



Determination of weed species, their frequency and densities in cherry orchards in Kahramanmaraş province, Turkey

Kahramanmaraş ili kiraz bahçelerinde bulunan yabancı ot türlerinin, yaygınlıklarının ve yoğunluklarının belirlenmesi

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ÖZET / ABSTRACT

Aims: In order to achieve successful chemical control of weeds, the species and density of weeds should be known. The aim of this study was to determine the species, density, frequency and general coverage area of the weeds in cherry orchards in Kahramanmaraş province.

Methods and Results: This survey was conducted to determine the species, density and frequency of weeds in cherry orchards of Kahramanmaraş province (11 districts). It was determined that the density of the weeds in Andırın cherry orchards had the highest density followed by Dulkadiroglu, Göksun, Onikisubat, Turkoglu, Elbistan, Afsin, Ekinözü, Caglayanerit, Pazarcik and Nurhak districts, respectively. As for the average density of each weed species; *Elymus repens* (L.) Gould., *Cynodon dactylon* (L.) Pers. and *Sorghum halepense* (L.) Pers. were found to be very dense. The frequencies of *E. repens*, *S. halepense* and *C. Dactylon*; on the other hand, were calculated as between 33.40% and 66.80% in all districts. In addition, the frequency of *Equisetum arvense* L. was calculated to be higher than 50% in Göksun district alone. The general coverage of weeds; however, ranged from 20.0% to 42.0% for *E. repens*, *S. halepense*, *C. dactylon* and *E. arvense* species.

Conclusions: Research carried out in the cherry orchards in Kahramanmaraş revealed that one hundred and sixty-four weed species belong to thirty-three families. These are; one Pteridophyta, twenty-four Monocotyledons, and one hundred and thirty-nine Dicotyledons. Weed density, frequency and covering area in the cherry orchards were found to be different among districts. However, weed species in Andırın were more intense than in other districts. Also, *E. arvense* was found to be important only in Göksun district.

Significance and Impact of the Study: The density of weed species determined in cherry orchards in Kahramanmaraş province has been shown to vary from one district to the other. Weed species in rhizome and stolon root in terms of density is an important threat for cherry trees. Broad-leaved weed species were very dense in young cherry orchards; whereas, narrow-leaved weed species were found to be dense in older orchards aged 15 and over. In controlling weeds, especially narrow and broad-leaved weeds should be targeted.

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INTRODUCTION

Turkey is a considerable fruit producer and its ecological condition are highly suitable to increase the production substantially (Agaoglu et al., 2010). According to the reports of FAO (2017), Turkey was ranked as the first cherry producer in the world with 627.132 tons of production annually, which is followed by US with 398.140 and Iran with 140.081 tons. On the other hand, the most three productive cities in Turkey were İzmir, Konya and Bursa with 57.892, 68.204 and 52.235 tons in a year respectively, while Kahramanmaraş was ranked as the 17th with 10.793 tons of production (TUIK, 2018).

Many factors such as insects, disease and weeds affect on the yield and quality of the cherry production. Cherry orchards infested with a variety of annual and perennial weeds, which competing with the trees for water and nutrients. Competition for these resources is greater concern with young trees because weeds can reduce their growth, vigor, and delay fruit production (Ogawa and English, 1991).

According to results of survey in the fruit nurseries in different regions of Turkey the frequency of weeds; *Stelleria media*, *Matricaria chamomilla*, *Oxalis* spp., *Cyperus* spp., *Poa annua* and *Lactuca serriola* observed more than 50 % in the Adana, Antalya, Gaziantep, Hatay, Icel and Kahramanmaraş (Kadioglu and Ulug, 1993). The highest density of monocotyledon and dicotyledon weeds in cherry orchards were determined in Aydın, Bahkesir, Canakkale, Denizli, İzmir, Kütahya, Manisa, Mugla and Usak (Uzun, 1995). The weed species; *Artemisia vulgaris*, *Convolvulus arvensis*, *Chenopodium album*, *Amaranthus* spp., *Sonchus* spp., *Alopecurus myosuroides*, *Capsella bursa-pastoris*, *Sinapis arvensis*, *Xanthium strumarium* and *S. halepense* were found high density in Amasya, Corum, Kastamonu, Samsun, Sinop and Tokat (Kasa, 1995). In the other study, monocotyledon weeds such as *E. repens*, *A. myosuroides*, *Avena* spp., *Bromus* spp., *C. rotundus* and dicotyledon weeds; *A. retroflexus*, *Anchusa arvensis*, *Anthemis tinctorial*, *A. vulgaris*, *C. bursa-pastoris*, *C. album*, *C. arvensis* were found densely in Turkey cherry orchards (Tepe, 1997; Anonymous, 2011, 2017b; Özdem et al., 2014).

In the other countries; The weed species in cherry orchards in North Carolina were; *Euphorbia humistrata*, *E. maculate*, *O. stricta*, *Cardamine hirsute*, *Phyllanthus tenellus*, *Ecliptica prostrata* and *Senecio vulgaris* (Gina and Neal, 2000). According to Dastgheib and Frampton (2000), *Malva* spp., *Solanum nigrum*, *C. album*, *A. retroflexus* and *Cirsium arvense* determined to be intense in Nelson, New Zealand. In Pilovdiv of Bulgaria

the weed species found dense as follow: *Veronica hederifolia*, *Stelleria media*, *Apera spica venti*, *Lamium purpureum*, *S. vulgaris*, *Sonchus oleraceus*, *E. canadensis*, *C. bursa-pastoris*, *S. asper*, *L. amplexicaule*, *A. retroflexus*, *X. strumarium*, *P. oleracea*, *Polygonium aviculare*, *Setaria viridis* and *L. serriola* (Rankova et al., 2009). Perennial and annual weeds caused problems on the fruits in Nigeria, perennial species were *Commelina benghalensis*, *C. dactylon*, *Digitaria scalarum*, *C. esculentus*, *C. rotundus*, *Eleusine indica*, *S. incanum* and annual species were *A. spinosus*, *C. album*, *S. nigrum*, *Avena fatua*, *Ageratum conyzoides* and *P. aviculare* (Hamma and Ibrahim, 2013). In another survey research in cherry orchards of India the weeds that were commonly; *C. album*, *C. benghalensis*, *O. corniculata*, *A. conyzoides*, *Parthenium hysterophorus*, *Duchesnea indica*, *Rosa moschata*, *Imperata cylindrica*, *Paspalum distichum* and *C. compressus* (Naidu, 2012; Korlapati et al., 2015). In California cherry orchards the weeds; *Bromus diandru*, *Conyza bonariensis*, *Echinochloa crus-galli*, *P. dilatatum*, *Festuca arundinacea*, *Amsinckia* spp., *Gnaphalium* spp., *Malva parviflora* and *C. bursa-pastoris* were found intense (Anonymous, 2019).

