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TECHNICAL STAFF'S KNOWLEDGE LEVEL ABOUT INTEGRATED PEST MANAGEMENT AND THEIR FEATURES

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Abstract

Integrated fight is briefly described as the administration and management system of pests and expressed as integrated pest control or integrated pest management. Within this definition it is defined as all of the efforts undertaken in order to keep the pest populations below economically damaging levels in harmony with each other on the use of all the techniques and methods and all factors that play a role in the exchange of populations of pest species with their environment in mind. This study was aimed to determine Ministry of Food, Agriculture and Animal Husbandry technical staff's knowledge level about integrated pest management and their features. Study is contributed by evaluating technical staff general features, ideas on integrated pest management and their observations on farmers to development of program. Main material of the study was gathered from face to face interview of 134 technical staff which work on Ministry of Food, Agriculture and Animal Husbandry Department on Antalya, Denizli, Konya, Karaman, Niğde and Isparta cities which are dominant for apple production. Serving as consultants or pest management department employees were included in the study. Technical staff members have important position by raising awareness of producers' agricultural management. It was determined that the technical staff is aware of the use of pesticides, but their level of knowledge in the pest management approaches such as integrated pest management is not at the desired level. Integrated pest management should be improved, especially in terms of monitoring the new developments taking place in the EU. According to technical staff observations farmers' awareness about the disease and pest management has not at the desired level yet. It is inevitable the necessity of extension to increase producers' knowledge and awareness and implementation more of integrated pest management.

Key words**:** *technical staff, apple producers, adoption level, Turkey, pest control*

INTRODUCTION

The use of drugs that determine adverse effects on human health is restricted in most developed countries. Practices such as biological control and organic agriculture, while providing a new dimension to the agrarian struggle, these methods do not exceed 5% even in the developed countries of the world among pesticide management (Özkan et al.,2003) [9]. This situation caused resistance to pesticides, the emergence of endemic breeds, the emergence of harmful pests, the use of natural balance, and environmental and human health negatively (Toros et al., 1999; Kutlar and Ceylan, 2008) [7,13] and resulted with impulsion of researchers to develop sustainable technologies related to pest management. The late Prokopy (2003) [11] defined integrated pest management (IPM) as '... a decision-based process involving coordinated use of multiple tactics for optimizing the control of all classes of pests (insects, pathogens, weeds, vertebrates) in an ecologically and economically sound manner (Ehler, 2006) [3]. It is an important requirement for the sustainability of world fruit production to closely monitor the developing elements of production and trade. Increasing product associations or council associations on product basis, branding, implementation of

integrated fighting methods is also important in terms of sustainability. It is very important to evaluate the production potential in Turkey in this regard (Gül and Akpınar, 2006) [4].

In 1998, the Ministry of Food, Agriculture and Livestock in Turkey announced the apple integrated technical instruction; the definitions of apple pest, diseases, pest management methods and the periods in which they are harmful are mentioned.

In this study, it was aimed to determine the knowledge levels and general characteristics of the technical staff working in the Ministry of Food, Agriculture and Livestock within the scope of "Integrated Pest Management". Increasing awareness of consumers with increasing levels of income and knowledge will cause changes in production techniques (Gül at al., 2008) [5]. Accordingly, it was aimed to contribute to the development of the program by considering the general characteristics of the technical staff, their thoughts on the IPM and the producer observations.

MATERIALS AND METHODS

In this context, Antalya, Denizli, Isparta, Karaman, Konya and Niğde provinces' technical staffs were taken into the scope of research where intensive cultivation of apple (64 percent of the apple production, 55.1 percent of planted areas, 50.2 percent of the number of trees) in Turkey takes place. Questionnaire forms include open-ended, two-choice, multi-choice questions and 5-point Likert scale questionnaires. The questionnaires included questions about socio-demographic characteristics as well as approaches to chemical use, integrated management, and knowledge of early warning systems and observations of apple producers in the region. The data were analysed as mean, ratio, group and cross tabulation. In the selection of the technical staff, those who deal with the IPM in the plant protection departments and serve as consultants in the villages were taken into the scope of the study. While it is targeted to, collect data from all technical staffs but it is not possible to perform a complete counting for various reasons (in the field or absence). Within the scope of the study, 134 technical staff interviewed which are located in six provinces and their distribution according to the province are given in Table 1. According that; 20.9% of the 134 technical staff interviewed are located in Isparta, 18.7% in Antalya, 17.9% in Konya, 16.4% in Karaman, 13.4% in Niğde and 12.7% in Denizli.

