

Determination of Weeds Flora in Apple Orchards of Iğdır Province and Approaches of Farmers to Solve the Problems

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Abstract: This study was conducted to determine the weed species, their frequency, and density of weeds in the apple orchards of Iğdır province, as well as the approaches of the farmers in the region to solve the weed problems and their control methods. Surveys were conducted in 50 apple orchards in 2020. Besides, a questionnaire survey was conducted with 100 farmers engaged in apple growing. A total of 53 weed species belonging to 15 families, including 1 parasite, 2 narrow-leaved, and 12 broad-leaved weeds were identified. The highest number of weeds among these identified families were Asteraceae (12 species), Poaceae (12 species), and Brassicaceae (9 species), respectively. The weeds with the highest frequency were *Bromus tectorum* (84%), *Echinochloa crus-galli* (84%), and *Trifolium pratense* (82%). The weeds with the highest density were determined as *T. pratense* (76.44 plant/m²), *Setaria viridis* (74.62 plant/m²), and *Alopecurus myosuroides* (70.96 plant/m²). In the current study, 96% of the farmers stated that the weeds were very dense in the apple orchards and the weed species with the highest density were *A. myosuroides* (80%), *Poa trivialis* (74%), and *Hordeum murinum* (73%). They stated that none of the farmers engaged in apple cultivation in Iğdır province used chemicals for controlling weeds. In addition, when the opinions of the farmers were taken, they stated that they mow the weeds in the apple orchards and use them to feed their livestock. As a result, it is seen that the farmers do not manage weeds in the apple orchards of Iğdır province and the density of weeds in the apple orchards is very high.

Keywords: Survey, density, weed, frequency.

Iğdır İli Elma Bahçelerinde Görülen Yabancı Ot Florasının Belirlenmesi ve Bölge Çiftçisinin Sorunları Çözmedeki Yaklaşımları

Öz Bu çalışma; Iğdır ili elma bahçelerinde bulunan yabancı ot türleri, rastlama sıklıkları, yoğunlukları, ayrıca bölge çiftçisinin yabancı ot sorunlarını çözmedeki yaklaşımlarını, mücadele yöntemlerini belirlemek amacıyla yürütülmüştür. Çalışma, 2020 yılında 50 elma bahçesinde sürveyler yapılmıştır. Ayrıca elma yetiştiriciliği yapan 100 çiftçi ile anket yapılmıştır. Çalışma sonucunda; 1 parazit, 2 dar yapraklı ve 12 geniş yapraklı olmak üzere toplamda 15 familyaya ait 53 yabancı ot türü tespit edilmiştir. Tespit edilen bu familyalar içinde en fazla yabancı ot sayısına; Asteraceae (12 tür), Poaceae (12 tür) ve Brassicaceae (9 tür) familyalar sahip olmaktadır. Rastlama sıklıkları en yüksek yabancı otlar, *Bromus tectorum* (%84), *Echinochloa crus-galli* (%84) ve *Trifolium pratense* (%82) olmaktadır. Yoğunlukları en yüksek yabancı otlar ise *T. pratense* (76.44 bitki/m²), *Setaria viridis* (74.62 bitki/m²) ve *Alopecurus myosuroides* (70.96 bitki/m²) olarak tespit edilmiştir. Yapılan anketler sonucunda çiftçilerin %96'sı elma bahçelerinde yabancı otların çok yoğun olduğunu ve en fazla yoğunlukta bulunan yabancı ot türlerinin *A. myosuroides* (%80), *Poa trivialis* (%74) ve *Hordeum murinum* (%73) olduğunu ifade etmişlerdir. Iğdır ilinde elma yetiştiriciliği yapan çiftçiler, yabancı otlara karşı kimyasal mücadele yapmadıklarını belirtmişlerdir. Ayrıca çiftçilerin görüşleri alındığında elma bahçelerinde bulunan yabancı otları biçip hayvan yemi olarak kullandıklarını dile getirmişlerdir. Sonuç olarak Iğdır ili elma bahçelerinde çiftçilerin yabancı otlara karşı mücadele etmedikleri ve elma bahçelerinde yabancı ot yoğunluğunun çok yüksek olduğu görülmektedir.

Anahtar kelimeler: Sürvey, yoğunluk, yabancı ot, rastlama sıklığı.

1. Introduction

Apple is widely consumed due to its good taste, important nutrients and vitamins it includes, and its high antioxidant content. It is thought that the apple first appeared in Northern Anatolia, the Southern Caucasus, the regions in the south-west of Russia, and around Central Asia (east of Kazakhstan) (Özbek, 1978). The high adaptability of the species to different ecologies has caused it to spread widely around the world (Taşçı, 2017). Apple is a widely cultivated species in the world and is the third most produced fruit in the world (FAO, 2021).

According to FAO data, 4.717.384 orchard areas (ha) and 87.236.221 production amounts (tons) of apples were produced in the world in 2020. The highest apple

production in the world in 2020 is in Asia with 65%. In terms of the apple production rates, after the Asian continent, Europe (20%), America (11%), Africa (3%), and Oceania (1%) come respectively. In the world, the highest apple production is in China (42.425.400 tons) that produces about half of the total production in 2020. The USA (4.997.680 tons) comes next. Türkiye is the third country with the highest apple production in the world in 2020. According to data for the year 2020 in Türkiye, a total of 1.709.032 (da) apple orchards and 4.300.486 total (tons) apples were produced. Apple, which is of great importance for Türkiye, is directly or indirectly affected by diseases, pests, and weeds. It is a known fact that it negatively affects fruit yield and quality in orchards. For this reason, weed control in apple cultivation has taken its

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place among indispensable agricultural practices with the increase in production areas. The basic principle of controlling weeds is to know the weed species and their biology well (Özer et al., 1998). Agricultural production should be eliminated, minimized, or made tolerable, with the least possible expense, the reason or reasons that hinder the yield and quality of the product. For this reason, studies have been carried out to determine the weeds that are a problem in apple production areas in different regions of our country (Eşitmez & Işık, 2016).

While there are studies in the literature on the determination of weeds in different cultivated plants in Iğdır province (Üçrak et al., 2019; Şahin et al., 2020), no detailed study has been conducted on the identification of the weeds that are a problem in orchards that are an important source of income for the region. Thus, the objectives of this study were to determine the troublesome weed species, their frequency and density throughout apple orchards, and the approaches of the local farmers to solve the weed problems, control methods and level of knowledge in order to manage weeds in Iğdır province.

