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DETERMINATION OF WEED SPECIES AND DENSITY SEEN ON THE BANK OF IRRIGATION CANALS IN KAHRAMANMARAŞ PROVINCE OF THE MEDITERRANEAN REGION

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Abstract

The aim of this study was to determine the density of weed species seen around irrigation canals located in the district of Kahramanmaraş was made during the 2016 vegetation period of the species. This study caried out along the bank of irrigation channals in order to determine density of weed species in 8 district of Kahramanmaraş (Onikişubat, Dulkadiroğlu, Afşin, Andırın, Elbistan, Göksun, Pazarcık and Türkoğlu). The study was not conducted in Çağlayancerit, Nurhak and Ekinözü because lack of suitable agricultural plains and absense of irrigation channals. 31 different weed species belonging to 145 families were identified as far as studies in open channals in Kahramanmaraş. On average, 103.64 units/m^2 of weed has fallen in the square meter in the region. The district with the highest weed density is Onikişubat district (124.64 units/m^2). This was followed by Dulkadiroğlu (115.79), Göksun (110.10), Pazarcık (108.49 units/m^2), Türkoğlu (105.08 units/m^2), Andırın (104.92), Elbistan (81.87 units/m^2) and Afşin (78.26 units/m^2), respectively. In the study area, 1 of the weed species is fern (Pterydophyta), 29 of them are monocotyledone, and 115 are dicotyledone. Some weed species, which are detected intensively in the area, are; Bromus varvensis (9.17), Cynodon dactylon (8.56), Agropyron repens (8.48), Alopecurus myosuroides (8.35), Papaver rhoeas (8.06), Matricaria chamomilla (7.00), Sorghum halepense (6.63), Phragmites australis (5.37), Dactylis glomerata (2.96), Amaranthus retroflexus (2.90) and Avena sterilis (2.85). Off irrigation channals are only used in Onikişubat, Dulkadiroğlu and Türkoğlu districts agriculture areas. 62 weed species belonging to 18 families were determined according to mean of these districts where overall weed species intensity is 35.315 per m^2. Agropyron repen, C. dactylon, Alopecurus myosuroides, Bromus arvensis, Avena sterilis, Setaria verticillata, Dactylis glomerata, Matricaria chamomilla are intensive weed species (mean weed number 1-10 per m^2) in those districts were determined.

Key words*: irrigation channal, weed species, intensity*.

INTRODUCTION

The area that can be economically irrigated in Turkey is 8.5 million hectares. As of the end of 2014, a total of 6.09 million hectares were irrigated (Anonymous, 2014a). In order to prevent the loss of yield and quality in agricultural products, it is absolutely necessary to struggle with weeds, diseases and harmful. If there is no the struggle, the harvested product yield and quality loss can be 100%. According to a study by Rao (2000), 45% of the crop losses in agricultural production are from weeds, 30% from insects, 20% from diseases and 5% from other plant mites.

Many studies in Turkey have reported that irrigation water is important in spreading weeds and that many weed species are carried to irrigation channels and agricultural areas.

In the irrigation channels of weeds which are a problem in cotton, corn and soybean cultivation areas in Çukurova region and Harran plain. These weed species are; *Physalis* spp.*, Cyperus rotundus, Prosopis farcta, Convolvulus arvensis, Xanthium strumarium, Cynodon dactylon.* Weed species spreading through irrigation channels in the Aegean region; *Physalis alkekengi, Matricaria chamomilla, Silybum marianum, Melilotus officinalis, Cynodon dactylon, Sorghum halepense, Chenopodium album, Amaranthus retroflexus* and *Rumex crispus* (Gönen, 1999; Güncan, 2002; Erbas and Dogan, 2015; Bükün, 2001; Tetik, 2010).