Table 1. Technical staff distribution according to the provinces

	Number of technical staff	Percent (%)
Antalya	25	18.7
Denizli	17	12.7
Isparta	28	20.9
Konya	24	17.9
Niğde	18	13.4
Karaman	22	16.4
Total	134	100.0

Source: Own calculation.

RESULTS AND DISCUSSIONS

Socio-economic Characteristic of Technical staff

It was determined that 72.4% of the technical staff were male and 27.6% were female counsellors. According to the results of the survey, 90.3% of the technical personnel interviewed in the region were Agricultural Engineers, while only 9.7% were Technicians. When the graduated departments of interviewed technical staff were evaluated Plant Protection (28.9%) and Horticulture (28.9%) were the highest and it was determined that these sections were followed by Field Crops and Agricultural Machinery.

Among the technical staff interviewed, it was determined that the Horticulture (30.8%) and Seedling Growing (30.8%) were the first ones when the high school departments occupied by the technicians were examined. When the graduation periods of technical staff working in the region were considered, it was seen that they graduated (54.5%) mainly in the period of 2000 and after. The average age of the technical staff was 35.18 years and it was determined that they had an IPM experience for an average of 5.87 years. It was seen that most experienced technical staffs were located in Denizli, Karaman and Niğde provinces (Table 2).

Table 2.Socio-economic characteristics of technical staff

Gender	**N**	**%**
Female	37	27.6
Male	97	72.4
Occupation status	**N**	**%**
Agriculture Engineer	121	90.3
Agriculture Technician	13	9.7
Agriculture Faculty	N	%
Animal production	1	0.8
Agriculture technologies	1	0.8
Horticulture	35	28.9
Field crops	15	12.4
Agriculture economics	5	4.1
Agricultural structure and irrigation	5	4.1
Animal husbandry	4	3.3
Soil science and plant nutrition	3	2.5
Milk technologies	7	5.8
Agriculture machinery	10	8.3
Plant protection	35	28.9
Vocational School	**N**	**%**
Horticulture	4	30.8
Seedling growing	4	30.8
Field crop	1	7.7
Greenhouse	2	15.3
Organic agriculture	1	7.7
Agricultural management	1	7.7
Graduation year	**N**	**%**
Before 1990	15	11.2
Between 1990-1999	46	34.3
After 2000	73	54.5
Age (year)	**Average**	
Antalya	31.6	
Denizli	40.5	
Isparta	36.1	
Konya	34.7	
Niğde	35.0	
Karaman	35.8	
Total	35.1	
IPM experience (year)	**Average**	
Antalya	4.1	
Denizli	8.1	
Isparta	5.0	
Konya	5.4	
Niğde	7.3	
Karaman	7.5	
Total	5.9	

Source: Own calculation.

Knowledge Levels and Characteristics of Technical Staff on IPM

When the level of knowledge of the technical staff in the agricultural pest management was considered, it was seen that 50% of them know themselves as knowledgeable about the pest management. Those who define themselves as less informed were 3% and those who define themselves as fully informed were 4.5%. Accordingly, it can be concluded that many of the technical staff are knowledgeable about the pest management. When asked about the level of knowledge about the IPM of technical staff, it was determined that 51.5% defines itself as Middle level and 37.3% as Informed. 46.3% of the technical staff interviewed expressed themselves as moderate and 31.3% expressed themselves informed about early warning system (Table 3).

Table 3. Distribution of knowledge levels of technical staff on agricultural pest management, IPM and early warning system (%)

Knowledge level	Low		Moderate		Informed		Fully informed	
	N	%	N	%	N	%	N	%
Pest management techniques	4	3.0	57	42.5	67	50.0	6	4.5
IPM	9	6.7	69	51.5	50	37.3	6	4.5
Early warning system*	19	14.2	62	46.3	42	31.3	10	7.5

Source: Own calculation. *Sum of the item is less than 100 due to one stuff express himself uniformed.

The 51.5% of the technical staff interviewed in the mentioned area stated that they did not participate in the training program (seminars, conferences, courses, etc.) related to IPM. Those participating in the training program on IPM are the main source of in-service training. About 50% of the technical staff participated in the training program (seminars, conferences, courses, etc.) on the early warning system in the elderly. The main source of information on early warning is in-service training (Table 4).

Table 4. Distribution of technical staff to participation on a training program related to agricultural pest management, IPM and early warning system

IPM training participation status	N	%
No	69	51.5
Yes	65	48.5
Training / Education sources		
Agriculture Ministry	58	89.3
University	6	9.2
Research Institute	1	1.5
Early warning system education participation status		
No	67	50.0
Yes	67	50.0
Training / Education sources		
Agriculture Ministry meetings	42	62.7
University	2	2.9
Written sources (journals, brochures etc.)	13	19.4

Source: Own calculation.