Table 1. Climate data for the year 2020 and for the year in which the study was conducted (MGM, 2019-2020).

Months	Mean Temperature (°C)		Total Rainfall (mm)		Mean Relative Humidity (%)	
	2020	MLY (1941-2020)	2020	MLY (1941-2020)	2020	MLY (1941-2020)
January	0.0	-3.3	7.3	15.1	65.2	60.1
February	1.9	-0.3	14.1	16.1	64.4	59.6
March	10.6	6.4	18.1	22.4	56.4	52.2
April	11.7	13.1	83.6	34.2	64.8	49.9
May	18.6	17.8	76.1	46.9	55.0	51.5
June	23.9	22.3	15.7	31.4	44.7	47.3
July	26.7	25.9	30.2	14.2	48.4	45.3
August	24.2	25.3	15.3	9.8	47.6	47.1
September	23.5	20.5	1.4	11.3	47.7	46.2
October	14.5	13.1	7.3	25.9	49.6	48.53
November	7.2	5.9	7.3	18.7	67.0	61.5
December	1.9	-0.3	20.6	13.9	81.4	79.4

MLY: Mean of long years (MGM, 2020)

2.1. Questionnaire Study

The research was conducted with a 25-question survey and face-to-face interviews with 100 farmers engaged in apple growing in Iğdır. Different opinions and thoughts of our producers were noted and evaluated.

Those who participated in the survey were asked about

- The problems that apple producers face with apple production
- Weeds that are a problem in apple orchards, and
- Issues such as weed control.

2.2. Survey Study

This study was carried out to determine the weed species, densities, and frequency of occurrence in apple orchards in Iğdır province in a total of 50 apple orchards during the vegetation periods of 2020. The surveyed districts and the number of orchards were determined by taking into

2. Material and Methods

The research was conducted in the form of a face-to-face interview and survey study with farmers engaged in apple growing in villages of Iğdır province and districts during the vegetation periods of 2020. The research was conducted in the form of a 25-question questionnaire and 100 farmers were interviewed. In addition, 50 orchards producing apples were visited in Iğdır province and its districts and a survey study was conducted to determine weed species, incidence rates, and densities. Iğdır province is located between 39'-41' north latitudes and 43'-45' east longitudes. The population of the province is 176.536, the area is 3539 km², and the altitude is 800 m. Approximately 74% of the region is mountainous and 26% consists of lowlands. The annual precipitation received at the sight of the study region was given as mean of long years in Table 1. As it can be seen in Table 1, the monthly highest precipitation for the study year 2020 ranged from 0.0 (no rainfall) to 26.7 mm over the duration of the year of study (Table 1).

account the apple production areas (da) in the districts (Table 2). It was ensured that the gardens sampled during the surveys were far from each other and that the samples were taken from different parts of the district visited in different directions.

Table 2. The total fruit bearing areas for apples for the year 2019 according to the districts in Iğdır province and the number of surveys carried out in these areas (TUIK, 2021)

Counties	Production area(da)	Number of Surveys
Aralık	1.550	4
Karakoyunlu	2.870	8
Center	9.650	25
Tuzluca	4.870	13
Total	18.940	50

To remove the edge effect in the gardens selected for survey purposes, starting from within 10 m of the garden edge;

- 4 in 1-5 decare areas,
- 6 in 5-10 decare areas,
- 8 in 10-20 decare areas,
- Frames of 1 m² were counted 12 times in 20-50 decare areas and 16 times in larger areas and the weeds entering the frame were detected (Bora & Karaca, 1970). Weed species outside the 1 m² frame were also determined and the frequency of occurrence was calculated.

After determining the weed species and their numbers, the frequency of occurrence of each species used to evaluate the population were calculated. The necessary formulas are listed below (Uygur, 1991). When determining the frequency of occurrence, all weeds found in the environment were recorded and evaluated regardless of whether they entered the framework or not.

$$R.S = 100 \times N / M$$

- R.S: Frequency of occurrence (%)
- N= Number of gardens where the species is found
- M= Total number of gardens observed

Density (plant/ m²) was calculated by dividing the total number of plants in m² by the number of surveys conducted at the census point.

2.3. Data Analysis

The data obtained as a result of the survey were analyzed in the SPSS 17.0 statistical package program. The results are shown as frequency and percentage distribution.

3. Results and Discussion

3.1. Weed Species Detected in the Study, Frequency, and Density of Occurrence

The distribution of the weed families determined as a result of the surveys conducted in apple orchards in Iğdır Province in 2020 where the research was conducted according to the number of weed species are given in Figure 1.

The highest number of weeds among these identified families are Asteraceae (12 species), Poaceae (12 species), and Brassicaceae (9 species). These families are followed by Fabaceae (6 species), Amaranthaceae (3 species), Plantaginaceae (2 species), and Apiaceae, Compositae, Convolvulaceae, Lamiaceae, Papaveraceae, Polygonaceae, Ranunculaceae, Urticaceae and Cuscutaceae (1 species) (Fig. 1). Previous research by Yazlık et al. (2019) reported similar results carried out in Fruit Nursery Area in Düzce province and found that 68 weed species from 29 families were Poaceae (11 species), Asteraceae (10 species), Brassicaceae (6 species), and Fabaceae (5 species), respectively. Our results were similar to the results of the study given above.