Before control the weeds, the first step should be right weed species determination. Because different weed species respond to different control methods. The challenge without recognizing weeds will be unsuccessful and this will cause waste time, money and environmental pollution with herbicide. The most susceptible phase of the weeds life cycle for the chemical control is their 4 to 7 leaves stages. Therefore, recognizing the life stages of the weed will help in determining the control methods. For all this reasons; we detected species, densities, frequency and general coverage of weeds in the cherry orchards in Kahramanmaraş province of Turkey.

MATERIALS and METHODS

In the study, surveys were applied at 2018 in the cherry orchards of Kahramanmaraş province (Afsin, Andırın, Caglayancerit, Dulkadiroglu, Ekinözü, Elbistan, Göksun, Nurhak, Onikisubat, Pazarcık and Türkoglu districts). On Table 1 the survey studies applied were shown. Due to both summer and winter weeds grew in the cherry orchards, a total of 1307 samples obtained in two different seasons.

This survey was conducted according to the cherry production area in 11 districts. The distance between two orchards were more than 3 km and the samples were taken starting from 15 m inside the orchard edge. In each 1 da area, 4 frames (1 m²) were used and weeds

obtained and counted (Odum, 1971; 1983). The number of weeds in 1 m² calculated by dividing the total number of each species. Weed density calculated by using the formula:

$$\text{Density} = B/n \text{ formula (Günçan, 2014)} \quad (1)$$

Here; B= Total weeds number in the sample,
n= Number of sample.

As suggested by Üstüner and Günçan (2002), density scale used as follows;

Density scale,

A. High dense (average more than 10 weeds/m²)

$$\text{Frequency (\%)} (F) = \frac{\text{Number of surveyed locations where a species occurred}}{\text{Number of total surveyed locations}} \times 100 \quad (2)$$

$$\text{General Coverage (\%)} (GC) = \frac{\text{Coverage of a weed species in survey areas}}{\text{Number of total surveyed locations}} \quad (3)$$

B. Dense (average 1-10 weeds/m²)

C. Mid dense (average 0.1-1 weeds/m²)

D. Low dense (average of 0.01 to 0.1 weeds/m²)

E. Rare (average of less than 0.01 weeds/m²)

In the counting of weeds, all of the broad-leaved weeds were counted as one plant and in narrow-leaved weeds, one stem was counted as one plant.

Species, numbers, frequency and general coverages of weeds recorded obtained data calculated to using the following formulas:

$$\text{Special Coverage (\%)} (SC) = \frac{\text{Coverage of a weed species where a species occurred}}{\text{Number of total surveyed locations}} \quad (4)$$

(Odum, 1971 and 1983; Uygur, 1997).

The weed species identified by using "Flora of Turkey and East Aegean Islands; Weeds of the West " (Davis, 1965-1985; Uygur et al., 1986; Whitson et al., 1992).

Table 1. Surveyed districts in the area of cherry plantation and the number of frames in the study

Districts	Cherry plantation area (da)	Number of frame
Afsin	300	76
Andırın	4000	188
Caglayancerit	570	130
Dulkadiroglu	2000	94
Ekinözü	645	148
Elbistan	500	124
Göksun	1230	240
Nurhak	60	43
Onikisubat	750	153
Pazarcık	51	32
Türkoglu	380	79
Total	10486	1307

(Anonymous, 2017a).

The first survey conducted in April and May and the second survey in August and September in 2018 (Figure, 1).

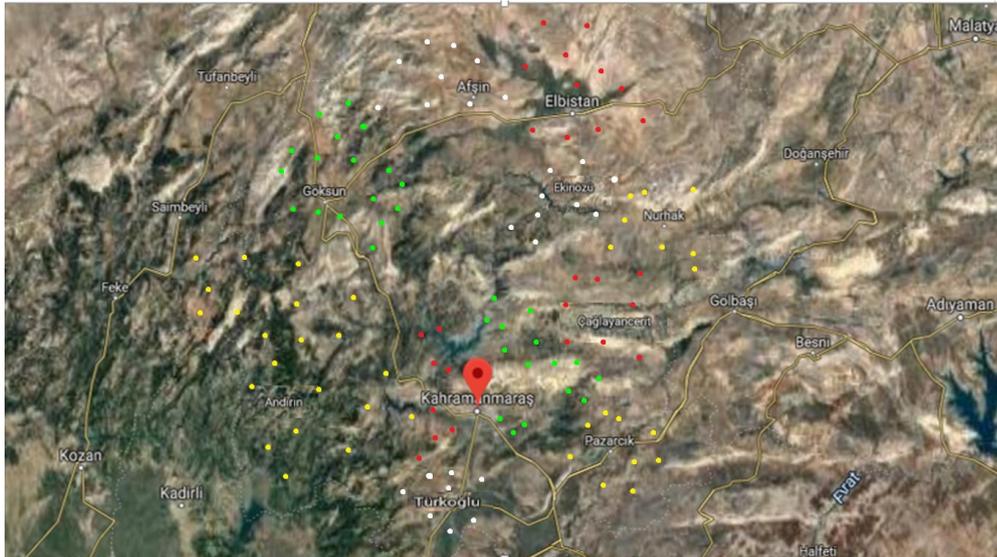


Figure 1. Satellite view of the surveyed area and survey points in Kahramanmaraş cherry orchards.

RESULTS and DISCUSSION

This research carried out in Kahramanmaraş region of Turkey in 2018. The districts were Afsin, Andırın, Caglayancerit, Dulkadiroglu, Ekinözü, Elbistan, Gökşun, Nurhak, Onikisubat, Pazarçık and Türkoğlu (Table 2). In this study, the range, density and frequency of weeds determined in the cherry orchards. In the surveys 164 weed species belong to 33 families, including 1 Pteridophyta, 24 Monocotyledon and 139 Dicotyledone

were detected.

The density of all weeds were 92.59 weed/m². The maximum density of weed species found in Andırın (166.72 weed/m²) followed by Dulkadiroglu (139.35), Gökşun (125.88), Onikisubat (104.16), Türkoğlu (81.46), Elbistan (76.65), Afsin (76.61), Ekinözü (74.54), Caglayancerit (72.04), Pazarçık (51.43) and Nurhak (49.64).

