



Attitude and Behaviours of Persimmon Growers to Pesticide Use in Adiyaman Province

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Abstract The aim of study is to determine attitude and behaviours of persimmon growers to pesticide use in Adiyaman province. For this purpose, data have been acquired with simple random sampling method from 66 persimmon growers through surveys in Gölbaşı, Besni and Çelikhhan districts in 2017 and results have been assessed in percentage. According to study results, it has been determined that 75.4% of the persimmon growers are primary school graduates, 84.8% have non-agricultural income and their income level is above hunger limit. Persimmon growers have indicated that they ask for proposals from pesticide sellers for pesticide selection and dosage adjustment (66.7%, 69.7%). With regards to pesticide selection, 90.9% of them base their selection on the brand, 72.7% do not always use the same pesticide for the same disease and pests, 59.1% use pesticide without seeing the disease and pest, 97% apply the exact recommended dosage in spraying, 43.9% said the pesticides they use leave residue on the product, 81.8% said they are using protective clothing and mask during spraying, 87.9% said they observe the waiting times of pesticides, 97% said they burn the empty pesticide boxes, 92.4% said they clean the spray tank after spraying, 89.4% said they are using a mixture of pesticides, 69.7% said they are applying cultural control as well as chemical control and 97% said they never heard of the term bio-pesticide.

Keywords Persimmon growers, pesticide, chemical control, Adiyaman

1. Introduction

Being grown in subtropical climate zone, persimmon (*Diospyros kaki* L.) is a fruit variety of the Ebenaceae family which can also grow in mild temperate zones. It can be planted in humid, soil rich in terms of organic matter and it's homeland is China, where planted started in 5th-6th centuries. From there it spread to Japan and Korea, then to India, Ceylon, Australia and other countries. It is also grown in Mediterranean countries, France, Italy, North African countries, Israel and Turkey [1, 2]. *Diospyros* sp. to which persimmon is a member, includes approximately 400 varieties, most of them are found naturally in tropic and subtropical climate zones and only 4 varieties are commercially grown [1, 3]. From these varieties, *Diospyros lotus* L. and *D. virginiana* L. are being used as rootstock. Persimmon is a highly important nutrient source being consumed fresh and dried, and contains Vitamin A, E, C, dietary fibre, carotenoid and polyphenols. As well as being consumed fresh and dried, it's fruits are being used in deserts, sauces, ice-cream, marmalade, cream, custard, cake, gum and puree



among other things [1, 4, 5]. Persimmon assumes the role of being a functional nutrient in the treatment of Alzheimer and Parkinson diseases and has protective effects against type 2 diabetes [6, 7, 8].

According to 2014 data the total amount of persimmon production in the world was 5.190.624 tons and the biggest producers were China (3.730.800 ton), Korea (428.363 ton), Spain (245.000 ton) and Japan (240.600 ton) [9]. Turkey's total persimmon production was 38.043 tons in 2017 and production was mostly in Adana (9.100 ton), Izmir (4.179 ton), Mersin (3.403 ton) Hatay (3.172 ton) and Adıyaman (2.991 ton) provinces. The persimmon growing area in Adıyaman (197.5 ha) makes up approximately 8.2% of the total persimmon production area in Turkey (2393.2 ha) and the production amount makes up around 7.9% of the total production [10].

One of the factors restricting production in persimmon growing is disease and the pests. In persimmon trees, fungal and bacterial disease factors such as anthracnose, grey mould, bacterial blight and pests such as mediterranean fruit fly, carob moth, citrus mealybug, fruit scale and thrips create problems [1, 11, 12]. Control against pests and diseases has the characteristics of protecting the targeted production. It is reported that without controlling diseases, pests and weeds in plant production, there will be a product loss of 65% [13]. It has been reported that in Isparta 114 apple growers apply 13.7 g insecticide, 11.3 g fungicide, 2.1 g acaricide per hectare in apple production, application of pesticide in high dosages leads to an economic loss of 472.7 TL ha⁻¹, and that these losses stem from insecticides by 63.33%, fungicides by 26.70%, acaricides by 9.67% [14]. In a study conducted in Turkey, it has been reported that the amount of pesticide used per hectare is reduced when apple growers implement integrated pest management, and also that training is required to be given to growers on protection of natural enemies and the methods of controlling apple pests [15].