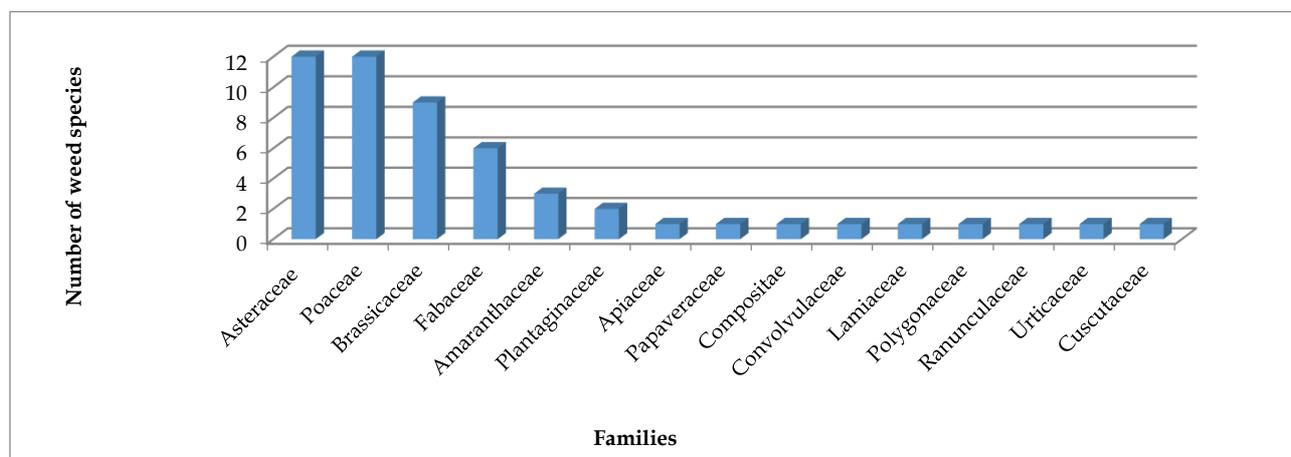


Figure 1. Distribution of the detected weed families according to the number of weed species they have

As a result of the surveys carried out in the apple orchards of Iğdır province, 53 weed species belonging to 15 families in total, including 1 parasite, 2 narrow-leaved, and 12 broad-leaved, were determined. Among the detected weeds, there are 1 parasite, 14 narrow-leaved and 38 broad-leaved weed species. Among the detected weeds, 1 kind of parasite, 28 species of annual and 24 species of perennial. Among these weeds, 8 species are annual and 6 species are perennial in narrow-leaved weeds. Among broadleaf weeds, 20 species are annual and 18 species are perennial (Table 3). Similar results were reported by Eşitmez and Işık (2016) who determined 129 weed species belonging to 33 families in total, 2 narrow-leaved and 31 broad-leaved, in the study they carried out to determine the weed species in apple orchards in Kayseri province between 2012-2013. The species identified in apple orchards were mostly belonged to Asteraceae (21 species), Poaceae (15 species), and Brassicaceae (13 species)

families. According to their surveys; *Agropyron repens*, *Convolvulus arvensis*, *Medicago sativa*, *Chenopodium album*, *Echinochloa crus-galli* and *Setaria viridis* weed species show parallelism with the current study.

Karaca (2003) determined 109 weed species belonging to 31 different families in his study in young apple orchards in Karaman Province. Some of the weeds were *Amaranthus retroflexus*, *Chenopodium album*, *Convolvulus arvensis*, *Setaria viridis*, and *Sinapis arvensis*. Yazlık and Tepe (2001) determined 82 weed species belonging to 28 different families and found that 1 fern (Pteridophyta) of the 82 determined weed species, 11 narrow-leaved and 70 broad-leaved weeds. The weeds and families identified in the current study we carried out are similar to the studies mentioned above.

The frequency of occurrence for 30 of the 53 weed species detected in the study was 50% and above. Weed

species whose frequency of occurrence is between 70-100% were *Bromus tectorum* (84%), *Echinochloa crus-galli* (84%), *Trifolium pratense* (82%), *Sorghum halepense* (80), *Setaria viridis* (78%), *Medicago sativa* (76%), *Alopecurus myosuroides* (76%), *Poa trivialis* (74%), *Hordeum murinum* (74%), *Agropyron repens* (70%), and *Chenopodium album* (70%). The 5 weed species with the lowest frequency of occurrence were listed as *Mentha arvensis* (8%), *Sinapis arvensis* (8%), *Erysimum repandum* (6%), *Carduus nutans* (4%), and *Adonis flammea* (2 %) (Table 4).

Eşitmez and Işık (2016) reported similar results in apple orchards in Kayseri province. They found the first 5 weed species with the highest occurrence as *Agropyron repens* (60.13%), *Convolvulus arvensis* (52.44%), *Medicago sativa* (49.65%), *Chenopodium album* (47.55%), and *Echinochloa crus-galli* (46.85%). The same weed species were found with a high occurrence in the current study. The weeds mentioned above and the weeds that were detected

with high incidence in our study are similar whereas others are not similar. The reason why some weeds are different is because weed types and frequency of occurrence vary according to regions.

As a result of the surveys, the density of 11 of the weeds detected was 50 plants/m² and above. These weeds, respectively, are *Trifolium pratense* (76.44 plant/m²), *Setaria viridis* (74.62 plant/m²), *Alopecurus myosuroides* (70.96 plant/m²), *Trifolium repens* (69.8 plant/m²), *Sorghum halepense* (69.04 plant/m²), *Poa trivialis* (68.74 plant/m²), *Agropyron repens* (64.14 plant/m²), *Capsella bursa-pastoris* (59.29 plant/m²), *Echinochloa crus-galli* (55.34 plant/m²), *Hordeum murinum* (54.89 plant/m²), and *Lepidium perfoliatum* (50.55 plant/m²). The 5 weed species with the lowest densities are *Mentha arvensis* (1.79 plant/m²), *Anthemis cretica* (62 plant/m²), *Adonis flammea* (0.6 plant/m²), *Erysimum repandum* (0.4 plant/m²), and *Carduus nutans* (0.28 plant/m²) as given in Table 4.

Table 3. Identified weed species, families, scientific names, English names, local names, and life cycles