Worldwide, in this work, irrigation channels carried by rivers or irrigation water in agricultural areas and weed species reaching vineyards, gardens and fields are generally hydrophytes. These weed species can be

transported at distances with irrigation water. These weed species include *Capsella bursa-pastoris* (L.) Medik., *Cyperus rotundus* L., *Paspalum paspaloides* (Michx.) Schrib., *Digitaria sanguinalis* (L.) Scop., *Sorgum halepense* (L.) Pers., *Portulaca oleracea, Myriophyllum aquaticum, Azolla filiculoides, Eichhornia crassipes, Lemna gibba, Myriophyllum spicatum, Potamogeton pectinatus* and *Lactobacillus* spp., *Spyrogira* spp. (Wilson, 1980; Dastgheib, 1989; Saavedra et al., 1990; Ferrero and Maggiore, 1992; Rojas and Agüero, 1996; Moreira 1998; Riis et al., 2001; Masaaki et al., 2002; Boedeltje et al., 2004; Jansson et al., 2005; Merritt and Wohl, 2006).

Since weed density is high during irrigation channels of Kahramanmaras agricultural area and there is no further study in this area. The aim of this study is to determination the species and density of weed species found in irrigation channels in Kahramanmaras province.

MATERIALS AND METHODS

Survey work was conducted in the districts of Kahramanmaras region (Onikisubat, Dulkadiroglu, Afşın, Andırın, Çaglayancerit, Ekinözü, Elbistan, Göksun, Nurhak, Pazarcık and Türkoglu). By the reason the fact that there are no irrigation channels in Çaglayancerit, Ekinözü and Nurhak districts, no surveys were conducted on these districts. Considering the distribution of irrigation channels, Kahramanmaras region is divided into 8 regions according to the provinces. Within each of the county boundaries, 3 x 1 m^2 quadrats per 300 m intervals within an area of 1 km length with intervals of 3 km along the irrigation canals were laid and weed species counted in the frame to represent the region in question. The number of siblings and the number of individuals in broad leaves were counted from foreign grasses in narrow foliage. The Turkish names of the weeds identified in Uluğ et al. (1993) and Anonymous (2014 b) are mentioned in the findings. Herbarium samples were taken from the unidentified weeds during the survey and then identified in the Herbology Laboratory of the Plant Protection Department of the KSU Faculty of Agriculture. Water weeds, which cannot be identified in nature as a source in weed species diagnostics, have been identified using Altınayar (1988) "Water Weeds" and Davis, (1975) "Flora of Turkey" books. In the case of weed density Güncan, 2001);

Density = calculated by formula B/n

Where,

B = total number of individuals in the sample,

n = number of samples

As suggested by Üstüner and Güncan (2002), the weed density scale is used as follows;

Density scale;

A. Very dense (average> 10)

B. Intensive (average 1-10)

C. Mid intensive (average 0.1-1)

D. Intensive (average 0.01 to 1)

E. Rare (average less than 0.01)

The surveys carried out in the Kahramanmaras region were carried out in accordance with the number of places and frames specified in Table 1. Kahramanmaras region, the skirts of the Ahir mountains in the north, Gaziantep in the south, Adıyaman in the east, Kayseri in the west and Islahiye and Osmaniye in the south and is an plain with a width of 204,000 ha. The Mediterranean is dominated by terrestrial and transitional climates.

Table 1. Surveys, sample area and number of frames scored in Kahramanmaraş region (Anonymous, 2016)

District	Open channel lengths (km)				Number of frames skipped (units)
	Main channel	Secondary channel	Tertiary channel	Pipe irrigation system	
Afsin	41	52	58	0	150
Andırın	44	37.9	53.3	0	135
Dulkadiroglu	50	77	100	20	227
Elbistan	24.2	60.8	31.2	0	116
Göksun	54	85.3	80.8	0	220
Pazarcık	72.4	80	77.3	0	229
Onikisubat	33	49	58	18.4	140
Türkoglu	55.4	76.5	32	17	163
Toplam	374	518.8	490.6	55.4	1380

RESULTS AND DISCUSSIONS

The weed species identified in the surveys conducted during irrigation channels in the vegetation area of Kahramanmaras region in the period of 2016 vegetation were classified according to their families. A total of 31 different families were identified in the region. These families: (*Leguminosae*), *Geraniaceae* (*Leguminosae*), *Bacillus* spp., *Pseudomonas* spp., *Labiatae* (*Lamiaceae*), *Malvaceae*, *Papaveraceae*, *Plantaginaceae*, *Polygonaceae*, *Portulacaceae*, *Primulaceae*, *Ranunculaceae*, *Rosaceae*, *Rubiaceae*, *Scrophulariaceae* (*Scrophyllaceae*), *Solanaceae* and *Zygophyhllaceae.*