The literature reviews held by the authors did not yield any studies covering the attitudes and behaviours of persimmon growers in Turkey with regards to plant protection practices, however there are several studies covering the plant protection applications of growers of different fruit species. It has been reported that 74.15% of the citrus growers in Antalya are spraying pesticides only when they see any disease or pests, 49.7% make their pesticide selection on the basis of their own knowledge and experience, 70.4% said pesticides are leaving behind residues and 96.8% said extreme use of pesticide harms the environment [16]. 51.09% of the Isparta province cherry growers said they adjust the pesticide dosing in accordance to the instructions, 65.22% said they are not taking any protective measures when spraying and 41.31% said they carelessly throw the empty pesticide boxes to the environment [17]. It has been reported that almost half of the 104 agricultural farms doing plant production in Iğdır are unaware on issues such as pesticides are not harmful to the environment, pesticides do not leave any residues behind and the storage and disposal of empty pesticide boxes and left-over pesticides [18]. 41.6% of the 267 apple growers in Antalya, Denizli, Isparta, Karaman, Konya and Niğde provinces said that they apply pesticide on the basis of early warning system [19]. 37.3% of the cherry growers in Izmir, Manisa, Konya, Isparta, Afyon and Denizli provinces are applying integrated pest management in a high level while 22.5% is applying it at a lower level [20]. It has been reported that the majority of the 96 almond growers in Adıyaman province said they ask for recommendations of the pesticide sellers and the provincial directorate of agriculture when it comes to determining the pesticide selection and pesticide dosage, brand and active ingredient are the defining factors in pesticide selection, they observe the recommended dosage and are using the pesticides as a mixture [21].

In Adıyaman, persimmon growers consider chemical control as the first option against the disease and pest control and are using pesticides in chemical control against these factors. However, use of pesticides in agricultural pest control leads to many problems such as harming human and environmental health. The aim of study is to determine attitude and behaviours of persimmon growers to pesticide use in Adıyaman province.

2. Materials and Methods

2.1. Materials

The research area of the study includes the villages of Gölbaşı, Besni and Çelikhan districts where persimmon production is concentrated in Adıyaman province [22]. While the primary material of the study was the original quality data obtained from persimmon growers in Adıyaman province by questionnaire in 2017, it was used as a secondary source in similar studies related to the research topic.



2.2. Method

There are 213 active farms growing persimmon in the districts of Gölbaşı, Besni and Çelikhan in Adıyaman [22], and the farms are calculated at confidence limit of 95%. In face-to-face interviews with the growers, questionnaires with 20 questions were used and the answers were given in terms of number and percent. The number of growers to be interviewed in the study was calculated according to the following formula with simple random sampling method [23].

$$n = \frac{N \times s^2 \times t^2}{(N-1)d^2 + (s^2 \times t^2)}$$

In the formula; n: indicates the sample volume, N: total business number within the sampling framework, S: standard deviation, t: 95% t table value corresponding to confidence limit, d: acceptable error (5% deviation). The study has been executed within the confidence limit of 95%, where the remaining 5% corresponds to the acceptable error. It has been calculated that the number of persimmon growers selected to be surveyed had to be 66, all of which have been randomly selected.

3. Results and Discussion

It has been determined that 100% of the persimmon growers are male, 42.4% are primary school graduates, 33.3% are secondary school graduate, 18.2% are high school graduate and 6.1% are university graduates. It is evident that the education levels of persimmon growers in Adıyaman is low, and the ratio of university graduates in particular is lower when compared to other graduates. In parallel with our results, it has been observed that the majority of the stone fruit producers in Korkuteli (Antalya), apple growers in Antalya and vineyard growers in Nusaybin (Mardin) are primary school graduates [24, 25, 26]. 84.8% of the growers have social security and 77.3% have non-agricultural income (Table 1). Similar to our results, it has been reported that the producers in Seyhan and Yüreğir, vineyard growers in Manisa and the almond growers in Adıyaman are mostly covered by social security [27, 28, 21].

