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Documentation of pest management practices among banana growers in major banana growing districts of Tamil Nadu

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ABSTRACT

A survey was conducted during the year 2014-2015 in major banana growing district of Tamil Nadu to study the pest management practices against major pests of banana. The studies revealed low responses on knowledge about eco-friendly pest management practices except following the clean cultivation practices (61.25 %) and use of plant products (54.17 %). Awareness about the recommended pesticides for banana was low (17.50 % respondents) and many of the banana growers (42.5 %) use monocrotophos against banana pests. Around 46.25 per cent of farmers get their plant protection advice from pesticide dealers. Interventions for eco–friendly pest management with the rational and sustainable use of pesticides in banana is necessary among the banana growers.

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INTRODUCTION

Banana (Family: Musaceae), also called as "Apple of Paradise", is an important tropical and sub-tropical fruit around the world and a staple food for more than 400 million people worldwide. Most of the edible bananas are derived from *Musa acuminata* and *Musa balbisiana* and their hybrids (Simmonds, 1966 and Robinson, 1996). Due to the extensive benefits given by Banana plant, it is called as a Plant of virtue (*Kalpataru*), after coconut. It is an important export commodity from India and fetches good foreign revenue. India is the largest producer of banana among 135 banana growing countries in the world which share 25.84 per cent of global production followed by China and Philippines (India Stat, 2013). Tamil Nadu has the largest area followed by Maharashtra and Karnataka. Tamil Nadu also ranks first in production, followed by Maharashtra. In Tamil Nadu, the total area under banana is 118.04 thousand ha and production is 5650 thousand Metric tonnes contributing 19 per cent of India's Banana production (NHB, 2013). More than 470 insects and mites have been recorded on banana world over (Ostmark, 1974), out of which 30 species infest banana in India (Wadhi and Batra, 1964). For managing these pests and diseases banana growers often rely on chemical insecticides as a quick control measure. Conventional insecticides offer good control but their residue levels are high besides causing the adverse effects like resurgence and resistance. As various plant parts of banana such as, fruits, stem, flower

buds etc., are being directly consumed, the use of conventional insecticides during production is being discouraged all over the world. The national standards set residue limits (MRL) of pesticides are very low on exported harvest produce to guide the exporters for compliance (Anonymous, 1998). Hence, the production of fresh produce with minimum pesticide residual levels has become a big challenge for the agricultural scientists and other stake holders. To promote appropriate use of pesticides, it is essential to understand the actual situation of pesticide use pattern adopted by banana growers. Until now, there has been no published report regarding insecticides use pattern in banana in India. Since the crop has immense trade value in domestic as well as international, a field survey was taken upto explore the pest management practices and insecticides usage pattern among banana growers in major banana growing districts of Tamil Nadu.

MATERIAL AND METHODS

For assessing the knowledge of banana growers on the management of banana pests and the insecticide usage pattern followed by them, face-to-face interviews were carried out. Although expensive, this method provides the highest response rates and is better suited in collecting complex information. The study areas were selected based on the extent of cultivation of the crop (Fig. A).

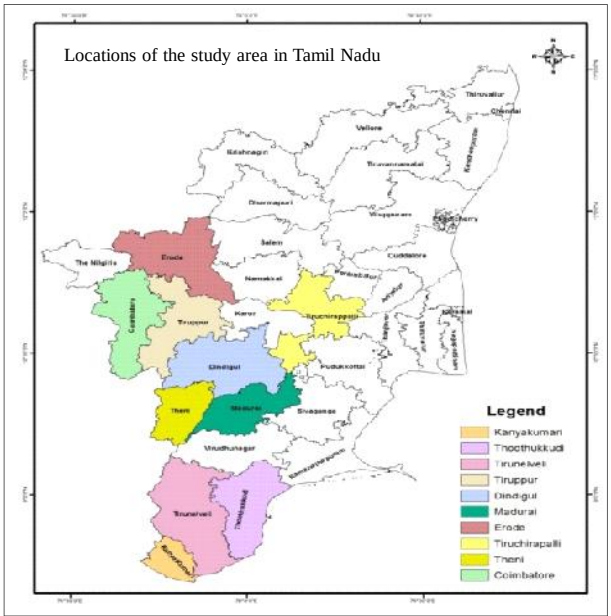

Fig. A : Map showing the study site

From each selected village, 5 to 10 banana growing farmers were randomly selected and the data collected by means of a structured questionnaire prepared in local language administered via personal interviews (Pinyupa *et al.*, 2009). Thus, a total of 240 farmers that spread over the major banana growing districts of Tamil Nadu formed the sample of this study. The questionnaire composed of the farmers' demographic information, literacy rate, cultivation practices, major pesticides and method of application, intervals in application, dosage of insecticides, number of sprays, reasons for number of sprays at each harvest interval period and knowledge on eco-friendly pest management practice of pesticide and frequency. The objectives and scope of the study were first explained to the banana growers to win their co–operation. Even though the farmers of the study region did not maintain any farm records, they were able to furnish necessary information by memory recall and by virtue of their experience. The data set was compiled and tabulated.