Levels of Adoption to the IPM of the producer in their Region According to Technical Staff

IPM approaches are based upon the judicious mix of physical, cultural, biological and chemical control methods, employed to manage and control pests. IPM is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices (Hoyt, 2001; Ofuoku et al., 2008; Ali et al., 2003) [1, 6, 8]. The chemical control method is a form of agricultural pest management used to protect agricultural products from pests and diseases, to ensure quality products and is the most common component that has increased usage since 1940's. The use of pesticides is the most preferred method because of its short duration and its ease of use (Tiryaki et al., 2010) [12]. The term biological control has come to be used in variety of ways. Professor H.S. Smith coined the term in 1919 to apply to the control or regulation of pest populations by natural enemies, i.e. by predators, parasites or pathogens and this is briefly what biological control means (DeBach and Rosen, 1991) [2]. According to the observations of the technical staff apple producers in the study region, prefer mostly chemical control against diseases and pests. This ratio was similar for all provinces that were surveyed. Mechanical and cultural management follows chemical pest management (Table 5).

Isparta, Denizli and Karaman provinces were foregrounds in terms of knowing IPM by the producers according to technical staff observations but in terms of implementation level Isparta, Denizli, Antalya and Karaman provinces were getting to the forefront. Technical staff expressed that early-warning system was more aware and knowledgeable for apple producers in Denizli, Isparta and

Karaman provinces. In terms of compliance of the dates from early-warning system all, the provinces except Konya were forefront (Table 6).

Table 5. Producers' pest and diseases management methods participation level according to technical staff observations

Provinces	Antalya	Denizli	Isparta	Konya	Niğde	Karaman	Average
Cultural control	2.14	2.15	2.55	2.45	2.25	2.62	2.40
Chemical control	4.64	4.77	4.68	4.07	4.17	4.52	4.41
Mechanic control	2.23	2.62	2.50	2.34	2.42	2.76	2.45
Biological control	1.14	1.23	1.36	1.43	1.25	1.62	1.37
Sticky trap	1.59	1.69	2.14	1.59	1.42	1.76	1.70
Predator	1.05	1.00	1.23	1.14	1.00	1.19	1.12

(1:Never (% 0) 2:Rarely (% 1-25) 3:Sometimes (% 26-50) 4:Almost always (% 51-75) 5:Always (% 76-100)

Table 6. Observations of technical staff for implementation of IPM, early-warning system

Provinces	IPM knowledge level	IPM implementation level	Early-warning knowledge level	Early-warning implementation level
Antalya	2.41	2.55	3.00	3.14
Denizli	2.77	2.77	3.62	3.77
Isparta	2.86	3.00	3.50	3.36
Konya	2.36	2.27	2.66	3.02
Niğde	2.17	2.33	3.00	3.25
Karaman	2.71	2.52	3.05	3.95
Average	2.53	2.53	3.04	3.34

(1: None (% 0) 2:Low (% 1-25) 3:Moderate (% 26-50) 4: High (% 51-75) 5:Very High (% 76-100))

According to the observations of the technical staff interviewed in the region, it was considered that the level of knowledge about IPM was low (% 48.5'i). About 34.3% of the technical staff stated that at less than half of the producers know the term IPM. Similarly, 48.5% of the technical staff observed that IPM implementation level was low on apple producers. Observations of the technical staff for the knowledge level of apple producers in the region on the term of early warning were similar to the results of IPM. The 31.3% of the staff found apple producers unconsciousness on early-warning system in the region. Nevertheless, technical staff indicate that the apple producers in the region generally compile the early-warming spraying schedule (Table 7).

Table 7. Observations of technical staff for knowledge and adoption level on IPM and early-warming spraying schedule

	None (%0)		Low (%1-25)		Moderate (%26-50)		High (%51-75)		Very High (%76-100)	
	N	%	N	%	N	%	N	%	N	%
IPM knowledge level	7	5.2	65	48.5	46	34.3	16	11.9	-	-
IPM implementation level	9	6.7	65	48.5	42	31.3	16	11.9	2	1.5
Early-warning system knowledge level	5	3.7	42	31.3	39	29.1	39	29.1	9	6.7
Early-warning implementation level	3	2.2	26	19.4	42	31.3	49	36.6	14	10.4

Deficiencies in IPM, What To Do

It was determined that the rate of visiting IPM orchard was 42.5% more than three times in a month. About 58.2% of the technical staff also stated that this rate was not sufficient for a good IPM mechanism. The 22.4% of the technical staff pointed out that the density of paper work (Table 8).