Table 1: Demographic information of persimmon growers

Gender	Number	Percentage (%)
Man	66	100.00
Woman	-	-
Total	66	100.00
Education status	Number	Percentage (%)
Primary school	28	42.40
Secondary school	22	33.30
High school	12	18.20
University	4	6.10
Total	66	100.00
Social security	Number	Percentage (%)
Yes	56	84.80
No	10	15.20
Total	66	100.00
Non-agricultural income	Number	Percentage (%)
Yes	51	77.30
No	15	22.70
Total	66	100.00

The annual level of income of the persimmon growers has been defined as 20.454 ₺. In parallel with the results, the level of income of almond growers in Adıyaman has been defined as 30.393 ₺; and the income level of hazelnut growers in Giresun has been defined as 28.170 ₺ [21, 29]. According to 2017 data, the annual hunger level in Turkey is 19.296 ₺ [30], indicating that the annual income level of the persimmon growers in Adıyaman is just above hunger level.



66.7% of the persimmon growers base their pesticide selection on the suggestion of pesticide sellers, 18.2% on agricultural extension people recommendations and 13.6% on the suggestion of special advisor recommendation (Table 2). In Antalya, parallel to our results, 49.7% of citrus growers base their pesticide selection on their own experiences, 42.8% on the suggestion of pesticide sellers; 54% of the apple growers in Isparta consult their pesticide sellers when deciding on the type of pesticide, and %10 consult their special advisor recommendation; and 88.9% of the growers in Nevşehir consult their pesticide sellers when deciding on the type of pesticide [16, 24, 31]. Contrary to our results, vineyard growers in Manisa and fruit growers in Gümüşhane reportedly pay attention to the recommendations of the agricultural extension people recommendations when selecting pesticide [32, 33].

Table 2: Information sources of pesticide selection of persimmon growers

Information sources	Number	Percentage (%)
Pesticide seller	44	66.70
Neighbour recommendations	-	-
Own knowledge and experiences	1	1.50
Agricultural extension people recommendations	12	18.20
Special advisor recommendation	9	13.60
Total	66	100.00

It has been determined that persimmon growers base their pesticide selection in pest and disease control on the brand by 90.9%, active ingredient by 4.5%, expiration date by 3% and price by 1.5% (Table 3). Contrary to our results, in studies conducted in Turkey have concluded that growers base their pesticide selection on several different criteria such as the brand, price and active ingredient of the pesticides [34, 35, 36, 21].

Table 3: Criteria for pesticide selecting of persimmon growers

Criteria	Number	Percentage (%)
Price	1	1.51
Expiration date	2	3.05
Active ingredient	3	4.54
Brand	60	90.90
Total	66	100.00

72.7% of the persimmon growers reported that they do not always use the same pesticide for the same disease and pest, while 27.3% said they always use the same pesticide. Similar to our results, 53.8% of the almond growers in Adiyaman are reported not to use the same pesticide for the same disease and pest [21]. 42.2% of the growers in Tokat, 43.2% of the apple growers in Karaman, 34% of the vineyard growers in Manisa have been reported to be spraying before seeing any pest and disease [37, 38, 28].

It has been determined that in terms of selecting pesticide dosage, 69.7% of the persimmon growers consult pesticide seller, 18.2% consult the agricultural extension people recommendations, 10.6% consult the special advisor recommendation and 1.5% rely on their own knowledge and experiences (Table 4). It has been reported that, similar to our results, 37.2% of the growers in Konya, 33.3% of the growers in Samsun, 52.7% of the growers in Adiyaman and 90.28% of the growers in Tokat base their pesticide dosage selection in chemical control on the recommendations of the pesticide seller [34, 39, 21, 36].

Table 4: Information sources of dose adjustment of persimmon growers

Information sources	Number	Percentage (%)
Pesticide seller	46	69.70
Neighbour recommendations	-	-
Own knowledge and experiences	1	1.50
Agricultural extension people recommendations	12	18.20
Special advisor recommendation	7	10.60
Total	66	100.00



97% of the persimmon growers said they apply the exact recommended dosage, while 3% said they apply a dosage above the recommended level. The fact that a great majority of the persimmon growers are applying the exact recommended dosage increases the chances of succeeding in chemical control, while it is also a source of hope in terms of human and environmental pollution. It has been reported in reports that in general in the world, the level of applying the exact recommended dosage is 50%, the level of applying above the recommended dosage is 23-27% and the level of applying a dosage below the recommended level is 23% [40, 41]. Similar to our results, 72% of the vineyard growers in Turkey; 87.3% of the growers in Manisa and 97.82% of the almond growers in Adiyaman have reported that they are using the exactly the recommended dosage [32, 28, 21].