Table 2. The number of species and families of the weeds caused problems on the cherry orchards in Kahramanmaraş

Districts	Number of families	Number of species
Afsin	23	66
Andırın	33	164
Caglayancerit	21	65
Dulkadiroglu	29	153
Ekinözü	20	58
Elbistan	23	59
Gökşun	27	119
Nurhak	9	35
Onikisubat	30	115
Pazarçık	11	34
Türkoğlu	24	75

The weeds in the cherry orchards in Kahramanmaraş were evaluated according to the survey results.

The very dense (weed dense>10) weed species were; 11.32 weed/m² for *E. repens*, 10.06 for *C. dactylon* and 10.03 for *S. halepense*. Also as dense (weed dense 1-10) weeds were determined; 2.44 for *A. myosuroides*, 2.10 *Dactylis glomerata*, 1.64 *X. strumarium*, 2.24 *Bromus*

arvensis, 1.86 *Rumex crispus*, 1.52 *C. arvensis*, 1.72 *P. aviculare*, 1.32 *L. serriola*, 1.54 *S. viridis*, 1.22 *M. chamomilla*, 1.45 *Cardaria. draba ssp. draba*, 1.40 *Phragmites australis*, 1.36 *C. bursa-pastoris*, 1.32 *E. arvensis*, 1.28 *Lolium multiflorum*, 1.26 *Aegliops*

columnaris, 1.20 *A. retroflexus*, 1.26 *Digitaria sanguinalis*, 1.24 *P. canariensis*, 1.15 *A. cylindrica*, 1.12 *Polygonum aviculare*, 1.12 *X. spinosum*, 1.12 *C. bursa-pastoris*, 1.10 *C. arvensis*, 1.07 *Matricaria perforata*, 1.06 *Plantago lanceolata*, 1.09 *S. nigrum* and 1.00 for *P. annua*.

Frequency of *E. repens*, *S. halepense* and *C. dactylon* were between 33.40 and 66.80 % in the all districts. Also Frequency of *E. arvense* was more than 50 % only in Göksun district. Coverage of the weeds varied from 20.0 to 42.0 % for *E. repens*, *S. halepense* *C. dactylon* and *E. arvense* species.

Afsin district

In Afsin cherry orchards, 66 different weeds belong to 23 families were determined. The density of weed species were 76.61 weed/m². In this area, *E. repens*, *C. dactylon* and *S. halepense* were very dense, while *A. columnaris*, *A. cylindrica*, *A. myosuroides*, *A. retroflexus*, *A. fatua*, *B. arvensis*, *C. arvense*, *C. arvensis*, *D. glomerata*, *L. serriola*, *L. multiflorum*, *M. chamomilla*, *M. perforata*, *S. nigrum*, *P. australis* and *X. strumarium* were dense (Table 3). The frequency weed species were 50.41 % for *E. repens*, 48.73 % *S. halepense* and 46.13 % *C. dactylon*. General coverage of weeds were 39.26 % for *S. halepense*, 27.95 % *E. repens* and 25.37 % *C. dactylon*.

Table 3. Weed density frequency and general coverage of weeds in Afsin

Weed species	Density (weed/m ²)	Frequency (%)	Coverage (%)
<i>Elymus repens</i> (L.) Gould.	10.96	50.41	27.95
<i>Sorghum halepense</i> (L.) Pers.	10.75	48.73	39.26
<i>Cynodon dactylon</i> (L.) Pers.	10.70	46.13	25.37
Others	44.20	-	-
Total	76.61	-	-

Andırın district

In Andırın cherry orchards 164 different weeds belong to 33 families were determined. The density of weed species in this district were calculated to be 166.72 weed/m². In this area, *E. repens*, *C. dactylon* and *S. halepense* were very dense, while *Achillea biebersteinii*, *A. millefolium*, *Acroptilon repens*, *A. arvensis*, *A. columnaris*, *A. cylindrica*, *Allium rotundum*, *A. myosuroides*, *A. blitoides*, *A. retroflexus*, *A. fatua*, *A. sterilis*, *B. arvensis*, *B. tectorum*, *C. bursa-pastoris*, *C. draba* ssp. *draba*, *Centaurea solstitialis* subsp. *solstitialis*, *C. album*, *C. arvense*, *C. arvensis*, *C. rotundus*, *D. glomerata*, *Daucus carota*, *D. sanguinalis*, *E. crus-galli*, *E.*

arvense, *Hordeum murinum*, *L. serriola*, *L. multiflorum*, *M. neglecta*, *M. sylvestris*, *M. chamomilla*, *M. perforata*, *Papaver rhoeas*, *P. orientale*, *P. canariensis*, *P. australis*, *P. annua*, *P. aviculare*, *P. oleracea*, *R. crispus*, *S. viridis*, *Silybum marianum*, *S. arvensis*, *S. nigrum*, *Sonchus arvensis*, *S. oleraceus*, *Taraxacum officinale*, *T. scaturiginosum*, *T. terrestris*, *Turgenia latifolia*, *Urtica urens*, *X. spinosum* and *X. strumarium* were calculated dense (Table 4). The frequency of weed species were 64.72 % for *E. repens*, 62.48 % *S. halepense* and 53.14 % *C. dactylon*. General coverage of weeds were 41.79 % for *S. halepense*, 38.58 % *E. repens* and 35.51 % *C. dactylon*.

