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STUDY ON TECHNOLOGICAL GAP ANALYSIS AND GARRETT RANKING IN RECOMMENDED PEST MANAGEMENT PRACTICES OF TEMPERATE FRUIT CROPS AT KODAIKANAL HILLS, TAMIL NADU

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ABSTRACT

Agriculture is the mainstay of the Indian economy, contributing over 17 per cent to the total GDP and Creating employment to over 60 per cent of the population. A study was conducted on technological gap in adoption of IPM pest management practices in Kodaikanal taluk of Dindigul district in Tamil Nadu with 60 respondents from Vadakavunji and Senbaganoor villages through simple random sampling during March – May 2020.To identify a best package practice of the technology, the finalized nine practices were resistant variety, Seed treatment, Yellow sticky traps, Light traps, Predators, Parasitoids, Entomopathogen, Botanicals and Chemical insecticides. The findings revealed that among the practices 96.67 per cent farmers adopting chemical treatment it means spraying insecticides to controlling the pests followed by Botanicals (86.67 per cent). The gap was 86.67 per cent in predators and 95.00 per cent in parasitism. From the ranking of the pest management practices spraying of chemical for controlling pests takes up the first position followed by yellow sticky trap and botanicals. Further, lack of knowledge, lack of technical help, unconvincing merit of technology and non-availability of technical inputs complexity of practices were expressed as reasons for t–echnological gap in adoption of pest management practices in temperate fruit crops.

INTRODUCTION

Kodaikanal hills located on a plateau above the southern escarpment of the upper Palani Hills at 2,133 metre, between the Parappar and Gundar Valleys. Insect pests pose a challenge to the efficient horticultural fruit production especially in temperate region. In order to obtain optimal production of horticulture fruits crops and compete at global level in terms of productivity, knowledge about insect pests, their biology, bionomics and management is of paramount importance. This information could be best used to devise suitable management practices so that insect pests are controlled before they could cause severe infestation and subsequent loss of quality produce. In temperate region, there are so many insects pests that are affecting the temperate crops because of the favourable climate conditions (Chauhan and Srivastava, 2014). Among the pest categories like defoliators, sucking pests and borers based on the farmer's response the sucking pest complex were causing high damage in temperate fruit crops followed by borer complex (Rathee and Dalal, 2018). Integrated pest management is the ultimate solution for controlling the pests which affecting temperate fruit crops (Vincent *et al*., 2003). The area was purposively selected as this was one of the highest productions of temperate crops like Apple, Peach, Pear, Plum, Avocado and Kiwi. The personal interaction with farmer was carried out to collect the details about adaptation of plant protection measures in their field. Totally nine package of practices *viz*., resistant variety, seed treatment, yellow sticky traps, light traps, predators, parasitoids, entomopathogens, botanicals and chemical insecticides were finalized to find out the technology gap. Mostly the farmers of hilly region were using one or two components for managing pests of temperate crops like chemical pesticides and botanicals(Awasthi and Sridharan, 2015). Hence, the study was carried out to analyse the technology gap of farmers about in IPM components in temperate crops pest management and how they are adopted this recommended technologies for controlling pest complexes in Temperate crops.

MATERIALS AND METHODS

Study area

The present study was conducted in two villages in Kodaikanal hills of Tamil Nadu,

namely Vadakavunji (10.31° N , 77.58° E) and Senbaganoor (10.23° N, 77.50° E). From both the villages together 60 farmers were selected, thirty farmers from each. The area was purposively selected as this was one of the highest productions of temperate crops like Apple, Peach, Pear, Plum, Avocado and Kiwi at Kodaikanal region of Dindugal district. The personal interaction with farmer was carried out to collect the details about adaptation of plant protection measures in their field. The sample size was totally 60.

Technology Gap

Gap analysis indicates the extent to which technologies have

not been adopted. This feedback information is essential to identify the weakness of technology transfer programme, to remove bottlenecks and accelerate adoption. The general formula for measuring technology gap, which can be applied irrespective of the nature of technology, Total nine packages of practices were finalized to find out the technology gap. These practices were resistant variety, Seed treatment, Yellow sticky traps, Light traps, Predators, Parasitoids, Entomopathogen, Botanicals and Chemical insecticides. In this situation, gap analysis was done by using the formula Dubey *et al*. (1981). The following formula was used to ascertain the technological gap in adoption of each of the above practices.

$$T.G.I. = \frac{R - A}{R} X100$$

Where,

TGI = Technology Gap Index

R = Recommended package score

A = Adopted package score

On account of a wide range of technological gap in the adoption of IPM practices by the respondents, the farmers were categorized as 'High' as for those having TGI of 75 and above, 'Medium' and 'Low' having TGI between 40 and 75 and below 40 respectively.