43.94% of the persimmon growers expressed that pesticides leave behind residue on the product, 34.84% said leave no residue is left on the product and 21.22% said only leave little residue is left behind (Table 5). 70.4% of the citrus growers in Antalya; 36% of the apple growers in Eğirdir (Isparta), 44.44% of the growers in Kazova (Tokat), 38.7% of the almond growers in Adiyaman said that pesticides leave residue on the product [16, 35, 36, 21].

Table 5: Persimmon growers comments on the residue of pesticides in product

Comments	Number	Percentage (%)
Leave no residue	23	34.84
Leave little residue	14	21.22
Leave residue	29	43.94
Leave a lot of residue	-	-
Total	66	100.00

It has been observed that when spraying, 81.8% of the persimmon growers are using protective clothing and mask, 9.1% is I do not use, while 9.1% is I use it sometimes (Table 6). In the world, the level of mask use by the growers when spraying is 9-48%, level of using protective clothing is 63%, and the level of using work clothing is 55% [42, 43, 44, 45]. Similar to our results, in studies conducted in Turkey reported that use of mask during spraying is 70-88.1%, and the use of special protective clothing is between 12-92.5% [46, 47, 21].

Table 6: The use of protective clothing and mask during the spraying of the persimmon growers

Answers	Number	Percentage (%)
Yes I'm using	54	81.80
I do not use	6	9.10
I use it sometimes	6	9.10
Total	66	100.00

It has been reported that 87.9% of the persimmon growers observe the waiting times in pesticides while 12.1% is not observing it. In a study conducted in Latin America, it has been reported that producers do not have sufficient knowledge about the waiting times and are not observing the waiting times% [48]. Studies conducted in Turkey concluded that the waiting time for harvesting is observed by 43.2-71% of apple producers; 80% of potato producers; and 94.6% of almond producers [35, 38, 31, 21].

In the study, 97% of the persimmon growers said they are burning the empty pesticide boxes and 3% said they let in to land (Table 7). In the studies held worldwide, it has been reported that empty pesticide boxes are being burned at a ratio of 7-50% and buried at a ratio of 3-18% [40]. Studies conducted in Turkey concluded that empty pesticide boxes are burned (7.45%; 15.48%; 65.3%; 59.72%; 76.3%) and buried (14.36%; 35.6%; 29.17%; 54%; 15.1%) [16, 32, 46, 28, 18, 36, 21].

Table 7: Usage ways of empty pesticide boxes of persimmon growers

Usage ways	Number	Percentage (%)
Let-in to land	2	3.00
Burning it	64	97.00
Throwing to field	-	-
Washing and using	-	-
Total	66	100.00



92.4% of the persimmon growers expressed that they clean their spray tank after spraying while 7.6% said they do not clean them. Similar to our results, 85.42% of the vineyard growers in Manisa, 69.2% of the growers in Iğdır and 90.3% of the almond growers in Adıyaman reported that they clean the spray tank after spraying [32, 18, 21].

89.4% of the persimmon growers reported they are using the pesticides in mixtures, 7.6% used pesticides without any mixing while 3% use pesticides occasionally. Similar to these results, 83% of the apple growers in Isparta and 78.5% of the almond growers in Adıyaman reported they are using the pesticides in mixing [35, 21].

Outside of chemical control, 69.7% of the persimmon growers reported that they apply cultural control, 27.3% use of mechanical control while 3% use of physical control (Table 8). Studies conducted in Turkey reported that in addition to chemical control, growers prefer cultural control by 43.58-71%, mechanical control by 12.9-33.33% and physical control by 15.1-23.07% [37, 21].