Table 4. Weed density, frequency and general coverage of weeds in Andırın

Weed species	Density (weed/m ²)	Frequency (%)	Coverage (%)
<i>Sorghum halepense</i> (L.) Pers.	12.84	62.48	41.79
<i>Elymus repens</i> (L.) Gould.	12.35	64.72	38.58
<i>Cynodon dactylon</i> (L.) Pers.	11.90	53.14	35.51
<i>Dactylis glomerata</i> L.	6.10	36.68	30.73
<i>Setaria viridis</i> (L.) P.Beauv.	5.36	31.92	27.53
<i>Alopecurus myosuroides</i> Huds.	4.08	30.20	24.70
<i>Bromus tectorum</i> L.	3.20	27.81	21.50
<i>Bromus arvensis</i> L.	3.14	27.10	21.13
Others	107.75	-	-
Total	166.72	-	-

Caglayancerit district

In Caglayancerit cherry orchards, 65 different weeds belong to 21 families were determined. The density of weed species in this district were calculated 72.04 weed/m². In this area, *E. repens* was very dense, while *A. columnaris*, *A. myosuroides*, *A. retroflexus*, *A. fatua*, *B. arvensis*, *C. bursa-pastoris*, *C. draba* ssp. *draba*, *C. album*, *C. arvense*, *C. arvensis*, *C. dactylon*, *D. glomerata*, *L. serriola*, *L. multiflorum*, *M. chamomilla*, *M. perforata*, *S.*

halepense, *S. nigrum*, *S. viridis*, *P. lanceolate*, *P. canariensis*, *P. australis*, *R. crispus*, *T. officinale*, *X. spinosum* and *X. strumarium* were calculated dense (Table 5). The frequency of weed species were 53.27 % for *E. repens*, 41.35 % *C. dactylon* and 34.82 % *S. halepense*. General coverage of weeds were 37.54 % for *E. repens*, 31.66 % *S. halepense* and 30.52% *C. dactylon*.

Table 5. Weed density, frequency and general coverage of weeds in Caglayancerit

Weed species	Density (weed/m ²)	Frequency (%)	Coverage (%)
<i>Elymus repens</i> (L.) Gould.	10.68	53.27	37.54
<i>Cynodon dactylon</i> (L.) Pers.	8.80	41.35	30.52
<i>Sorghum halepense</i> (L.) Pers.	7.78	34.82	31.66
<i>Alopecurus myosuroides</i> Huds.	2.70	16.27	10.39
<i>Xanthium strumarium</i> L.	2.10	14.25	11.20
Others	39.98	-	-
Total	72.04	-	-

Dulkadiroglu district

In Dulkadiroglu cherry orchards 153 different weeds belong to 29 families were determined. The density of weed species in this district were calculated 139.37 weed/m². In this area, *E. repens*, *C. dactylon* and *S. halepense* were very dense, while *A. millefolium*, *A. repens*, *A. arvensis*, *A. tricornis*, *A. columnaris*, *A. cylindrica*, *A. myosuroides*, *A. blitoides*, *A. retroflexus*, *A. majus*, *A. sterilis*, *B. arvensis*, *B. tectorum*, *C. bursa-pastoris*, *C. draba* ssp. *draba*, *Carduus nutans*, *C. solstitialis* subsp. *solstitialis*, *C. album*, *C. arvense*, *C. arvensis*, *C. rotundus*, *D. glomerata*, *D. sanguinalis*, *E.*

crus-galli, *H. murinum*, *L. serriola*, *L. multiflorum*, *M. neglecta*, *M. sylvestris*, *M. chamomilla*, *M. perforata*, *P. rhoeas*, *P. orientale*, *P. canariensis*, *P. australis*, *P. lanceolata*, *P. annua*, *P. aviculare*, *P. oleracea*, *R. crispus*, *S. viridis*, *S. marianum*, *S. arvensis*, *S. nigrum*, *S. asper*, *Tamarix smyrnensis*, *T. terrestris*, *U. urens*, *X. spinosum* and *X. strumarium* were calculated dense (Table 6). The frequency for weed species were 61.40% for *E. repens*, 60.73 % *S. halepense*, 56.93 % *C. dactylon* and 30.25 % *D. glomerata*. General coverage of weeds were 40.85 % *S. halepense*, 37.80 % *E. repens*, 34.18 % *C. dactylon* and 29.39 % *D. glomerata*.

Table 6. Weed density, frequency and general coverage of weeds in Dulkadiroglu

Weed species	Density (weed /m ²)	Frequency (%)	Coverage (%)
<i>Elymus repens</i> (L.) Gould.	11.70	61.40	37.80
<i>Sorghum halepense</i> (L.) Pers.	11.51	60.73	40.85
<i>Cynodon dactylon</i> (L.) Pers.	10.50	56.93	34.18
<i>Dactylis glomerata</i> L.	5.20	30.25	26.39
<i>Alopecurus myosuroides</i> Huds.	3.51	11.60	9.51
<i>Bromus arvensis</i> L.	3.27	10.82	9.10
Others	93.68	-	-
Total	139.37	-	-

Ekinözü district

In Ekinözü cherry orchards 57 different weeds belong to 20 families were determined. The density of weed species in this district were calculated 74.54 weed/m². In this area, *E. repens* was very dense, while *A. arvensis*, *A. columnaris*, *A. cylindrica*, *A. myosuroides*, *A. retroflexus*,

A. fatua, *B. arvensis*, *C. bursa-pastoris*, *C. arvense*, *C. arvensis*, *C. dactylon*, *D. sanguinalis*, *L. serriola*, *L. multiflorum*, *M. chamomilla*, *M. perforata*, *P. canariensis*, *P. australis*, *P. lanceolata*, *P. aviculare*, *S. viridis*, *S. nigrum*, *S. halepense*, *X. spinosum* and *X. strumarium* were calculated dense (Table 7). The

frequency for weed species were 59.43 % for *E. repens*, 40.62 % *S. halepense* and 33.25 % *C. dactylon*. General

coverage of weeds were 38.41 % for *E. repens*, 30.61% *C. dactylon* and 30.58 % *S. halepense*.

Table 7. Weed density, frequency and general coverage of weeds in Ekinözü

Weed species	Density (weed/m ²)	Frequency (%)	Coverage (%)
<i>Elymus repens</i> (L.) Gould.	11.10	59.43	38.41
<i>Sorghum halepense</i> (L.) Pers.	9.80	40.62	30.58
<i>Cynodon dactylon</i> (L.) Pers.	7.10	33.25	30.61
<i>Bromus arvensis</i> L.	4.19	16.39	8.09
<i>Alopecurus myosuroides</i> Huds.	2.70	11.20	6.85
<i>Xanthium spinosum</i> L.	2.10	4.19	2.43
Others	37.55	-	-
Total	74.54	-	-

Elbistan district

In Elbistan cherry orchards 59 different weeds belong to 23 families were determined. The density of weed species in this district were calculated 76.65 weed/m². In these cherry orchards *E. repens* and *C. dactylon* were very dense, while *A. columnaris*, *A. myosuroides*, *A. retroflexus*, *A. fatua*, *B. arvensis*, *C. arvense*, *C. arvensis*, *L. serriola*, *L. multiflorum*, *M. chamomilla*, *M. perforata*,

P. lanceolata, *P. canariensis*, *P. australis*, *R. crispus*, *S. viridis*, *S. nigrum*, *S. halepense* and *X. strumarium* were calculated dense (Table 8). The frequency for weed species were 65.35 % for *E. repens*, 54.27 % *C. dactylon* and 33.46 % *S. halepense*. General coverage of weeds were 39.60 % for *E. repens*, 35.64 % *C. dactylon* and 30.15 % *S. halepense*.