Family	Scientific names	Local names	English names	Life Cycle
Narrow-Leaved				
<i>Plantaginaceae</i>	<i>Plantago lanceolata</i> L.	Dar yapraklı sinir otu	Buckhorn plantain	P
	<i>Plantago major</i> L.	Sinirli ot	Broad-leaved plantain	P
<i>Poaceae</i>	<i>Poa trivialis</i> L.	Çayır salkım otu	Kentucky bluegrass	A
	<i>Alopecurus pratensis</i> L.	Çayır tilkikuyruğu	Meadow foxtail	P
	<i>Agropyron repens</i> L.	Ayrık otu	Couch Grass	P
	<i>Setaria viridis</i> L.	Kirpi darı	Green foxtail	A
	<i>Hordeum murinum</i> L.	Pisipisi otu	Mouse barley	A
	<i>Sorghum halepense</i> (L.) Pers	Kanyaş	Johnsongrass	P
	<i>Alopecurus myosuroides</i> Huds.	Tilki kuyruğu	Blackgrass	A
	<i>Avena fatua</i> L.	Yabani yulaf	Oat, wild	A
	<i>Cynodon dactylon</i> (L.) Pers	Köpek dişi ayrığı	Bermudagrass	P
	<i>Digitaria sanguinalis</i> (L.) Scop.	Çatal otu	Hairy crabgrass	A
	<i>Echinochloa crus-galli</i> (L.) P.Beauv	Darıcan	Barnyardgrass	A
	<i>Poa annua</i> L.	Salkım otu	Bluegrass, annual	A
	Broad-Leaved			
<i>Amaranthaceae</i>	<i>Amaranthus albus</i> L.	Horoz ibiği	Tumble pigweed	A
	<i>Amaranthus retroflexus</i> L.	Kırmızı köklü tilki kuyruğu	Redroot pigweed	A
	<i>Chenopodium album</i> L.	Sirken	Lambsquarters, common	A
<i>Apiaceae</i>	<i>Daucus carota</i> L.	Yabani marul	wild carrot	P
<i>Asteraceae</i>	<i>Taraxacum officinale</i> (L.) Weber	Karahindiba	Dandelion	P
	<i>Lactuca serriola</i> L.	Yabani marul	Lettuce, prickly	P
	<i>Cirsium arvense</i> (L.) Scop	Köygöçüren	Canada thistle	P
	<i>Senecio vernalis</i> Waldst & Kit	Kanaryaotu	Eastern groundsel	A
	<i>Sonchus asper</i> (L.) Hill	Eşşek marulu	Spiny sowthistle	A
	<i>Tragopogon latifolius</i> Boiss.	İri yapraklı yemlik	broad-leaved salsify	P
	<i>Carduus nutans</i> L.	Deve dikenini	Musk thistle	P
	<i>Chondrilla juncea</i> L.	Ak hindiba	Devil's grass	P
	<i>Anthemis altissima</i> (L.) var. <i>altissima</i>	Papatya	Tall Chamomile	A
	<i>Anthemis cretica</i> Subsp. <i>anotolica</i> (Boiss.) Grierson	Horoz papatyası	Anatolian chamomile	A
	<i>Crepis foetida</i> L.	Hindiba	Stinking hawkbeard	A
	<i>Xanthium strumarium</i> L.	Domuz pıtrağı	Rough cocklebur	A
	<i>Brassicaceae</i>	<i>Descurania sophia</i> (L.) Webb Ex Prantl	Sadır otu	Flixweed

Table 3. (Continued)

Family	Scientific names	Local names	English names	Life Cycle
	<i>Sisymbrium loeselii</i> L.	Bülbül otu	Mall tumbleweed mustard	A
	<i>Boreava orientalis</i> Jaub. & Spach	Sarı ot	Yellow-weed	A
	<i>Capsella bursa-pastoris</i> (L.) Medik	Çoban çantası	Shepherd's-purse	A
	<i>Lepidium draba</i> L.	Yabani tere	Hoary cress	P
	<i>Erigeron canadensis</i> L.	Pekmez hardalı	Spreading wallflower	A
	<i>Isatis tinctoria</i> L.	Çivit otu	Dyer's woad	P
	<i>Lepidium perfoliatum</i> L.	Geniş yapraklı tere	Clasping pepperweed	P
	<i>Sinapis arvensis</i> L.	Yabani hardal	Charlock mustard	A
Compositae	<i>Erigeron canadensis</i> L.	Kanada şifaotu	Horseweed	A
Convolvulaceae	<i>Convolvulus arvensis</i> L.	Tarla sarmaşığı	Bindweed, field	P
Fabaceae	<i>Trifolium repens</i> L.	Ak üçgül	White clover	P
	<i>Trifolium pratense</i> L.	Çayır üçgülü	Red clover	P
	<i>Vicia sativa</i> L.	Fiğ	Common vetch	A
	<i>Melilotus officinalis</i> (L.) Pallas	Sarı taş yoncası	Sweet yellow clover	P
	<i>Medicago sativa</i> L.	Yonca	Alfalfa	P
	<i>Bromus tectorum</i> L.	Püsküllü çayı	Brome, downy	A
Lamiaceae	<i>Mentha arvensis</i> L.	Nane	Wild Mint	P
Papaveraceae	<i>Papaver rhoeas</i> L.	Gelincik	Common poppy	A
Polygonaceae	<i>Rumex crispus</i> L.	Kıvrıkcık labada	Dock, curly	P
Ranunculaceae	<i>Adonis flammea</i> Jagq.	Çin lalesi	Large pheasant's eye	A
Urticaceae	<i>Urtica dioica</i> L.	Isırgan otu	Nettle, burning	P
Parasite				
Cuscutaceae	<i>Cuscuta</i> spp.	Küsküt	Dodder	Parasite

A; Single-annual, P; Perennial

Table 4. Frequencies and densities of occurrence of detected weed species

Weeds	Frequency of Occurrence (%)	Density (plant/m ²)	Weeds	Frequency of Occurrence (%)	Density (plant/m ²)
<i>Adonis flammea</i> Jagq.	2	0.6	<i>Cynodon dactylon</i> (L.) Pers.	60	38.99
<i>Agropyron repens</i> L.	70	64.14	<i>Daucus carota</i> L.	16	1.89
<i>Alopecurus myosuroides</i> Huds.	76	70.96	<i>Descurania sophia</i> (L.) Webb. Ex Prantl.	12	2.53
<i>Alopecurus pratensis</i> L.	62	42.95	<i>Digitaria sonquinalis</i> (L.) Scop.	16	10.46
<i>Amaranthus albus</i> L.	62	19.75	<i>Echinochloa crus-galli</i> (L.) P. Beauv	84	55.345
<i>Amaranthus retroflexus</i> L.	50	14.61	<i>Erysimum repandum</i> L.	6	0.4
<i>Anthemis altissima</i> (L.) var. <i>altissima</i>	48	2.28	<i>Hordeum murinum</i> L.	74	54.89
<i>Anthemis cretica</i> Subsp. <i>anotolica</i> (Boiss.) Grierson	8	1.62	<i>Isatis tinctoria</i> L.	44	1.88
<i>Avena fatua</i> L.	60	32.55	<i>Lactuca serriola</i> L.	54	31.57
<i>Boreava orientalis</i> Jaub & Spach	44	7.81	<i>Lepidium perfoliatum</i> L.	42	50.55
<i>Bromus tectorum</i> L.	84	64.13	<i>Medicago sativa</i> L.	76	37.96
<i>Capsella bursa-pastoris</i> (L.) Medik	64	59.29	<i>Melilotus officinalis</i> (L.) Pallas	48	23.5
<i>Lepidium draba</i> L.	62	11.285	<i>Mentha arvensis</i> L.	8	1.79
<i>Carduus nutans</i> L.	4	0.28	<i>Papaver rhoeas</i> L.	24	2.86
<i>Chenopodium album</i> L.	70	36.065	<i>Plantago lanceolata</i> L.	26	36.71
<i>Chondrilla juncea</i> L.	8	3.51	<i>Plantago major</i> L.	56	40.49
<i>Cirsium arvense</i> (L.) Scop.	22	8.1	<i>Poa annua</i> L.	54	37.34
<i>Convolvulus arvensis</i> L.	66	20.11	<i>Poa trivialis</i> L.	64	68.74
<i>Erigeron canadensis</i> L.	32	5.43	<i>Rumex crispus</i> L.	56	19.31
<i>Crepis foetida</i> L.	40	4.73	<i>Senecio vernalis</i> Waldst & Kit.	14	11.93
<i>Cuscuta</i> spp.	10	2.4	<i>Sinapis arvensis</i> L.	8	13.58