The weeds species are determined 145. These 1 Pterydophyta, 29 of them monocotyledone, and 115 of them were dicotyledone. In the Kahramanmaras area, we found that weeds weighed 103.64 (unit/m^2) on average per square meter. While weed density (124.64 pcs m^{-2}) was highest in Onikisubat province, it was highest in Dulkadiroglu (11.79pcs m^{-2}), Göksun (110.10 plant m^{-2}), Pazarcık (108.49 pcs / 08 plant m^{-2}), Andırın (104.92 plant m^{-2}), Elbistan (81.87 plant m^{-2}) and Afşin (78.26 plant m^{-2}) (Figure 1). The results of surveys carried out in 8 districts representing Kahramanmaras region were evaluated separately.

Figure 1. Determination of weed density by 1 m^2 frame on irrigation canal edge

Afsin district

There are 102 different weed species from 24 families diagnosed during the open irrigation canals of the Afsin district farming area. In the district: *Alopecurus myosuroides* is very dense (average plant in m^2>10); *Papaver rhoeas, Agropyron repens, Bromus arvensis, Sorghum halepense, Cynodon dactylon, Matricaria chamomilla, Avena fatua, Amaranthus retroflexus, Echinochloa crus-galli, Phragmites australis, Chenopodium album, Setaria viridis, Dactylis glomerata, Sinapis arvensis, Hordeum vulgare, Phalaris canariensis, Lolium temulentum, Convolvulus arvensis, Rumex crispus, Matricaria perforata, Bromus tectorum, and Cuscuta campestris* species were found to be dense (mean plants 1-10 in m^2) (Figure 2).

Figure 2. *Agropyron repens* and *Bromus arvensis* on the edge of the irrigation channels

Andırın district

The weed species were determinede 97 different species from 29 families at the edge of Andırın, open irrigation canals were identified. In this district: *Agropyron repens, A. myosuroides, B. arvensis, Cynodon dactylon, Portulaca oleracea, Papaver rhoeas, Cyperus rotundus, Amaranthus retroflexus, Alopecurus myosuroides, Sorghum halepense, Setaria verticillata, Bromus tectorum, Dactylis glomerata, Matricaria chamomilla, Avena sterilis, Digitaria sanguinalis, Anchusa officinalis, Sinapis arvensis, Chenopodium album, Phalaris canariensis, Convolvulus arvensis, Rubus canasences* (Figure 3).

Figure 3. *Cynodon dactylon* and *Portulaca oleracea* L. on the edge of irrigation channals

Dulkadiroglu district

On the edge of the open irrigation canals of Dulkadiroglu district, 134 different weed species were found from 30 families diagnosed. In the district: *Agropyron repen, C. dactylon* is very intense while *Papaver rhoeas, Alopecurus myosuroides, Phragmites australis, Bromus arvensis, Avena sterilis, Setaria verticillata, Dactylis glomerata, Anchusa officinalis, Matricaria chamomilla, Amaranthus retroflexus, Sorghum halepense, Chenopodium album, Digitaria sanguinalis, Typha latifolia , Convolvulus arvensis, Lolium temulentum, Portulaca oleracea, Sinapis arvensis, Bromus tectorum, Phalaris canariensis, Cyperus rotundus, Cuscuta campestris, Poa trivialis* and *Aegilops cylindrica.*

There are 62 different weed species from 18 families diagnosed at the edge of closed irrigation channels. In the district: *Agropyron repens, C. dactylon Alopecurus myosuroides, Bromus arvensis, Avena sterilis, Setaria verticillata, Dactylis glomerata, Matricaria chamomilla, Chenopodium album, Digitaria sanguinalis, Convolvulus arvensis, Lolium temulentum, Papaver rhoeas, Portulaca oleracea, Sinapis arvensis, Bromus tectorum* and *Phalaris canariensis* (Figure 4).