Table 8. Weed density, frequency and general coverage of weeds in Elbistan

Weed species	Density (weed/m ²)	Frequency (%)	Coverage (%)
<i>Elymus repens</i> (L.) Gould.	11.80	65.35	39.60
<i>Cynodon dactylon</i> (L.) Pers.	11.20	54.27	35.64
<i>Sorghum halepense</i> (L.) Pers.	8.90	33.46	30.15
<i>Aegilops columnaris</i> Zhuk.	2.86	4.80	2.56
<i>Bromus arvensis</i> L.	2.23	5.63	4.29
<i>Xanthium strumarium</i> L.	2.18	4.25	3.70
Others	37.48	-	-
Total	76.65	-	-

Göksun district

In Göksun cherry orchards 119 different weeds belong to 27 families were determined. The density of weed species in this district were calculated 125.88 weed/m². In this area, *E. repens*, *C. dactylon*, *E. arvense* and *S. halepense* were very dense, while *A. repens*, *A. columnaris*, *A. cylindrica*, *A. rotundum*, *A. myosuroides*, *A. retroflexus*, *A. fatua*, *B. arvensis*, *B. tectorum*, *C. bursa-pastoris*, *C. draba ssp. draba*, *C. album*, *C. arvense*, *C. arvensis*, *D. glomerata*, *D. sanguinalis*, *E. crus-galli*, *H.*

murinum, *L. serriola*, *L. multiflorum*, *M. neglecta*, *M. sylvestris*, *M. chamomilla*, *M. perforata*, *P. lanceolata*, *P. canariensis*, *P. australis*, *P. annua*, *P. aviculare*, *R. crispus*, *S. viridis*, *S. nigrum* and *X. strumarium* were calculated dense (Table 9). The frequency of weed species were 66.80 % for *E. repens*, 61.45 % *C. dactylon* and 55.67 % *S. halepense*. General coverage of weeds were 40.32 % for *E. repens*, 38.90 % *S. halepense* and 34.59 % *C. dactylon*.

Table 9. Weed density, frequency and general coverage of weeds in Göksun

Weed species	Density (weed/m ²)	Frequency (%)	Coverage (%)
<i>Elymus repens</i> (L.) Gould.	13.10	66.80	40.32
<i>Cynodon dactylon</i> (L.) Pers.	12.30	61.45	34.59
<i>Sorghum halepense</i> (L.) Pers.	11.80	55.67	38.90
<i>Equisetum arvense</i> L.	10.87	50.26	30.57
<i>Dactylis glomerata</i> L.	4.30	21.58	19.53
<i>Digitaria sanguinalis</i> (L.) Scop	3.40	19.56	16.42
<i>Lolium multiflorum</i> L.	2.59	17.14	11.60
<i>Bromus arvensis</i> L.	2.44	16.56	12.70
<i>Alopecurus myosuroides</i> Huds.	2.20	15.62	12.97
<i>Aegilops cylindrica</i> Host.	2.09	11.46	10.26
Others	60.79	-	-
Total	125.88	-	-

Nurhak district

In Nurhak cherry orchards 35 different weeds belong to 9 families were identified. The density of weed species in this district were calculated 49.64 weed/m². In this area, *E. repens* were very dense, while, *A. columnaris*, *A. cylindrica*, *A. myosuroides*, *B. arvensis*, *C. arvense*, *C. dactylon*, *D. glomerata*, *L. serriola*, *M. perforata*, *P.*

canariensis, *R. crispus*, *S. halepense* and *X. strumarium* were calculated dense (Table 10). The frequency of occurrence for weed species were 51.73 % for *E. repens*, 47.82 % *S. halepense*, 40.65 % *C. dactylon*. General coverage of weeds were 42.85 % for *S. halepense*, 38.42 % *E. repens* and 30.79 % *C. dactylon*.

Table 10. Weed density, frequency and general coverage of weeds in Nurhak

Weed species	Density (weed/m ²)	Frequency (%)	Coverage (%)
<i>Elymus repens</i> (L.) Gould.	10.26	51.73	38.42
<i>Sorghum halepense</i> (L.) Pers.	6.85	47.82	42.85
<i>Cynodon dactylon</i> (L.) Pers.	6.80	40.65	30.79
<i>Dactylis glomerata</i> L.	2.10	13.14	11.25
Others	23.63	-	-
Total	49.64	-	-

Onikisubat district

In Onikisubat cherry orchards 111 different weeds belong to 26 families identified. The density of weed species were calculated 103.81 weed/m². In this area, *E. repens*, *C. dactylon* and *S. halepense* were very dense, while *A. repens*, *A. columnaris*, *A. cylindrica*, *A. myosuroides*, *A. bibersteinii*, *A. millefolium*, *A. retroflexus*, *A. tricornis*, *A. sterilis*, *B. arvensis*, *B. tectorum*, *C. bursa-pastoris*, *C. draba* ssp. *draba*, *C. nutans*, *C. solstitialis* subsp. *solstitialis*, *C. arvense*, *C. rotundus*, *D. carota*, *D. glomerata*, *D. sanguinalis*,

Eryngium bithynicum, *H. murinum*, *L. serriola*, *L. multiflorum*, *M. sylvestris*, *M. chamomilla*, *P. rhoeas*, *P. canariensis*, *P. australis*, *P. lanceolata*, *P. annua*, *P. aviculare*, *R. crispus*, *S. viridis*, *S. marianum*, *S. nigrum*, *T. smyrnensis*, *T. terrestris*, *T. latifolia*, *U. urens*, *X. spinosum* and *X. strumarium* were calculated dense (Table 11). The frequency of weed species were 61.25 % for *S. halepense*, 59.78 % *E. repens* and 58.72 % *C. dactylon*. General coverage of weeds were 41.57 % for *S. halepense*, 39.21 % *E. repens*, 37.56 % *C. dactylon*.