Table 4. (Continued)

Weeds	Frequency of Occurrence (%)	Density (plant/m ²)	Weeds	Frequency of Occurrence (%)	Density (plant/m ²)
<i>Sisymbrium loeselii</i> L.	44	16.79	<i>Trifolium pratense</i> L.	82	76.44
<i>Sonchus asper</i> (L.) Hill.	20	4.23	<i>Trifolium repens</i> L.	66	69.8
<i>Sorghum halepense</i> (L.) Pers.	80	69.04	<i>Urtica dioica</i> L.	42	19.98
<i>Sterea viridis</i> L.	78	74.62	<i>Vicia sativa</i> L.	32	25.81
<i>Taraxacum officinale</i> L.	60	47.98	<i>Xanthium strumarium</i> L.	34	16.27
<i>Tragopogon latifolius</i> Boiss.	48	19.34			

Karaca (2003) stated in his study that the weed species with the highest density in apple orchards are *Amaranthus retroflexus*, *Chenopodium album*, *Convolvulus arvensis*, *Setaria viridis*, and *Sinapis arvensis*. In the study of Eşitmez and Işık (2016), in apple orchards, the first 5 weed species with high densities were *Agropyron repens* (8.966 plants/m²), *Echinochloa crus-galli* (4.415 plants/m²), *Chenopodium album* (4.321 plants/m²), *Convolvulus arvensis* (1.883 plants/m²), and *Setaria viridis* (1.824 plants/m²) and the weeds that we determined to have high densities in our study are similar. Yazlık and Tepe (2001), in their study to detect weeds in apple and pear orchards, determined the weed species with the highest density as *Poa annua*, *Trifolium* sp., *Lolium perene*, *Taraxacum* sp., and *Lotus corniculatus*. Üstüner and Akyol (2007), in their study in apple orchards, determined the weed species important in terms of density as *Agropyron repens*, *Alopecurus myosuroides*, *Bromus tectorum*, and *Cynodon dactylon*. These weed species have similarities with the weed species whose densities are found to be high in our study.

The weeds mentioned above and the weeds that were detected with high incidence in our study are similar. The reason why some weeds are different is because weed types and frequency of occurrence vary according to regions.

3.2. Questionnaire Data Results

The answers given to the survey questions were obtained from face-to-face interviews conducted with the farmers who grow apples in Iğdır province and evaluated separately. Their percentage values are given in Figure 2.

Farmers engaged in apple growing stated that they are doing 55% physical management and 45% mechanical

management against weeds in apple orchards (Fig. 2).

As an answer to the question "Do you know what herbicides and pesticides are?", 51% of the farmers answered yes and remaining 49% answered no (Fig. 3).

When we asked farmers "How important is the weed problem for the yield?", 85% of the farmers stated that it was not important at all, 9% said that it was less important, and 6% said that it was moderately important (Fig. 4).

The question posed to the surveyed farmers as "What is the weed density in your garden?", 96% of the farmers stated that it is very dense and 4% stated that it is dense (Fig. 5).

When the Figure 6 was examined, 86% of the farmers stated that they did the control of weeds by looking at the weed population. 10% of the farmers stated that they did it by consulting with agrochemical dealers and 4% said that they did it by consulting with the agricultural engineer at the agricultural district organization (Fig. 6).

In the survey study conducted on farmers engaged in apple growing in Iğdır province, the farmers stated that they do not conduct chemical control of weeds (Fig. 7).

When the farmers were asked "Mark the most important weeds that you think are a problem in your garden?", the types of weeds that farmers consider problematic, respectively, are *Alopecurus myosuroides* (80%), *Poa trivialis* (74%), *Hordeum murinum* (73%), *Setaria viridis* (72%), *Trifolium pratense* (70%), *Echinochloa crus-galli* (62%), *Trifolium repens* (60%), *Sorghum halepense* (56%), *Capsella bursa-pastoris* (48%), *Agropyron repens* (40%), and 64% of the farmers stated that there are other weeds (Table 5).