Technology Gap (Practise wise)

$$T.G.I. \frac{S - A}{A} X100$$

Where,

S = Standard score (Total number of respondents),

A = Actual score (Actually technology adopted)

Perceived attributes of Technology gap:

The nine cultivation practices were taken to consideration which was measured by a scale developed by *Sakthivel et al*. (2012). The nine attributes are *viz*., Hybrid and seed resistance variety, Recommended seed rate, resistant variety, Seed treatment, Yellow sticky traps, Light traps, Predators, Parasitoids, Entomopathogen, Botanicals and Chemical insecticides. Respondents were categorized on these attributes basing on mean (X) and standard deviation (SD). The categories were:

Category	Range of score
Low	Upto X- S.D
Medium	X-S.D to X + S.D
High	Above X + S.D

Data was collected using a pre-tested, structured research schedule, using the

personal interview method

Garrett technique for Ranking

The questionnaire method is used for data collection. The responses were converted to numerical scores using Garrett technique (Christy, 2014) which is highly advantageous.

The Garrett's score conversion formula is

Percent position = 100 (Rij -0.5)/Nij

Where,

Rij – Rank given for the ith variable by the jth respondents

Nij – Number of variable ranked by jth respondents

RESULTS AND DISCUSSION

Among the practices 96.67 per cent farmers adopting chemical treatment it means spraying insecticides to controlling the pests followed by Botanicals (86.67 per cent).Managing sucking pests *viz*., Whitefly, thrips and aphids the erecting yellow stick traps was recommended in the IPM practices only 78.33 per cent of the farmers adopting followed by seed treatment (63.33), light traps (40.00) and Entomopathen (30.00) per cent, respectively. The least adoption component by farmers were

Table 1: Recommended package practices for pest management and their adoption (n = 60)

Score	Package practices	No. of farmers adopted	Adoption level (%)
1	Resistant variety	12	20
2	Seed treatment	38	63.33
3	Yellow sticky traps	47	78.33
4	Light traps	24	40
5	Predators	8	13.33
6	Parasitoids	3	5
7	Entomopathogen	18	30
8	Botanicals	52	86.67
9	Chemical insecticides	58	96.67

Table 2: Sourcing of information on pest management practices in temperate crops (n = 60)

S.No	Information on Pest management details	Farmer's responses (%)
1	Pesticide dealers	76.76
2	Horticulture department	6.67
3	TNAU Scientists	16.66

Table 3: Practices-wise technological gap about pest management practices in temperate crops (n = 60)

Score	Package practices	Technology Gap (%)
1	Resistant variety	80
2	Seed treatment	36.67
3	Yellow sticky traps	21.67
4	Light traps	60
5	Predators	86.67
6	Parasitoids	95
7	Entomopathogen	70
8	Botanicals	13.33
9	Chemical insecticides	3.33

Table 4: Overall technological gap about pest management practices in temperate crops (n = 60)

S.No	Categories	Frequency	Percentage	Mean score
1	Low (<40)	36	60%	31.46
2	Medium (40-70)	24	40%	45.17
3	High (> 70)	0	0%	0

Table 5: Preference and Ranking of the pest management practices in temperate crops (n = 60)

S.No	Package practices	Rank rendered by the Respondents								
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th
1	Resistant variety	0	8	6	7	0	12	17	0	10
2	Seed treatment	6	0	15	16	13	4	0	6	0
3	Yellow sticky traps	0	19	22	15	0	0	0	0	4
4	Light traps	0	0	10	6	24	13	7	0	0
5	Predators	0	0	0	12	0	10	0	18	20
6	Parasitoids	0	0	0		12	0	9	21	18
7	Entomopathogen	0	7	0	0	4	7	20	16	6
8	Botanicals	0	22	7	4	7	14	6	0	0
9	Chemical insecticides	54	6	0	0	0	0	0	0	0

Table 6: Percentage Positions and their corresponding Garretts Table values

Rank	Percentage	Calculated Value	Garrett table value
1	100(1-0.5)/9	6	80
2	100(2-0.5)/9	17	69
3	100(3-0.5)/9	28	61
4	100(4-0.5)/9	39	56
5	100(5-0.5)/9	50	50
6	100(6-0.5)/9	61	44
7	100(7-0.5)/9	72	38
8	100(8-0.5)/9	83	31
9	100(9-0.5)/9	94	20

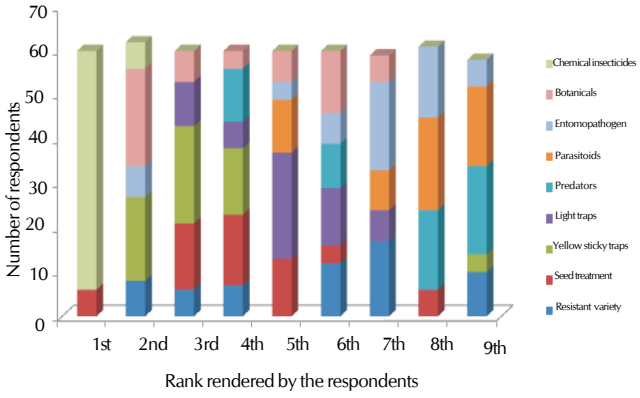

Figure1: Ranking of the pest management practices in temperate crops

natural enemies controlling pests in temperate region pradators (13.33 per cent) and parasitoid (5.00 percent) (Table 1).