Table 11. Weed density, frequency and general coverage of weeds in Onikisubat

Weed species	Density (weed/m ²)	Frequency (%)	Coverage (%)
<i>Sorghum halepense</i> (L.) Pers.	11.06	61.25	41.57
<i>Cynodon dactylon</i> (L.) Pers.	10.85	58.72	37.56
<i>Elymus repens</i> (L.) Gould.	10.52	59.78	39.21
<i>Dacus carota</i> L.	4.20	9.27	3.89
<i>Setaria viridis</i> (L.) P.Beauv.	2.30	5.12	2.38
<i>Digitaria sanguinalis</i> (L.) Scop	2.10	4.32	2.48
<i>Alopecurus myosuroides</i> Huds.	2.05	6.80	5.21
Others	61.08	-	-
Total	104.16	-	-

Pazarcık district

In Pazarcık cherry orchards different 34 weed species belong to 11 families identified. The density of weed species were calculated 51.40 weed/m². In this area, *E. repens*, *C. dactylon* and were very dense, while *A. myosuroides*, *A. sterilis*, *B. arvensis*, *C. arvense*, *L.*

serriola, *P. canariensis*, *P. australis*, *R. crispus*, *S. halepense* and *X. strumarium* were calculated dense (Table 12). The frequency of weed species were 54.40 % for *E. repens*, 51.37 % *C. dactylon* and 34.58 % *S. halepense*. General coverage of weeds were 36.38 % for *E. repens*, 33.86 % *C. dactylon* and 32.85 % *S. halepense*.

Table 12. Weed density, frequency and general coverage of weeds in Pazarcık

Weed species	Density (weed/m ²)	Frequency (%)	Coverage (%)
<i>Elymus repens</i> (L.) Gould.	10.41	54.40	36.38
<i>Cynodon dactylon</i> (L.) Pers.	10.10	51.37	33.86
<i>Sorghum halepense</i> (L.) Pers.	8.10	34.58	32.85
<i>Xanthium strumarium</i> L.	1.56	5.83	6.14
Others	21.23	-	-
Total	51.40	-	-

Türkoglu district

In Türkoglu cherry orchards 75 different weed species belong to 24 families identified. The density of weed species were calculated 81.46 weed/m². In this area, *E. repens*, *C. dactylon* and *S. halepense* were very dense, while *A. repens*, *A. myosuroides*, *A. retroflexus*, *A. sterilis*, *B. arvensis*, *C. bursa-pastoris*, *C. nutans*, *C. solstitialis* subsp. *solstitialis*, *C. arvense*, *Chondrilla juncea*, *L. serriola*, *L. multiflorum*, *M. chamomilla*, *P. canariensis*, *P. australis*, *P. lanceolata*, *P. aviculare*, *R. crispus*, *S. nigrum*, *T. terrestris*, *U. urens* and *X. strumarium* were calculated dense (Table 13). The frequency of weed species were 63.71 % for *E. repens*, 58.82 % *S. halepense* and 53.35 % *C. dactylon*. General coverage of weeds were 39.45 % for *E. repens*, 36.84 % *S. halepense* and 32.83 % *C. dactylon*. In this study, species of weeds, density, frequency and general coverage determined in the cherry orchards in Kahramanmaraş province of Turkey. In the cherry orchards 164 weed species from 33 families detected.

One species of that belong to the ferns, 24 monocotyledonae and 139 dicotyledonae. The density of weeds were calculated as 92.59 (weed/m²) in Kahramanmaraş province. The maximum density of weed species were calculated in Andırın 166.72 (weed/m²) followed by Dulkadiroglu (139.35), Göksun (125.88), Onikisubat (104.16), Türkoglu (81.46), Elbistan (76.65), Afsin (76.61), Ekinözü (74.54), Caglayancerit (72.04), Pazarcık (51.43) and Nurhak (49.64).

The density of weeds were calculated high density in Kahramanmaraş cherry orchards as 11.32 (weed/m²) for *E. repens*, 10.06 *C. dactylon* and 10.03 *S. halepense*. Frequency of *E. repens*, *S. halepense* and *C. dactylon* were between 33.40 % and 66.80 % in the all districts. Also *E. arvense* was more than 50 % only in Göksun district.

Table 13. Weed density, frequency and general coverage of weeds in Türkoglu

Weed species	Density (weed/m ²)	Frequency (%)	Coverage (%)
<i>Elymus repens</i> (L.) Gould.	11.70	63.71	39.45
<i>Sorghum halepense</i> (L.) Pers.	10.90	58.82	36.84
<i>Cynodon dactylon</i> (L.) Pers.	10.40	53.35	32.83
<i>Dactylis glomerata</i> L.	2.35	12.85	11.26
<i>Alopecurus myosuroides</i> Huds.	2.10	10.20	8.68
Others	44.01	-	-
Total	81.46	-	-

Coverage of the weeds varied from 20.0 to 42.0 % for the species of *E. repens*, *S. halepense*, *C. dactylon* and *E. arvensis*. In addition, *A. myosuroides*, *D. glomerata*, *B. arvensis*, *R. crispus*, *X. strumarium*, *C. arvensis*, *P. aviculare*, *L. serriola*, *S. viridis*, *M. chamomilla*, *C. draba* ssp. *draba*, *P. australis*, *C. bursa-pastoris*, *L. multiflorum*, *A. columnaris*, *A. retroflexus*, *R. crispus*, *D. sanguinalis*, *P. canariensis*, *A. cylindrica*, *P. aviculare*, *X. spinosum*, *C. bursa-pastoris*, *C. arvensis*, *M. perforata*, *P. lanceolata*, *S. nigrum* and *P. annua* species determined as dense.

Kahramanmaraş is located in the Mediterranean region and Continental climate zones. Therefore, while Dulkadiroglu, Onikisubat, Pazarcık and Türkoglu district are located in the Mediterranean climate, Andırın and Caglayanerit are located in the transition climate. However, Göksun, Afsin, Elbistan, Nurhak and Ekinözü have a continental climate. Species number of the weeds in the region of Mediterranean were more than in continental region. In this study weed density, frequency and general coverage of some species determined separately according to districts. Perennial weeds that have rhizome and stolon were especially found very dense. Also, dodder observed on *X. strumarim*, *P. aviculare*, *S. halepense* and *Chondrilla juncea* during the surveys in cherry orchards.