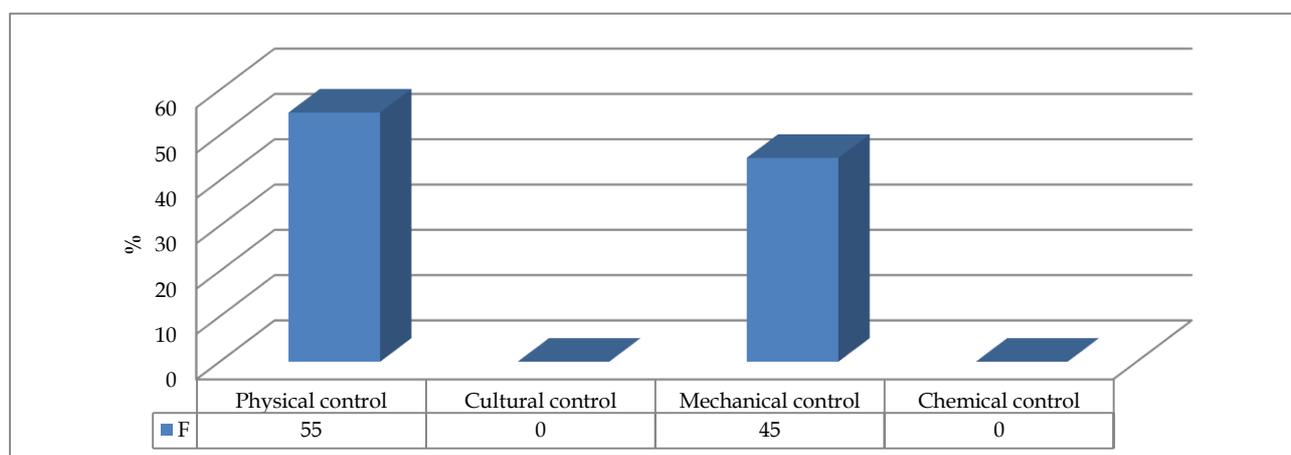


Figure 2. The percentage and frequency values of the answers to the question: What method of controlling weeds do you use?

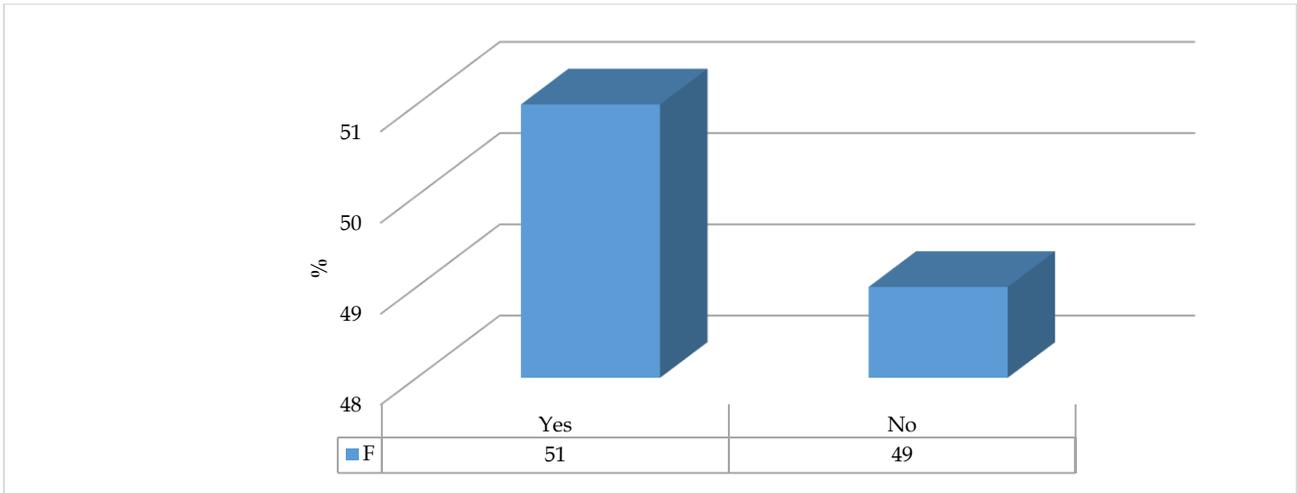


Figure 3. The percentage and frequency values of the answers to the question: Do you know what herbicides and pesticides are?

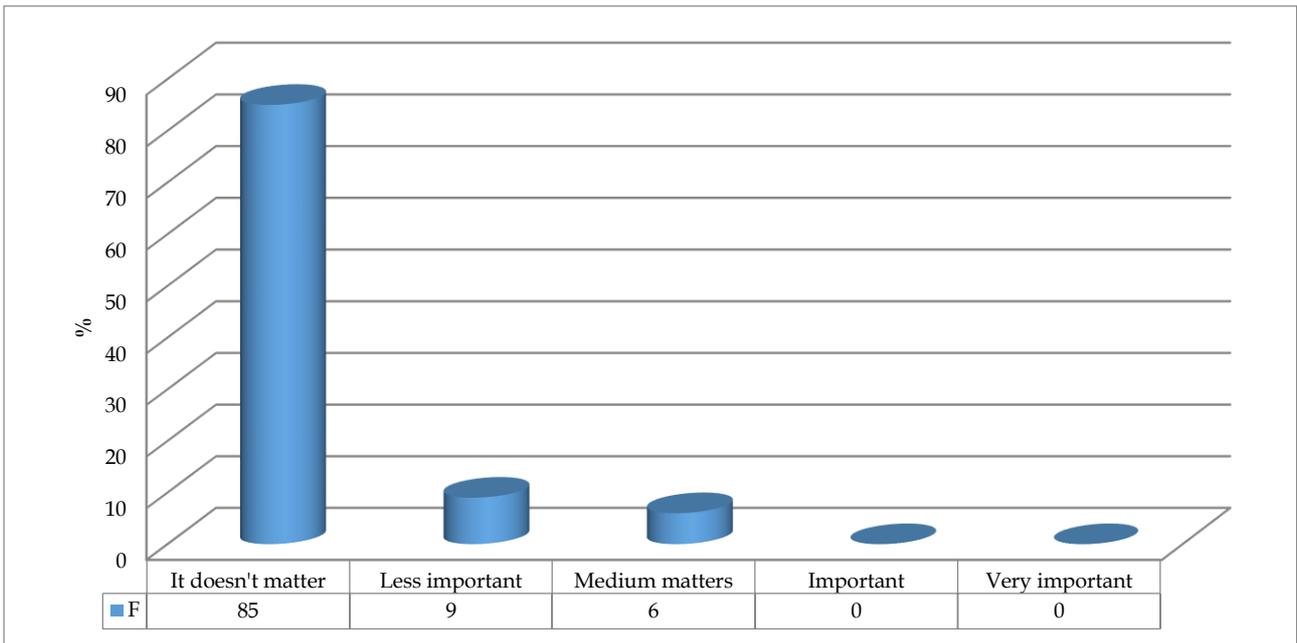


Figure 4. The percentage and frequency values of the answers to the question: How important is the weed problem for yield?