Table 8. The technical staff's visit frequency of the IPM orchards, and reasons for do not visit

Visit frequency of the IPM orchards (in a month)	**N**	**%**
Once	42	31.3
Twice	19	14.2
Three times	16	11.9
More than three times	57	42.5
Status of finding numbers of visit sufficient		
Sufficient	56	41.8
Insufficient	78	58.2
Reasons for not visiting enough IPM orchards		
High density of paper work	30	22.4
Vehicle / transportation problem	5	3.7
Lack of sufficient staff	26	19.4
Other reason	23	17.2

When the information sources of the integrated technical staff in the region were examined, 56% of the technical staff expressed their own experience was the first information source. Books, magazines, internet and related publications follow this (Table 9).

Table 9. Information sources of technical staff

Information sources	**N**	**%**
Own experience	75	56
Books, magazines	20	14.9
Internet	15	11.2
Other written publications	14	10.4
Producers experiences	3	2.2
Scientific articles	2	1.5
University	2	1.5
Foreign (companies, organizations etc.,)	2	1.5
Ministry, Research institute	1	0.7

When the problems encountered in IPM were analysed with the data obtained from the technical staff, 66.4% of the staff interviewed indicate that the producers do not follow recommended spraying dates. Other problem stated by 26.1 % of the technical staff was that they could not visit enough demonstration orchard in the research area (Table 10).

About 41.8% of the technical staff expressed that the IPM adoption level could be increased by forcing the apple processing industry, the association of apple producers and exporters to become sensitive to the IPM also they have to be included in the extension network with the legal obligation.

Table 10. Problems faced by technical staff in IPM

Problems	**N**	**%**
Do not visit enough demonstration orchard	35	26.1
Producers do not follow recommended spraying dates	89	66.4
Staffs are working in irrelevant departments	9	6.7
Other problems	1	0.7

The 38.1% of the technical staff stated that IPM could be implemented more effectively by organizing training courses and seminars on IPM to producers. In addition to these, technical staff suggested that these listed activities could increase IPM success in national level -Practical and visual educational programs should be launched on IPM at local/national level; -Leading farmer projects must be implemented; -Producers and technical staff have to work together to solve problems by mutual responsibility; -Demonstrations and training programs to be prepared by cooperating with trade associations and apples producers unions. In the study also what to do in order to develop / spread the IPM in the research area was asked to the technical staff. Half of the technical staff highlighted that extension services should be increase. A similar result was found by Parsa et al., (2014), according their study the low level adoption of IPM program was due to insufficient education and technical support. Another suggestion made by 16.4 % of the technical staff was that appropriate pesticides must have IPM licence. They proposed that licences could develop IPM. Also technical staffs suggested that IPM pesticides should be cheaper to spread IPM in the study area (Table 11).

Table 11. What should be done to increase IPM extension services according to technical staffs?

What should be done to increase IPM extension services	**N**	**%**
Forcing the apple processing industry, the association of apple producers and exporters to become sensitive to the IPM and included in the extension network with the legal obligation	56	41.8
Organizing training courses and seminars on IPM to producers	51	38.1
Practical and visual educational programs should be launched on IPM at local/national level	15	11.2
Leading farmer projects must be implemented	5	3.7
Producers and technical staff have to work together to solve problems by mutual responsibility	6	4.5
Demonstrations and training programs to be prepared by cooperating with trade associations and apples producers unions	1	0.7
What to do in order to develop / spread the IPM		
Extension services should be increase	67	50.0
Appropriate pesticides must have IPM licence	22	16.4
Traditional methods should be discarded, new methods should be developed	21	15.7
The pesticides used in the IPM should be cheaper	18	13.4
Task descriptions are fully structured, the registration system must be updated	6	4.5

CONCLUSIONS

In this study, technical staff point of view for IPM and farmer evaluated and their relation try to explain. It is hoped that these assessments will contribute to the spread of IPM awareness and level of implementation at the level of producers and related stakeholders. Technical staff are the individuals who are in an important position to guiding producers in the implementation of IPM. According to the study, it can be said that the technical staff is conscious about the use of agricultural pesticides. However, their knowledge about IPM approaches is not at the desired level. IPM should developed especially for the monitoring of new developments in the European Union. According to the technical staff, producers are not aware yet of pest and disease management method at desired level. In order to increase the knowledge and awareness of the producers and to apply the IPM, extension services are inevitable.

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