RESULTS AND DISCUSSION

Majority of the banana growers (n=240) were in the age group of 28 to 77 years with literacy rate of 90.42 per cent. Male banana growers outnumbered their female counterparts. Banana growers in the study region expressed pests and disease as one of the major challenge in banana production. Banana growers were aware about different pests, susceptible stages of the crop (Awasthi *et al.*, 2016). Banana growers shared their diverse knowledge about the pest management practices in banana, of which chemical management practice was found common and widely followed. Regarding the type of pesticides used, various chemical formulations were reported by referring their trade names. Overall picture of the relative usage of pesticides in banana shows that, the most frequently mentioned group was insecticides followed by fungicides. Table 1 shows the spectrum of pesticides used by the respondents. 102 respondents reported the use of monocrotophos as the major insecticide against banana pests followed by granular insecticides *viz.*, carbofuran (87 respondents) and phorate (43 respondents). The other insecticides used were triazophos (27 respondents) and chlorpyriphos (25 respondents). The frequently used fungicides were carbendazim (101 respondents), carbendazim 12 % + mancozeb 63 per cent (59 respondents), copper

oxychloride (55 respondents) and propiconazole (29 respondents). Most of the farmers expressed the use of broad spectrum organophosphates such as monocrotophos and triazophos and also granular insecticides such as carbofuran and phorate, which belong to highly hazardous (class Ib and Ia) toxicity chemical classes. In the present study, majority of farmers were found to use monocrotophos. In a similar study done in Costa Rica, Polidoro *et al*. (2008) reported the major use of chlorpyriphos, a broad spectrum organophosphate in Banana. Use of broad spectrum and toxic insecticides in banana has also been reported by Indira Devi (2010) during a study done in Kerala. These findings support the present finding on the use of broad spectrum organophosphates by the banana growers in Tamil Nadu. At present, very few insecticides are recommended for use in banana, which are broad spectrum, persistent and linked with several health implications. Organophosphate residues including monocrotophos have been detected in certain agricultural products like tea, sugars, vegetables and fruits throughout India and are restricted for use in India (Kumar *et al*., 2016). Several health implications have been reported due to the use of monocrotophos and thus it is proposed to be banned (WHO, 2010). Studies should necessarily be undertaken to screen alternative newer insecticide molecules, bioagents and botanicals against insect pests of banana, which may help to replace the conventional broad spectrum insecticides.

Most of the farmers used spraying as a mode of pesticide application (48.33 % respondents). Other methods of pesticide application were sucker treatment

Table 1 : Types of pesticides used in banana

Name of pesticide	Chemical group	Toxicity class*	Status	Number of farmers using it[$]
Insecticides				
Monocrotophos	Organophosphate	Ib	Registered	102
Triazophos	Organophosphate	Ib	Registered	27
Carbofuran	Carbamate	Ib	Registered	87
Chlorpyriphos	Organophosphate	II	Registered	25
Cypermehrin	Synthetic pyrethroids	II	Registered	10
Emamectin benzoate	Macrocyclic lactone	Unknown	Registered	8
Acephate	Organophosphate	II	Registered	4
Dimethoate	Organophosphate	Ia	Registered	7
Phosphamidon	Synthetic pyrethroids	II	Registered	4
Dichlorvas	Organophosphate	Ib	Registered	2
Malathion	Organophosphate	III	Registered	5
Quinalphos	Organophosphate	II	Registered	7
Phorate	Organophosphate	Ia	Registered	43
Imidacloprid	Neonicotinoid	II	Registered	1
Fungicides				
Carbendazim	Azole	U	Registered	101
Mancozeb	Dithiocarbamate	U	Registered	6
Propiconazolae	Triazole	II	Registered	29
Tebuconazole	Triazole	II	Registered	13
difenoconazole	Triazole	II	Registered	4
Carbendazim 12% + Mancozeb 63% WP	Fungicide mixture of benzimidazole and dithiocarbamate	Unknown	Registered	59
Copper oxychloride	Copper compound	II	Registered	55
pesticide mixtures	-	Unknown	-	43