Strategies for the management of temperate crop pests under hilly region is obtained by farmers from pesticide dealers (76.76 per cent farmers response), whereas a minimum respondents depend on TNAU scientist (16.66 per cent), followed by horticultural department (6.67 per cent) (Table 2).

Technological gaps in pest management practices against temperate crops

It can be inferred from Table.3 that among the nine sets of practices recommended, the technology gap was very minimum with respect to practising different components of IPM against pest management of temperate crops. It is observed that the adoption gaps were found less in chemical treatment (3.33 per cent) and in Botanicals (13.33) against temperate crop pests which is due to ease of application and availability of chemicals. Most of the farmers are spraying chemicals as preventive measure. In the case of cultural control like resistant variety selection (80.00 per cent) and in seed treatment (30.00 per cent) the gap was high in these practices. Mechanical control yellow sticky trap (21.67 per cent) is adopted with low level of gap because most of the farmers aware of this technology but in the case of fitting light trap physical control of the component the gap was medium (60.00 per cent) the reason for this adoption gap was placing of light trap in field was intensive and thus not follow by all the farmers but a wide gap was observed in case of biocontrol method related pest management using parasitoids and predators. The gap was 86.67 per cent in predators and 95.00 per cent in parasitoids. The main reason was the lack of awareness about biological control agents and the unavailability to the farmers. The adoption gap analysis clearly indicates that among IPM components recommended for the temperate crop pests, the biological control and a few cultural/mechanical practices with less complexity were more feasible in adoption as compared to botanical and chemical control. It might be due to several constraints *viz*., lack of knowledge, lack of technical help, unconvincing merit of technology and non-availability of technical inputs complexity of practice . Sakthivel *et al*.(2012) reported the same the biocontrol methods of pest managements are having wide range of technological gap. Because in table 2. that is clearly showes that majority of the farmers depending on pesticide dealers to know about pest management strategies. More or less similar findings were reported by Nikhode *et al*. (1997); Verma *et al*. (2003) and Bhagwan Singh *et al*. (2007).

Overall technological gap

From the findings in Table 4 it can be inferred that the 60%of farmers had low technological gap followed by medium technological gap 40% about the pest management practices with mean technological gap scores of 31.46 and 45.17, respectively. The knowledge limits the action of the individual as it is the basic for any individual to think of pros and cons in making a decision to adopt or reject a practice, hence probable reason for majority of the respondents to fall under medium adoption category might be due to the medium to high knowledge possessed by majority of the respondents. The finding was in conformity with the results of Ranish *et al*. (2001).

Ranking of pest management practices against temperate crops

From the ranking of the pest management practices spraying of chemical for controlling pests takes up the first position and other practices occupies their position as in Table.6. Botanicals

Table 7: Computation of the Garrett's Value

S.No	Package practices	Rank rendered by the Respondents								
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th
1	Resistant variety	0	552	366	392	0	528	646	0	200
2	Seed treatment	480	0	915	896	650	176	0	186	0
3	Yellow sticky traps	0	1311	1342	840	0	0	0	0	80
4	Light traps	0	0	610	336	1200	572	266	0	0
5	Predators	0	0	0	672	0	440	0	558	400
6	Parasitoids	0	0	0	0	600	0	342	651	360
7	Entomopathogen	0	483	0	0	200	308	760	496	120
8	Botanicals	0	1518	427	224	350	616	228	0	0
9	Chemical insecticides	4320	414	0	0	0	0	0	0	0

Table 8: Ranking of the pest management practices in temperate crops

S.No	Package practices	Total	Perc entage	Rank
1	Resistant variety	2684	45	6
2	Seed treatment	3303	55	4
3	Yellow sticky traps	3573	60	2
4	Light traps	2984	50	5
5	Predators	2070	35	8
6	Parasitoids	1953	33	9
7	Entomopathogen	2367	39	7
8	Botanicals	3363	56	3
9	Chemical insecticides	4734	79	1

occupies second rank followed by yellow sticky trap for third position. Seed treatment, light traps, resistant variety, entomopathogens, parasitoids and Predators occupies (4th, 5th, 6th, 7th, 8th and 9th) positions, respectively (Table 8).

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