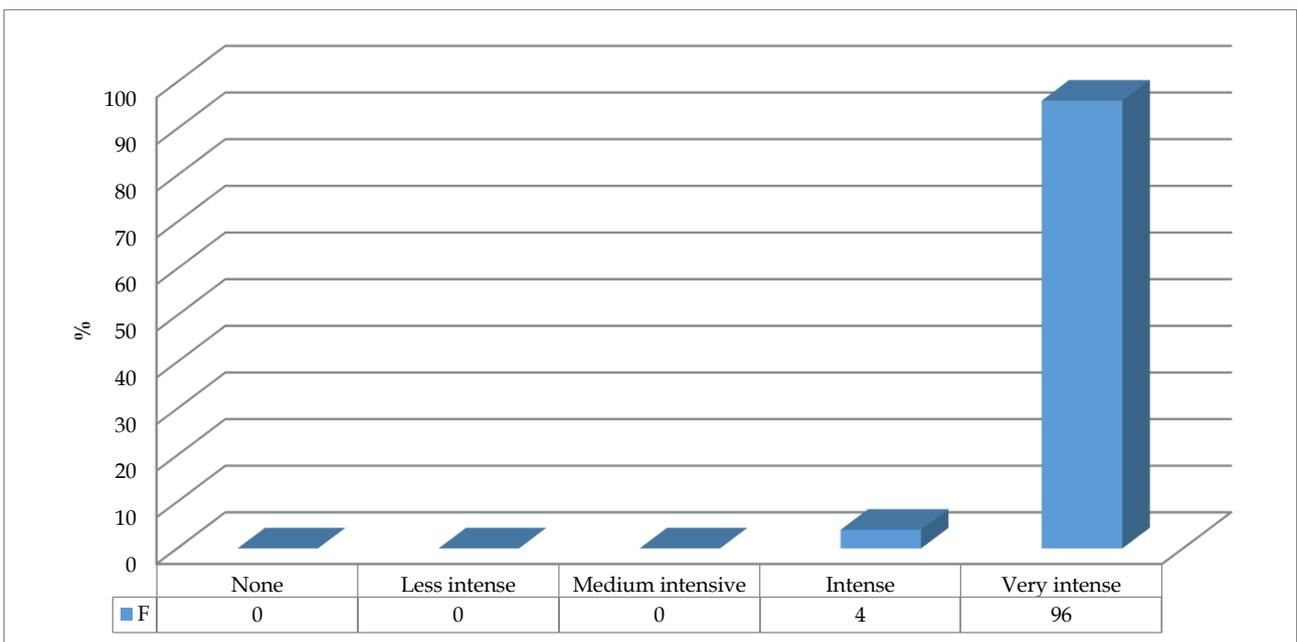


Figure 5. The percentage and frequency values of the answers to the question: What is the weed density in your garden?

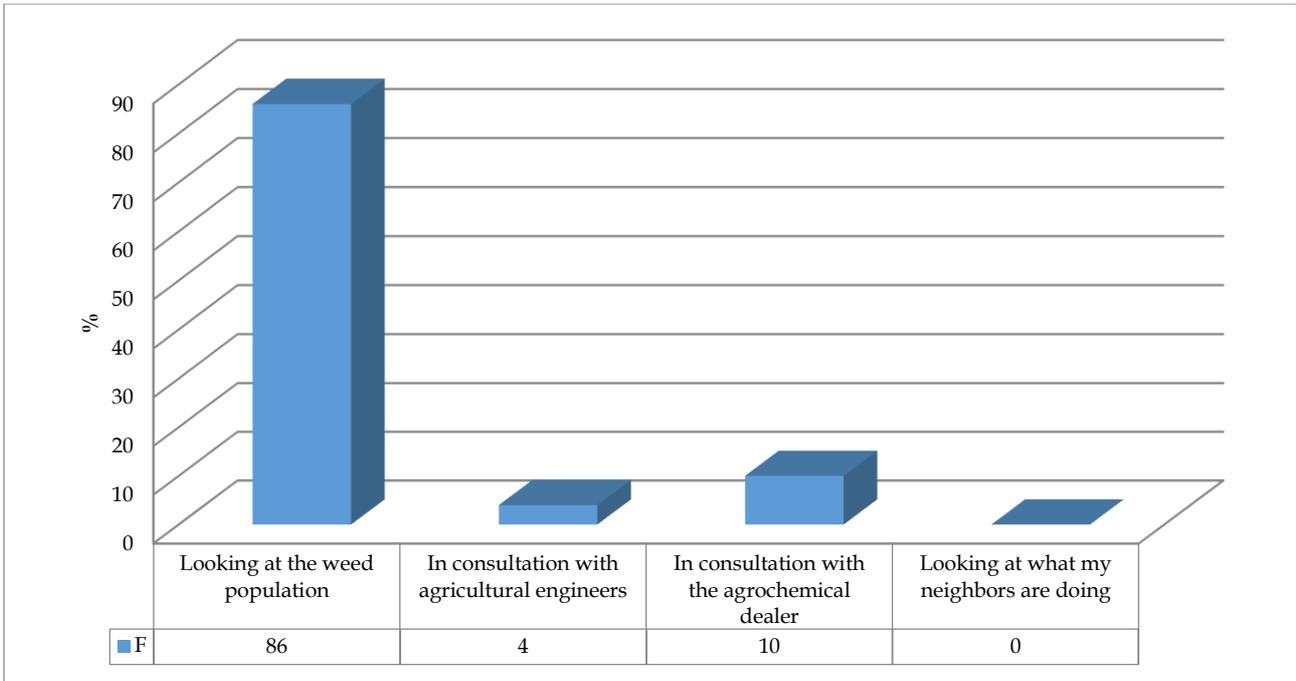


Figure 6. The percentage and frequency values of the answers to the question: How do you make the decision to fight against weeds in your apple orchard?