Table 8: Applications outside of chemical control of persimmon growers

Control methods	Number	Percentage (%)
Cultural control	46	69.70
Physical control	2	3.00
Mechanical control	18	27.30
Biological control	-	-
Total	66	100.00

97% of the persimmon growers stated that they are not aware of the term bio-pesticide, and 3% said they are aware of the term. Similar to these results, it has been reported that majority of the growers in Turkey are not aware of the term bio-pesticide [21, 31].

4. Conclusion

When the results obtained in the study are generally evaluated; it has been determined that persimmon growers have a low education level in general, majority have social security and non-agricultural income and their income levels are above hunger level. It has been determined that a great majority of the persimmon growers rely on the pesticide seller's recommendations for pesticide selection. Correct selection of pesticide, using it at the right time in correct dosage is highly important in chemical control. Therefore, pesticide sellers need to update their knowledge frequently. Persimmon growers mostly choose the pesticides they use on the basis of it's brand. This is something positive for the success of chemical control and can be associated with the high level of income of the persimmon growers. Majority of the persimmon growers reported that they are not always using the same pesticide for the same disease and pest. Persimmon growers have stated that constant use of the same pesticide will increase the cost of spraying and harm human and environmental health. More than half of the persimmon growers (59.1%) apply spraying before seeing the disease and pest. In this case, it is observed that persimmon growers are applying pesticides by disregarding the economic loss threshold. As a result of this, the input cost of persimmon growers is increasing, human health and environment is harmed by natural pests.

It has been determined that 2/3 of the persimmon growers consult the pesticide seller when defining the pesticide dosage. Persimmon growers prefer pesticide sellers for payment convenience and easy access, and the rate of preference of agricultural extension people recommendations is low. Therefore, pesticide sellers must particularly be plant protection graduates, audited in certain intervals and the disconnection between provincial directorate of agriculture and persimmon growers needs to be eliminated. Majority of the producers stated that they apply the exact recommended dosage. It is evident that the persimmon growers are conscious on this issue. Also, persimmon growers have expressed that when high dosages are applied to pest and disease, disease and pests will gain resistance, residues will be left on the products and soil and costs will increase. Almost half of the persimmon growers have reported that the pesticides they use leave residue on the product. Persimmon growers need to be educated to increase this ratio.

During spraying, most of the persimmon growers are using protective clothing and mask. It has been observed that persimmon growers observe the protective measures during spraying and are acting meticulous enough. Majority of the persimmon growers pay attention to the waiting time between spraying and harvest. This is an



indication that the persimmon growers not using the same pesticide all the time and observing the recommended dosage are also aware of environment and human health. Almost all of the persimmon growers (97%) expressed that they are burning the empty pesticide boxes after spraying. In this sense, it can be claimed that persimmon growers are protecting both themselves and the environment during and after spraying. Majority of the persimmon growers reported that they are cleaning the spray tank after spraying. However, persimmon growers also stated that they do not have enough knowledge about the calibration of the spray tank. Therefore, it is necessary to provide spray tank calibration trainings to the persimmon growers.

Persimmon growers have expressed that they are using the pesticides in mixtures for reasons such as cost, labour and time, even though they are aware of the fact that mixtures reduce the effects of pesticides and that plants will become phytotoxic. It has been determined that about 70% of the persimmon growers apply cultural control other than chemical control. The use of cultural control, other than pesticides, by persimmon growers with an income level of hunger limit, can be associated with persimmon growers having a high level of awareness. Majority of the persimmon growers have reported that they are not aware of the bio-pesticide. Considering that majority of the persimmon growers in Adiyaman base their pesticide selection on the recommendations of pesticide sellers and agricultural extension people, these two actors have great roles to play in terms of bio-pesticide and biological control.