Figure 4. *Phragmites australis* and *Convolvulus arvensis* on the edge of irrigation channals

Elbistan district

The weed species were found 108 from 27 families at the edge of the Elbistan irrigation channels. In this district; *A. myosuroides* is very dense, and *Cynodon dactylon, Bromus arvensis, Sorghum halepense, Papaver rhoeas, Matricaria chamomilla, Dactylis glomerata, Digitaria sanguinalis, Amaranthus retroflexus, Setaria viridis, Convolvulus arvensis, Agropyron repens, Avena fatua, Chenopodium album, Bromus tectorum, Matricaria perforate, Cuscuta campestris, Echinochloa crus-galli* and *Phragmites australis.*

Figure 5. *Alopecurus myosuroides* and *Setaria viridis*

Göksun district

There are 112 different weed species from 28 families diagnosed at the edge of the Göksun irrigation canals. In this region, *P. rhoeas* is very dense, *Alopecurus myosuroides, Bromus arvensis, Matricaria chamomilla, Setaria viridis, Equisetum arvense, Cynodon dactylon, Agropyron repens, Amaranthus retroflexus, Echinochloa crus- galli, Dactylis glomerata, Lolium temulentum, Digitaria sanguinalis, Sorghum halepense, Sinapis Arvensis, Anchusa officinalis, Bromus tectorum, Avena fatua, Phragmites australis, Cuscuta campestris, Portulaca oleracea, Convolvulus arvensis, Poa trivialis, Rumex crispus, Chenopodium album* and *Aegilops columnaris.*

Figure 6. *Papaver rhoeas* and *Equisetum arvense*

Pazarcık district

There are 110 different weed species from 28 families diagnosed at the edge of the Pazarderian irrigation canals. In this region, *A. myosuroides* is very dense, and *Agrobyron repens, Bromus arvensis, Phragmites australis, Sorghum halepense, Papaver rhoeas, Cynodon dactylon, Avena sterilis, Setaria verticillata, Dactylis glomerata, Digitaria sanguinalis, Aegilops columnaris, Sinapis arvensis, Rumex crispus, Matricaria perforata, Phalaris canariensis, Bromus tectorum, Portulaca oleracea, Convolvulus arvensis and Cuscuta campestris were found intensely* (Figure 7).

Figure 7. *Phragmites australis* and *Sinapis arvensis*

Onikişubat district

There are 128 different weed species from 30 families diagnosed at the edge of the open watering canals of the village of Onikişubat. In the district: *Sorghum halepense, Agropyron repens, Cynodon dactylon are very dense; Bacillus arborescens, Amaranthus retroflexus, Aegilops cylindrica, Cuscuta campestris, Bacillus arborescens, Bromus arvensis, Bromus arvensis, Alopecurus myosuroides, Avena sterilis, Setaria verticillata, Bromus tectorum, Lolium temulentum, Dactylis glomerata, Digitaria sanguinalis, Rumex crispus, Chenopodium album, , Typha latifolia, Anchusa officinalis, Aegilops columnaris, Poa trivialisve Cyperus rotundus* were found intensely. There are 58 different weed species from 15 families diagnosed at the edge of closed irrigation channels. In the district, it has been determined that the species of *Agapyron repens, C. dactylon Alopecurus myosuroides, Bromus arvensis, Avena sterilis, Setaria verticillata, Dactylis glomerata, Matricaria chamomilla, Chenopodium album, Digitaria sanguinalis, Convolvulus arvensis, Lolium temulentum, Papaver rhoeas, Portulaca oleracea and Sinapis arvensis* are intense.

Figure 8. *Phragmites australis* and *Sorghum halepense*

Türkoglu **district**

Türkoglu district, 105 different weed species from 28 families diagnosed at the edge of open irrigation canals were encountered. In this district: *Matricaria chamomilla, Bromus arvensis, Agropyron repens, Phragmites australis Very dense; Sorghum halepense, Papaver rhoeas, Alopecurus myosuroides, Cynodon dactylon, Avena sterilis, Matricaria perforata, Cyperus rotundus, Sinapis arvensis, Chenopodium album, Dactylis glomerata, Rumex crispus, Bromus tectorum, Portulaca oleracea, Digitaria sanguinalis, Setaria verticillata, Anchusa officinalis, Cuscuta campestris* and *Convolvulus arvensis*.