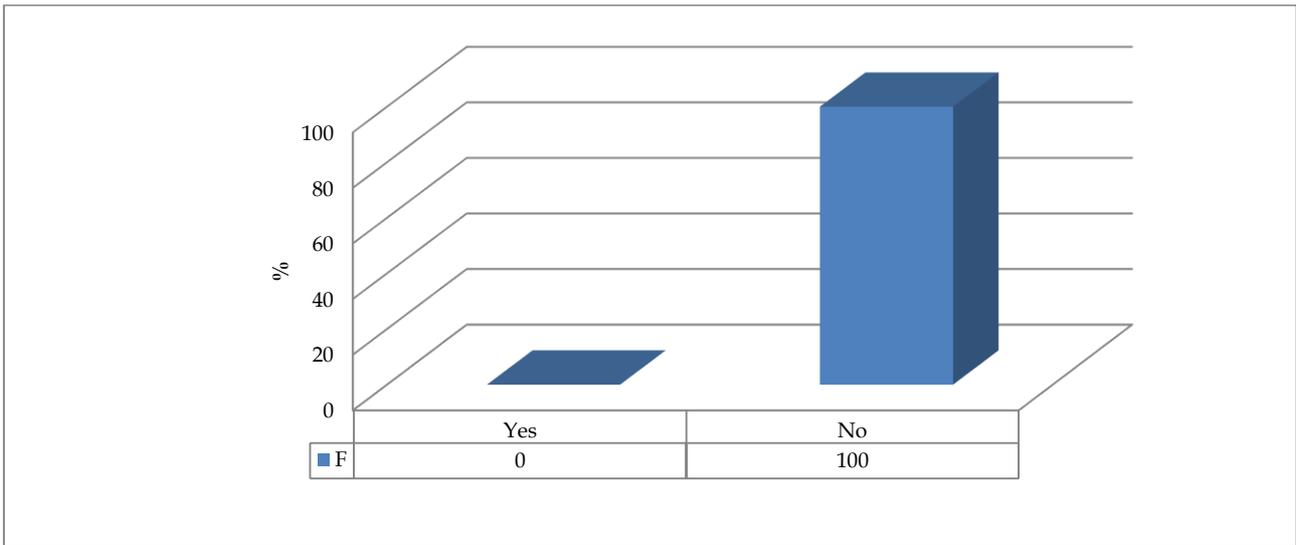


Figure 7. The percentage and frequency values of the answers to the question: Do you do chemical control of weeds?

Table 5. Do you mark the most important weeds that you think are a problem in your garden? Percentage and frequency values of the answers to the question above.

Weeds	frequency	%
<i>Trifolium pratense</i> L.	70	70
<i>Steria viridis</i> L.	72	72
<i>Alopecurus myosuroides</i> L.	80	80
<i>Trifolium repens</i> L.	60	60
<i>Sorghum halepense</i> (L.) Pers.	56	56
<i>Poa trivialis</i> L.	74	74
<i>Agropyron repens</i> L.	40	40
<i>Capsella bursa-pastoris</i> (L.) Medik.	48	48
<i>Echinochloa crus-galli</i> (L.) P. Beauv	62	62
<i>Hordeum murinum</i> L.	73	73
Other	64	64

4. Conclusions and Recommendations

Apple is widely consumed because of its high antioxidant content and as it contains important nutrients and vitamins. Due to the high adaptability of apples to different ecologies, it is produced in many countries around the world. It ranks first among the world fruit production. In our country, it is in the third place among the countries producing apples in the world. Apple, which is of great importance for Türkiye, is directly or indirectly affected by diseases, pests, and weeds. It is a known fact that weeds negatively affect fruit yield and quality in orchards. For this reason, weed control in apple cultivation has taken its place among indispensable agricultural practices with the increase in production areas. The basic principle of controlling weeds is to know the weed species and their biology well. For this reason, it is important to determine the weed species, their frequency and density, which are the problems in apple orchards in Iğdır

province, as well as to determine the approaches and control methods of the regional farmers in solving the weed problems.

As a result of the surveys, a total of 53 weed species belonging to 15 families, including 1 parasite, 2 narrow-leaved and 12 broad-leaved, were identified. The highest number of weeds among these identified families are Asteraceae (12 species), Poaceae (12 species), and Brassicaceae (9 species). Among the detected weeds, there are 1 parasite, 14 narrow-leaved, and 38 broad-leaved weed species.

Among the weeds detected in the surveys, the first 5 weed species with the highest incidence, respectively, are *Bromus tectorum* (84%), *Echinochloa crus-galli* (84%), *Trifolium pratense* (82%), *Sorghum halepense* (80), and *Setaria viridis* (78%). The 5 weed species with the lowest frequency of occurrence were listed as *Mentha arvensis* (8%), *Sinapis arvensis* (8%), *Erysimum repandum* (6%), *Carduus nutans* (4%), and *Adonis flammea* (2 %) (Table 4).

Among the detected weeds, the first 5 weed species with the highest density, respectively, are *Trifolium pratense* (76.44 plants/m²), *Setaria viridis* (74.62 plants/m²), *Alopecurus myosuroides* (70.96 plants/m²), *Trifolium repens* (69.8 plants/m²), and *Sorghum halepense* (69.04 plants/m²). The 5 weed species with the lowest density are *Mentha arvensis* (1.79 plants/m²), *Anthemis cretica* (62 plants/m²), *Adonis flammea* (0.6 plants/m²), *Erysimum repandum* (0.4 plants/m²), and *Carduus nutans* (0.28 plants/m²) (Table 4).

As a result of the survey conducted with the farmers engaged in apple growing in Iğdır, 40% of the farmers stated that they do farming so that their land would not be empty and 30% stated that they do farming to earn additional income. A little more than half of the farmers stated that they have knowledge about herbicides and pesticides. Nearly half of the farmers stated that they have been growing apples for a long time and all farmers used the flood irrigation method in apple growing. 70% of the farmers engaged in apple cultivation stated that they have never attended any training or meeting organized by agricultural organizations on apple farming and 79% of them stated that they do not follow the farmer training programs on television.

46% of the farmers engaged in apple growing in Iğdır stated that they rarely met with the engineers in the agricultural organization and 35% stated that they never met. 41% of the farmers who participated in the survey stated that they were satisfied with the apple yield. More than half of the apple producers participating in the survey stated that the most important problem in their gardens was insect pests, 42% stated that diseases and 3% stated that weeds were the problem. In addition, 96% of the farmers stated that weeds are very dense in apple orchards and 85% of them stated that weeds are not important for the yield.

The types of the weeds considered as problematic by the farmers engaged in apple production in Iğdır province, respectively, are *Alopecurus myosuroides* (80%), *Poa trivialis* (74%), *Hordeum murinum* (73%), *S. viridis* (72%), and *Trifolium pratense* (70%).

None of the farmers stated that they use chemical control against weeds. In addition, when the opinions of

the farmers were taken, they stated that they mow the weeds in the apple orchards and use them to feed their livestock.

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