References

- [1]. Kitagawa, H. & Glucina, P.G. (1984). *Persimmon culture in New Zealand*. New Zealand Department of Scientific and Industrial Research, DSIR Information Series No: 159, Wellington, New Zealand, 74 p.
- [2]. Alistair, D., George, M. & Collins, R.J. (1995). The cultivation of persimmon (*Diospyros kaki* L.) under tropical conditions. ISHS Symposium on Temperate Zone Fruits in the Tropics and Subtropics, 22-26 May, Cairo, pp. 11.
- [3]. Spongberg, S.A. (1977). Ebenaceae hardy in temperate North America. *Journal of the Arnold Arboretum, Harvard University*, 58(2): 146-160.
- [4]. Ercişli, S., Akbulut, M., Özdemir, Ö., Şengül, M. & Orhan, E. (2008). Phenolic and antioxidant diversity among persimmon (*Diospyros kaki* L.) genotypes in Turkey. *International Journal of Food Sciences and Nutrition*, 59(6): 477-482.
- [5]. Yönel, S.P., Uylaser, V. & Yonak, S. (2008). Composition and nutritional value of persimmon. 10th Food Congress in Turkey, 21-23 May, Erzurum, pp. 339-342.
- [6]. Khan, N., Syed, D.N., Ahmad, N. & Mukhtar, H. (2013). Fisetin: A dietary antioxidant for health promotion. *Antioxidants & Redox Signaling*, 19(2): 151-162.
- [7]. Nabavi, S.F., Braidy, N., Habtemariam, S., Sureda, A., Manayi, A. & Nabavi, S.M. (2016). Neuroprotective effects of fisetin in Alzheimer's and Parkinson's diseases: from chemistry to medicine. *Current Topics Medicinal Chemistry*, 16(17): 1910-1915.
- [8]. Yaqub, S., Farooq, U., Shafi, A., Akram, K., Murtaza, M.A., Kausar, T. & Siddique, F. (2016). Chemistry and functionality of bioactive compounds present in persimmon. *Hindawi Publishing Corporation Journal of Chemistry*, 1-13.
- [9]. FAOSTAT. (2014). The statistics division of the food and agriculture organization (FAO). Online located at: <http://faostat.fao.org> [Accessed date: 08.09.2014].
- [10]. TÜİK. (2018). Türkiye İstatistik Kurumu, Tarımsal İstatistik Verileri, Ankara, <http://www.tuik.gov.tr> [Erişim tarihi: 05.03.2018].
- [11]. Miller, E.P. & Crocker, T.E. (1992). *Oriental persimmons in Florida*. Cooperative Extension Service, University of Florida, Ins. of Food and Agr. Sciences. Gainesville, 15.
- [12]. Kasap, A. & Aslan, M.M. (2016). Akdeniz meyve sineğinin feromon tuzaklarla (*Ceratitidis capitata* Wied.) (Diptera: Tephritidae)'nin nar ve hurmadaki populasyon takibi ve zarar oranının tespiti. *KSÜ Doğa Bilimleri Dergisi*, 19(1): 43-50.
- [13]. Oerke, E.C., Dehne, D.W., Schonbeck, F. & Weber, A. (1994). *Crop production and crop protection: estimated losses in major food and cash crops*. Elsevier Hardcover, Amsterdam, 830 p.



