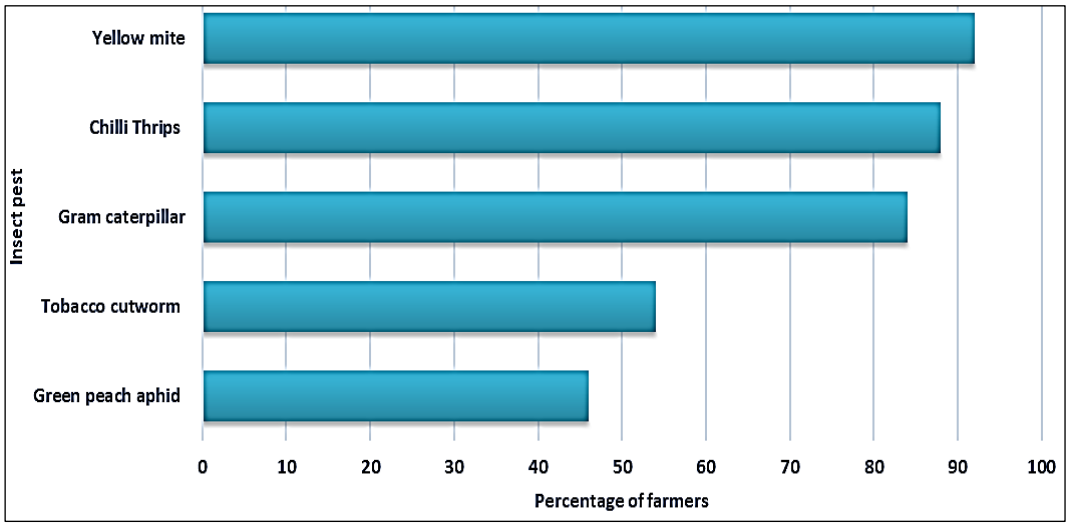

Fig 1: Key pests of farmers concern in Chilli grown in Southern Districts

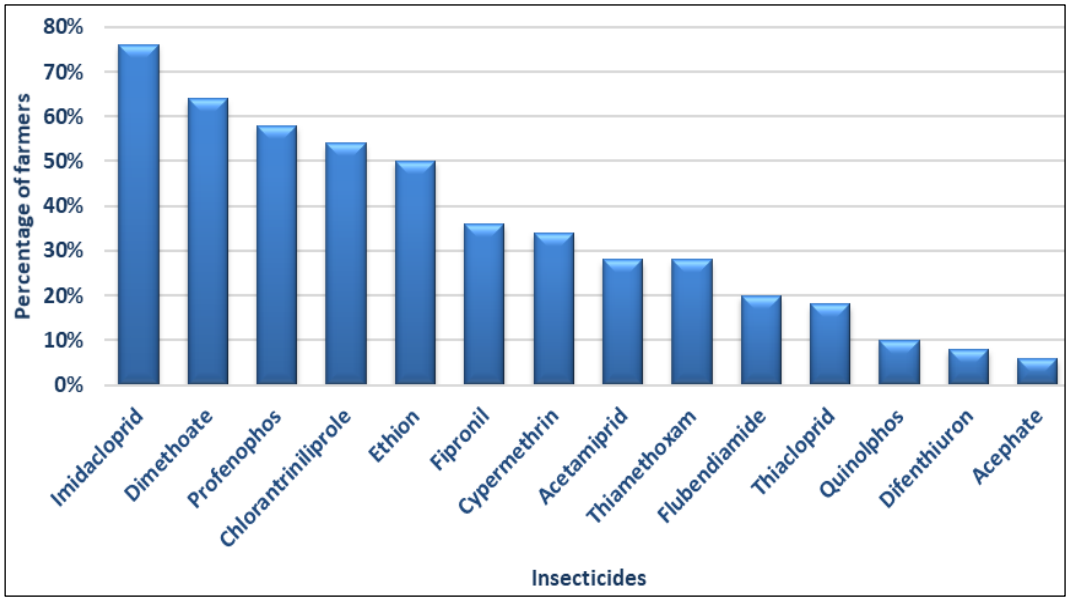

Fig 2: Pesticide used for pest management in Chilli in southern districts

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