According to the results of other studies on similar subject in Turkey; the study conducted in the Mediterranean region by Kadioglu and Ulu (1993) showed that densities of *Cyperus* spp. and *P. oleracea* were the most common weeds especially in the summer season, also frequency of *S. media*, *M. chamomille*, *Oxalis* spp., *P. annua* and *L. serriola* were more than 50 % in March and April. In another study in Izmir the results showed that *S. halepense*, *C. dactylon*, *E. crus-galli*, *C. rotundus* found very dense as narrow-leaved weeds and *A. retroflexus*, *A. vulgaris*, *C. bursa-pastoris*, *C. album*, *C. arvensis* were found broad-leaved weeds in cherry orchards (Tezcan et al., 2003). In Aydın province, 47 weed species belonging to 20 families reported by Ögüt while they have been rarely seen in Turkey. The reason is that these species not being commonly seen in the

Ögüt and Boz (2007) and frequency of weeds were 79.80 % for *S. media*, 63.60 % for *M. chamomilla*, 55.50 % for *O. corniculata*, 52.80 % for *P. annua* and 50.0 % for *L. serriola* in the dormant season. During summer season, frequencies of *P. oleracea*, *C. rotundus* and *Amaranthus* spp. were 87.80 %, 85.80 % and 63.30 %, respectively. Frequencies of *T. terrstris*, *C. dactylon*, *C. arvensis*, *D. sanguinalis*, *L. serriola*, *C. album*, *E. crus-galli* and *S. halepense* varied from 20 to 45 % while the other weeds were in between 2 and 10 %. The coverage of the weeds were 56.25 % for *P. oleracea*, 52.70 % for *C. rotundus*, 16.62 % for *C. dactylon*, 16.54 % for *Trifolium* spp., 13.39 % for *D. sanguinalis* and 12.74 % for *Amaranthus* spp. The weed species observed in the surveyed areas were found to be similar to earlier reports authored by Kadioglu and Ulu (1993), Tepe (1997), Ögüt and Boz (2007), Tezcan et al. (2003) and Anonymous (2011) whereas the density, frequency and general coverage were slightly different in proportion. This study found similar to other studies in terms of weed species in Turkey, but as numerical and proportional have been observed differences. The reasons for this difference due to some factors such as the altitude, soil structure, climate, irrigation system and plant communities of the region.

For the results of similar studies in the other countries, the study according by Dastgheib and Frampton (2000), *A. retroflexus*, *E. repens*, *C. album*, *C. arvensis*, *Malva* spp., *S. nigrum*, *C. album*, *A. retroflexus* and *C. arvensis* determined to be dense in cherry orchards. The species; *E. humistrata*, *E. maculate*, *C. hirsute*, *P. tenellus*, *E. prostrata*, *V. hederifolia*, *C. benghalensis*, *D. scalarum*, *C. esculentus*, *E. indica*, *S. incanum*, *I. cylindrica*, *Panicum* spp., *Mimosa* spp., *A. conyzoides*, *P. hysterophorus*, *D. indica*, *R. moschata* and *P. distichum* seen commonly in the cherry orchards studied by many groups (Gina and Neal, 2000; Rankova et al., 2009; Naidu, 2012; Hamma and Ibrahim, 2013, Korlapati et al., 2015). Although most of these weed species widely seen in various countries studies conducted in Turkey could be because of the climate conditions, soil chemical compounds and

altitudes of the region as well as the different agrosystem and irrigation systems used in the areas.

CONCLUSION

In Kahramanmaraş cherry orchards; *E. repens*, *C. dactylon* and *S. halepense* in terms of density, frequency and general coverage found to be very important. Weed species in Andırın were more than other districts. That because Pazarcık and Nurhak district have less cherry orchard area. At the same time these districts have continental climate. Also *E. arvense* was found importante only in Göksun district.

In young cherry orchards (3-7 years), the density of broad-leaved weeds were higher, whereas in middle and old orchards (15 and above) narrow-leaved weed density were higher. In other words, the density of narrow-leaved weeds in shade environments may be higher than that broad-leaved weeds. At the same time cherry may have allelopathic effect on broad-leaved weeds. Weed species, density, frequency and general coverage area can be vary from region to region and country to country.

ÖZET

Amaç: Yabancı otların kimyasal mücadelesinde başarılı sonuçlar almak için öncelikle yabancı ot türlerini ve yoğunluğunun bilinmesi gerekir. Bu çalışmada Kahramanmaraş ili kiraz bahçelerinde yabancı ot türünü, yoğunluğunu, sıklığını ve genel kaplama alanını tespit etmek amaçlanmıştır.

Yöntem ve Bulgular: Bu araştırma, Kahramanmaraş ili (11 ilçe) kiraz bahçelerinde yabancı ot türlerini, yoğunluğunu ve rastlama sıklığını belirlemek amacıyla yapılmıştır. Elde edilen sonuçlara göre, Andırın kiraz bahçelerinde yabancı otların yoğunluğu bakımından en yüksek yoğunluğa sahip olduğu tespit edildi ve bunu sırasıyla Dulkadiroğlu, Göksun, Onikişubat, Turkoğlu, Elbistan, Afşin, Ekinözü, Çağlayanerit, Pazarcık ve Nurhak ilçeleri takip etti. Her yabancı ot türünün ortalama yoğunluğuna gelince; *Elymus repens* (L.) Gould., *Cynodon dactylon* (L.) Pers. ve *Sorghum halepense* (L.) Pers. çok yoğun bulundu. Öte yandan, *E. repens*, *S. halepense* ve *C. dactylon* rastlama sıklığı tüm ilçelerde % 33.40 ile % 66.80 arasında hesaplanmıştır. Ayrıca, *Equisetum arvense* L. rastlama sıklığı sadece Göksun ilçesinde % 50'den fazla görülmüştür. Bununla birlikte, yabancı

otların genel kaplama alanı *E. repens*, *S. halepense*, *C. dactylon* ve *E. arvense* türleri için % 20.0 ila 42.0 arasında değişmiştir.

Genel Yorum: Kahramanmaraş'taki kiraz bahçelerinde yapılan araştırmalarda, yüz altmış dört yabancı ot türü, otuz üç familyaya ait olduğu belirlenmiştir. Bunlar, bir Pteridophyta, yirmi dört Monokotiledon ve yüz otuz dokuz Dikotiledon'dur. Kiraz bahçesinde yabancı ot yoğunluğu, rastlama sıklığı ve kaplama alanı ilçelere göre farklı bulunmuştur. Ancak Andırın'daki yabancı ot türleri diğer ilçelerden daha fazla yoğun bulunmuştur. Ayrıca *E. arvense* sadece Göksun ilçesinde önemli bulunmuştur.