- [14]. Yılmaz, H., Demircan, V., Gul, M. & Örmeci Kart, M.C. (2015). Economic analysis of pesticides applications in apple orchards in west mediterranean region of Turkey. *Erwerbs-Obstbau*, 57: 141-148.
- [15]. Gül, M., Akpınar, M.G., Demircan, V., Yılmaz, H., Bal, T., Arıcı, S.E., Polat, M., San, B., Eraslan, F., Örmeci Kart, M.Ç., Gurbuz, D. & Yılmaz, S.G. (2017). Economic analysis of integrated pest management adoption in apple cultivation: a Turkish case study. *Erwerbs-Obstbau*, 59: 147-154.
- [16]. Özkan, B., Vuruş Akçaöz, H. & Karadeniz, C.F. (2003). Antalya ilinde turunçgil üretiminde tarımsal ilaç kullanımına yönelik üretici tutum ve davranışları. *Anadolu Journal of AARI*, 13(2): 103-116.
- [17]. Demircan, V. & Aktaş, A.R. (2004). Isparta ili kiraz üretiminde tarımsal ilaç kullanım düzeyi ve üretici eğilimlerinin belirlenmesi. *Tarım Ekonomisi Derneği Dergisi*, 9: 51-65.
- [18]. Ertürk, Y.E., Bulak, Y. & Uludağ, A. (2012). Iğdır ili tarım işletmelerinin zirai mücadele uygulamalarında çevreye duyarlılıkları. *Tarih Kültür ve Sanat Araştırmaları Dergisi*, 1(4): 393-401.
- [19]. Gül, M., Akpınar, G., Demircan, V., Yılmaz, H., Bal, T., Arıcı, S.E., Polat, M., San, B., Eraslan, F., Örmeci Kart, Ç., Özdamar, D. & Yılmaz, S.G. (2016a). Economic analysis of early-warning system in apple cultivation: a turkish case study. *Custos e @gronegocio*, 10(3): 165-179.
- [20]. Gül, M., Akpınar, M.G., Demircan, V., Yılmaz, H., Bal, T., Arıcı, Ş.E., Polat, M., Örmeci Kart, M.Ç. & Acar, M. (2016b). Economic analysis of integrated pest management in cherry cultivation. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, 16(2): 165-178.
- [21]. Erdoğan, O., Tohumcu, E., Baran, M.F. & Gökdoğan, O. (2017). Adıyaman ili badem üreticilerinin zirai mücadele uygulamalarının değerlendirilmesi. *Turkish Journal of Agriculture-Food Science and Technology (TURJAF)*, 5(11): 1414-1421.
- [22]. Anonim. (2018). Adıyaman İl Gıda Tarım Hayvancılık Müdürlüğü Bitkisel Üretim İstatistikleri. <http://adiyaman.tarim.gov.tr>. [Erişim tarihi: 05.03.2018]
- [23]. Çiçek, A. & Erkan, O. (1996) *Tarım ekonomisinde araştırma ve örnekleme yöntemleri*. Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Yayınları, No:12, Tokat
- [24]. Ay, R., Yalçın, Ş., Sökeli, E. & Karaca, İ. (2006). Antalya ili Korkuteli ilçesi sert çekirdekli meyve üretici profiline bitki koruma uygulamaları yönünden incelenmesi. *Süleyman Demirel Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, 10(1): 52-55.
- [25]. Kızılay, H. & Akçaöz, H. (2009). Elma yetiştiriciliğinde ilaç ve gübre kullanımında ekonomik kaybın incelenmesi: Antalya ili örneği. *TABAD*, 2(1): 113-119.
- [26]. Çakır, A., Karaca Sanyürek, N., Karakaya, E. & Ay, Ş. (2017). Nusaybin (Mardin) ilçesi bağıcılığı sorunları ve çözüm önerileri. *GOPÜ Ziraat Fakültesi Dergisi*, 34(1): 15-25.
- [27]. Emeli, M. (2006). Seyhan ve Yüreğir havzasında bitki koruma yöntemlerinin uygulamadaki sorunları üzerine bir araştırma. Çukurova Üniversitesi Fen Bilimleri Enstitüsü, Bitki Koruma Anabilim Dalı, Yüksek Lisans Tezi, 123 p.
- [28]. Karataş, E. & Alaoğlu, Ö. (2011). Manisa ilinde üreticilerin bitki koruma uygulamaları. *Ege Üniversitesi Ziraat Fakültesi Dergisi*, 48(3): 183-189.
- [29]. Uzundumlu, A.S., Kılıç, B. & Tozlu, G. (2017). Fındık üretiminde kimyasal ilaç kullanımını etkileyen faktörlerin analizi: Giresun ili örneği. *Gümüşhane Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, 7(1): 1-9.
- [30]. Anonim. (2017). Türkiye İşçi Sendikaları Konfederasyonu (Türk-İş). <http://www.turkis.org.tr>. [Erişim tarihi: 31.12.2017]
- [31]. Erdoğan, O. & Gökdoğan, O. (2017). Nevşehir ilinde patates üreticilerinin bitki koruma uygulamaları. *BATEM Derim Dergisi*, 34(1): 51-60.
- [32]. Tücer, A., Polat, İ., Küçükler, M. & Özercan, A. (2004). Manisa-Saruhanlı bağ alanlarında tarımsal ilaç uygulamalarındaki sorunların saptanması. *Anadolu JAARI*, 14(1): 128-141.
- [33]. Kalkışım, Ö., Onaran, A., Azeri, F.N. & Turan, A. (2011). Gümüşhane ili ve ilçelerinde meyveciliğin genel durumu ve çiftçi uygulamaları üzerine bir araştırma. *Gümüşhane Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, 1(2): 123-134.