Toxicity class***** as classified by the WHO (2010) where Ia - Extremely hazardous; Ib -Highly hazardous; II - Moderately hazardous; III - Slightly hazardous; U -Unlikely to present acute hazard in normal use. [$] - Multiple answers possible

with granular insecticides (36.5 % respondents), pseudostem injection (27.92 % respondents) and whorl application of pesticides (27.50 % respondents) (Fig.1). Regarding the method of pesticide application, most of the farmers used spraying, whereas labour intensive methods such as pseudostem injection and swabbing of pseudostem were less frequently used for the management of banana pseudostem borer *Odoiporus longicollis* Olivier. In present study, the use of pseudostem injection was lower which can be reasoned for the lack of technical skill on handling of pseudostem injector which might have contributed to the lower adoption of this method.

With regard to pesticide dosage, most of the farmers (61 respondents) used 10 to 20 g/ml of pesticide per tank, whereas 37 respondents reported the use of more than 20 g/ml of pesticide per tank. Regarding the use of granular insecticides, 47 and 43 respondents reported the use of more than 5 g per plant and 3 to 5 g per plant, respectively. Banana growers, who followed pseudostem injection as pesticide application method, used more than 500 ml (36 respondents), 300-500 ml (20 respondents) and less than 300 ml (11 respondents) pesticide per lit. of water. Most of the farmers used high quantity of