Çalışmanın Önemi ve Etkisi: Kahramanmaraş ili kiraz bahçelerinde tespit edilen yabancı ot tür yoğunluğu ilçeden ilçeye değişkenlik gösterdiği bu çalışmayla ortaya konmuştur. Yabancı ot tür yoğunluğu açısından rizom ve stolon köke sahip yabancı ot türleri kiraz ağaçları için önemli bir tehdittir. Genç kiraz bahçelerinde geniş yapraklı yabancı ot türleri çok yoğunken 15 ve üzeri yaşlı bahçelerde ise dar yapraklı yabancı ot türlerin yoğun olduğu tespit edilmiştir. Özellikle yabancı otlarla mücadelede hem dar hem de geniş yapraklı yabancı otlar hedef alınmalıdır.

Anahtar Kelimeler: Kiraz bahçeleri, yabancı ot, yoğunluk, sıklık ve genel kaplama.

CONFLICT OF INTEREST STATEMENT

The author declares that there is no conflict of interest in the study.

REFERENCES

- Agaoglu YS, Çelik H, Çelik M, Fidan Y, Gülşen Y, Günay A, Halloran N, Köksal Aİ, Yanmaz R (2010) General horticulture. Ankara University Publications Number: 253, Ankara University Printing House, Ankara.
- Anonymous (2011) Cherry integrated combating technical instruction, T. C. Ministry of Food, Agriculture and Livestock, Department of Plant Health Research, 143-145.
- Anonymous (2017a) Cherry planting area. <http://www.tuik.gov.tr/UstMenu.do?metod=kategori>.
- Anonymous (2017b) Weeds in cherry orchards. <https://kirazyetistiriciligi.tr.gg/Kiraz-Bahcelerinde-Yababci-Otlar.htm>.

- Anonymous (2019) Integrated weed management. UC IPM Pest Management Guidelines: Cherry. <http://ipm.ucanr.edu/PMG/r105700111.html>. UC ANR Publication, 344.
- Dastgheib F, Frampton C (2000) Weed management practices in apple orchards and vineyards in the South Island of New Zealand. *New Zealand J. Crop Hortic. Sci.* 28: 53-58.
- Davis PH (1965-1988) *Flora of Turkey and East Aegean Islands*. Edinburg Univ. Press., Vol. 1-10, Edinburgh.
- FAO (2017) *Crops in the World*. <http://www.fao.org/faostat/en/#data/QC>.
- Gina MP, Neal JC (2000) Weed scouting in container nurseries. *SNA Research Conference*, 45: 387-390.
- Günçan A (2014) *Weeds and principles*, Selçuk univ. Agriculture faculty, Textbook., Konya, 309.
- Hamma IL, Ibrahim U (2013) *Weed management techniques of horticultural crops in Nigeria*. *American-Eurasian J. Agric. & Environ. Sci.* 13(3): 362-366.
- Kadioglu I, Ulug E (1993) Researchs on the determination of fruit nursery weeds in the Mediterranean region. *Turkey I. Herbology congress*, 3-5 February, Adana.
- Kasa M (1995) Detection of weeds in fruit seedlings of Black Sea region researches. *Plant Protection Research Institute* 26-27: 158-158.
- Korlapati S, Sushil SN, Jeyakumar P (2015) Cherry. <https://farmer.gov.in/imagedefault/jpm/cherry.pdf>.
- Naidu VSGR (2012) *Hand book on weed identification* directorate of weed science research, Jabalpur, India Pp 354.
- Odum EP (1971) *Fundamentals of ecology*. W.B. Saunders company, Philadelphia, London, Toronto, 574 p.
- Odum EP (1983) *Grundlagen der Ökologie (Band 1,2)*. Georg Thieme Verlag, Stuttgart.
- Ogawa JM, English H (1991) *Diseases of temperate zone tree fruit and nut crops*. Univ. Calif., Div. Agric. Nat. Res. Pub. 3345.
- Ögüt D, Boz Ö (2007) Determination of the weed species frequence and density in nursery growing areas in Aydın province. *Turkish Weed Sci.* 10(2): 9.
- Özdem A, Zeki C, Yıldırım A, Atlamaz A, Kodan M, Bozkur V, Baliç N, Kan M, Özyigit S, Conger E (2014) Management of disease, pest and weeds control in organic cherry production in Central Anatolia. Archived at <http://orgprints.org/21196>. file:///H:/KİRAZZZ/Organik_Kiraz_%2528Hastalık_Zararlı_Y._Ot_Yönetimi%2529.pdf.
- Rankova Z, Nacheva L, Gercheva P (2009) Growth habits of the vegetative apple rootstock MM 106 after treatment with some soil herbicides under in vitro conditions. *Acta Hortic.* 825: 49-54.
- Tepe I (1997) *Weeds and control the problems of agriculture and non-agricultural areas in Turkey*. Centenary univ., Publication No. 32. Agriculture faculty, Number Textbook of Plant Protection 18:102-103, Van.
- Tezcan S, Demrikan H, Çetinkaya N, Gülperçin N (2003) A view on Kemalpaşa (İzmir) cherry cultivation. Page,1-61.
- TÜİK (2018) *Crop production statistics*. http://www.tuik.gov.tr/PreTablo.do?alt_id=1001
- Uludag A, Katkat M (1993) Southeastern Anatolia Region in fruit nurseries. *Studies on the determination of weeds and their density*. *Turkey I. Herbology Congress*, 3- 5 February 1993, Adana, 175-178.
- Uzun A (1995) Research on the determination of weeds in fruit seedlings of Aegean region, *Plant Protection Research Institute* 26-27:160-160.
- Uygur FN, Koch W, Walter H (1986) Cukurova region wheat-cotton sowing system important definition of weeds. *PLITS 1986/4 (1)*, Josef Margraf Verlag, Stuttgart, 169 pp.
- Uygur S (1997) *Weed species in Cukurova*. Investigation of the possibility of use of disease agents in biological control and disease agents and their distribution by hosted species. PhD Thesis. Cukurova University Graduate School of Natural and Applied Sciences, Adana, 147s.
- Üstüner T, Guncan A (2002) A research on weed species which are problem, importance, biology of germination and control possibilities of them in potato fields in Nigde province. Selcuk university, Graduate school of natural and Applied science, PhD dissertation, Konya. :35 P.
- Whitson TD, Burril LC, Dewey SA, Cudney DW, Nelson BE, Lee RD, Parker R (1992) *Weeds of the West*. The Western Society of Weed Science in cooperation with the Western United States Land Grant Universities Cooperative Extension Services. Page,1-615.