- [34]. İnan, H. & Boyraz, N. (2002). Konya çiftçisinin tarım ilacı kullanımının genel olarak değerlendirilmesi. *Selçuk Üniversitesi Ziraat Fakültesi Dergisi*, 16(30): 88-101.
- [35]. Boyraz, N., Kaymak, S. & Yiğit, F. (2005). Eğirdir ilçesi elma üreticilerinin kimyasal savaşım uygulamalarının genel değerlendirilmesi. *Selçuk Üniv. Ziraat Fak. Dergisi*, 19(36): 37-51.
- [36]. Gözener, B., Sayılı, M. & Çağlar, A. (2017). Tokat ili Kazova Bölgesinde domates yetiştiriciliğinde ilaç kullanımı. *Türk Tarım-Gıda Bilim ve Teknoloji Dergisi*, 5(5): 451-458.
- [37]. Kadioğlu, İ. (2003). Tokat ilinde üreticilerin zirai mücadele etkinlikleri üzerinde bir araştırma. *GOPÜ Ziraat Fakültesi Dergisi*, 20(1): 7-15.
- [38]. Karaçayır, H.F. (2010). Elma üretimi yapan tarım işletmelerinde tarımsal ilaç kullanımında yayım yaklaşımları: karaman ili örneği. Selçuk Üniversitesi Fen Bilimleri Enstitüsü, Tarım Ekonomisi Anabilim Dalı, Yüksek Lisans Tezi, 158 p.
- [39]. Gedikli, O. (2012). Samsun ili alaçam, bafra ve terme ilçeleri üreticilerinin bitki koruma yönünden karşılaştıkları sorunlar ile tarımsal ilaç kullanım durumunu etkileyen faktörlerin değerlendirilmesi, Atatürk Üniversitesi Fen Bilimleri Enstitüsü, Bitki Koruma Anabilim Dalı, Yüksek Lisans Tezi, 92 p.
- [40]. Zyoud, S.H., Sawalha, A.F., Sweileh, W.M., Awang, R., Al-Khalil, S., Al-Jabi, S.W. & Bsharat, N.M. (2010). Knowledge and practices of pesticide use among farm workers in the West Bank, Palestine: safety implications. *Environmental Health and Preventive Medicine*, 15(4): 252-61.
- [41]. Macharia, I., Mithöfer, D. & Waibel, H. (2012). Pesticide handling practices by vegetable farmer in Kenya. *Environmental Development and Sustainable*, 15(4): 887-902.
- [42]. Palis, F.G., Flor, R.J., Warburton, H. & Hossain, M. (2006). Our farmers at risk: behaviour and belief system in pesticide safety. *Journal of Public Health*, 28(1): 43-48.
- [43]. Atreya, K. (2007). Pesticide use knowledge and practices: a gender differences in Nepal. *Environmental Research*, 104(2): 305-311.
- [44]. Feola, G. & Binder, C.R. (2010). Why don't pesticide applicators protect themselves? Exploring the use of personal protective equipment among Colombian smallholders. *International J Occupational and Environmental Health*, 16(1): 11-23.
- [45]. Mohanty, M.K., Behera, B.K., Jena, S.K., Srikanth, S., Mogane, C., Samal, S. & Behera, A.A. (2013). Knowledge attitude and practice of pesticide use among agricultural workers in Puducherry, South India. *Journal of Forensic and Legal Medicine*, 20(8): 1028-1031.
- [46]. Budak, F. & Bostan Budak, D. (2006). Farm level analysis of pesticide use in cotton production in East Mediterranean region of Turkey. *J Environmental Biology*, 27(2): 299-303.
- [47]. Şahin, G., Uskun, E., Ay, R. & Öğüt, S. (2010). Elma yetiştiriciliği alanında çalışanların tarım ilaçları konusunda bilgi, tutum ve davranışları. *TAF Preventive Medicine Bulletin*, 9(6): 633-644.
- [48]. Jors, E., Morant, R.C., Aguilar, G.C., Huici, O., Lander, F., Baelum, J. & Konradsen, F. (2006). Occupational pesticide intoxications among farmers in Bolivia: a crosssectional study. *Environmental Health*, 5: 10.