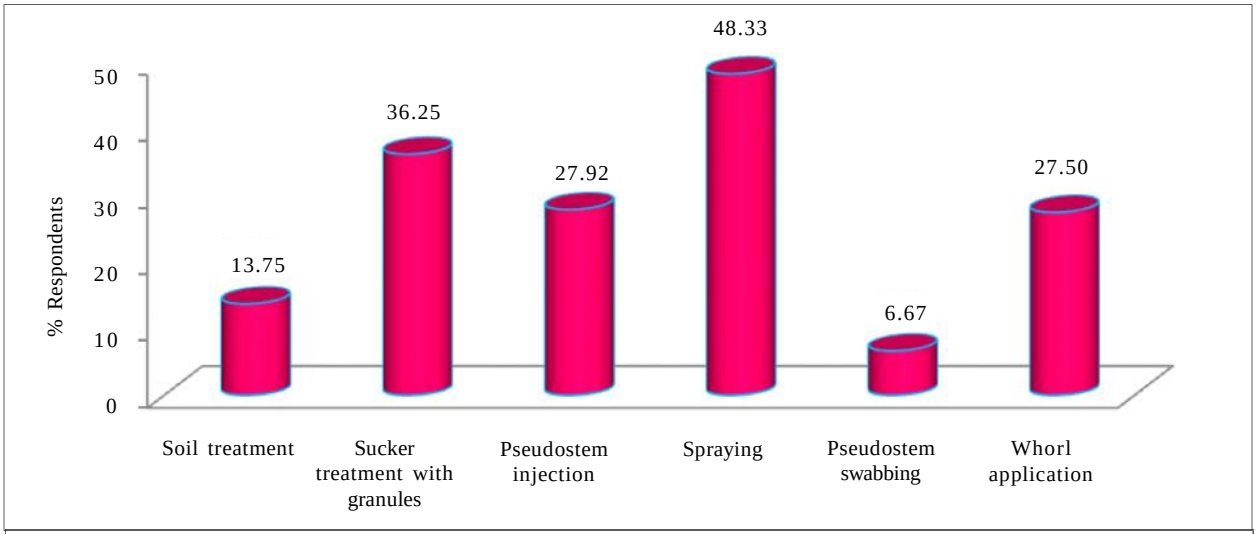

Fig. 1 : Method of pesticide application

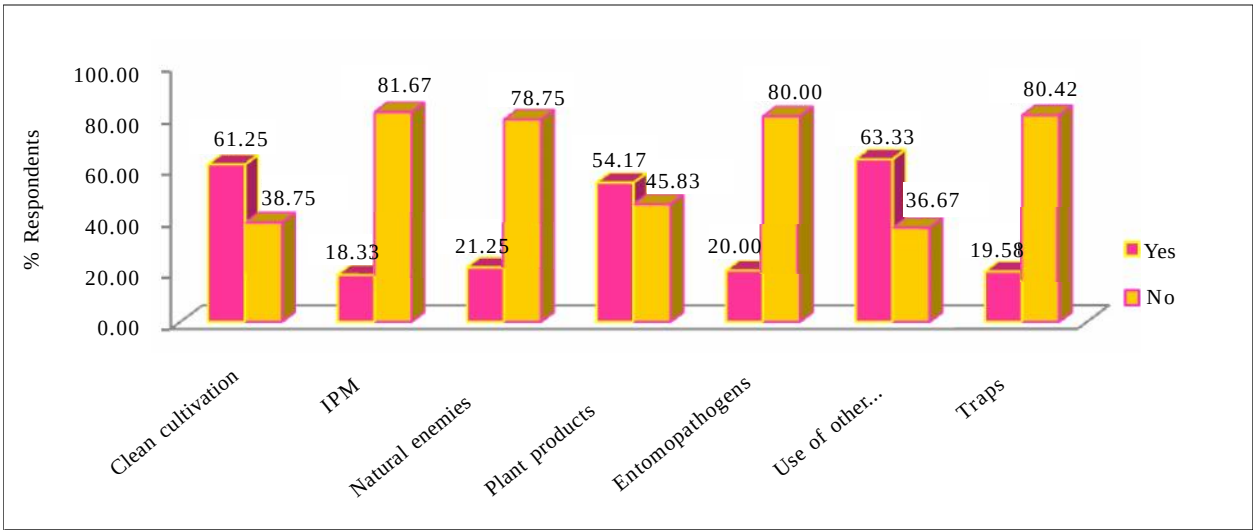

Fig. 2 : Awareness on eco-friendly pest management

pesticides irrespective of the method of application. This indicates the necessity of crop protection over pests and also lack of awareness among banana growers on the recommended dosage of pesticides.

Response of banana growers on the interval of pesticides spraying revealed that most of the respondents used pesticides at three months interval (48.33%) followed by need based application (30.83 %) and two months interval (6.25 %). The farmers who responded for no use of insecticide were 14.58 per cent. Banana growers who reported more than two applications of pesticides during the crop period were 37.85 per cent, whereas 20.42 per cent reported it as two applications. The respondents seldom used the insecticides were 14.58 per cent and 8.75 per cent respondents applied only once. Response of banana growers on the frequency of pesticide usage revealed that most of the respondents followed need based application of the pesticides. Regarding other pest management practices, the clean cultivation practices (61.25 %) and use of plant products (54.17 %) were well adopted. Banana grower's responses on awareness of eco-friendly pest management practices like use of traps, natural enemies, entomopathogens and IPM adoption technique were relatively low (Fig. 2).

However, most of the banana growers responded positively (63.33 %) for the knowledge on use of other bioagents such as *Trichoderma* and *Pseudomonas* and responded negatively about the removal of residual pseudostems (82.08 %) and treatment of residual pseudostem (93.33 %). Present finding explored the good indigenous knowledge and technology adoption by the banana growers which can be still be improvised by training and skill development programmes. Most of the banana growers were aware about the safe use of pesticides, *viz*., pesticide residues (61.25 % respondents), safety measures of pesticide use (64.58 % respondents) and pre-harvest interval for pesticide application (59.58 % respondents). Very few respondents knew the recommended pesticides for banana (17.50 % respondents). Farmers obtain required information on plant protection from various sources such as pesticide dealers, agricultural extension officers/scientists, radio/ television and fellow farmers. Most of the banana growers relied on private agro pesticide dealers and agricultural officers/scientist *viz.*, 46.25 and 42.92 per cent, respectively, as their source of information for pesticides usage. 3.75 per cent banana growers used their own knowledge for pesticides use whereas, 7.08 per cent follow advice of the fellow farmers. This shows that more than 50 per cent banana growers use unreliable source of crop protection information. Shetty *et al*. (2010) also reported that only 20 per cent of the respondents obtained their information on plant protection aspect from the agricultural extension officer and the rest of 80 per cent of the farmers used unreliable information. Lack of adoption of pest management technologies by banana growers in Tamil Nadu has been reported by Awasthi *et al*. (2016), which correlates with present findings.

Present study highlights the need of interventions for improving pest knowledge and safe pesticide use. Public policies should be developed to encourage farmers to change their pest management methods from chemical based to methods that are healthier and more environmental friendly and sustainable. It is necessary to promote the awareness on eco-safe pest management strategies, knowledge on pesticides dosage, spray intervals and insecticides residues in order to make the produce safe both for internal consumption and export.

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