There are 51 different weed species from 13 families diagnosed at the edge of closed irrigation channels. In the district, it has been determined that the species of *Agropyron*

repens, C. dactylon Alopecurus myosuroides, Bromus arvensis, Avena sterilis, Setaria verticillata, Dactylis glomerata, Matricaria chamomilla, Chenopodium album, Digitaria sanguinalis, Convolvulus arvensis, Papaver rhoeas and *Sinapis arvensis* (Figure 9).

Figure 9. *Anchusa officinalis* and *Aegilops columnaris*

CONCLUSIONS

In the Kahramanmaras region, 145 weed species and an average of 103.64 (plant m^{-2}) weeds were found to fall. In terms of the weed density determined by the unit area in the region: *Bromus arvensis* (9.17), *Cynodon dactylon* (8.56), *Agropyron repens* (L.) P.Beauv. (8. 48), *Alopecurus myosuroides* (8.35), *Papaver rhoeas* (8.06), *Matricaria chamomilla* (7.00), *Sorghum halepense* (6.63), *Phragmites australis* (2.75), *Dactylis glomerata* (2.96), *Amaranthus retroflexus* (2.90), *Avena sterilis* (2.85), *Setaria verticillata, Portulaca oleracea* (2.00), *Digitaria sanguinalis* (1.94*), Setaria viridis* (1.80), *Chenopodium album* (1.65), *Convolvulus arvensis* (1.57), *Sinapis arvensis* (1.57), *Cyperus rotundus* (1.49), *Bromus tectorum* (1.39), *Anchusa officinalis* (1.36), *Cuscuta campestris* (1.08) and *Equisetum arvense* (1.06 plant m^{-2}) were found to be dense.

In the open irrigation channels, the number and density of weed species, especially seen on the soil surface and along the secondary channels, were determined at the highest level. In addition, since there is no continuous water in these irrigation channels, weeding of the weed in the canal was found to be considerably high as the soil was accumulated in the soil of the canal (Figure 10). This reduces the speed and the flow of irrigation water. In addition, because weed seeds will be poured into the canal, they cause direct transport to the fields.

Figure 10. Problems of gravel and soil residues that accumulate in irrigation channels

The density of weed seen along the irrigation channels at certain height from the soil surface was found to be slightly lower. Moreover, since many weed species are short in length due to

their irrigation canal height, it will not be possible to transport seeds, stolons and rhizomes with such irrigation canals.

The closed-pipe irrigation system is only available in Onikisubat, Dulkadiroglu and Türkoglu districts. According to the average of these 3 groups, 62 weed species of 18 families were identified. The density of weed species in the square meter is 35.31 plant m^{-2}. According to the open irrigation channels, the weed density in the tubular irrigation system is determined at the lowest level. Because there is no water leakage in the closed pipe system, the weed output is at the minimum level in the soil. In addition, there has never been any spread of weed seeds with closed-pipe irrigation system (Figure 11).

Figure 11. Overview of the closed pipe system

In a study conducted in America; During the irrigation season, 77 species of weed were identified in the irrigation channels sampled with plastic sieves for years (Kelley and Burns, 1975). In Spain, 23 families and 63 weed species were identified in irrigation channels. The most common families were Asteraceae 62.4% and Poaceae 18.9% followed by Rosaceae (4.4%) and Fabaceae (3.7%). The most important weed species were *Conyza* spp., *Sonchus oleraceus and Picris echioides, Amaranthus hybridus, Bromus* spp., *Hordeum murinum* and *Poa annua* were found to be very common (Catalán et al. 1997). Zuo RanLing et al. (2007) also found that the seeds of 21 weed species belonging to 14 families were distributed to irrigated water and rice fields in the study conducted in China. The most important families are Gramineae, Primulaceae, Polygonaceae and Chenopodiaceae. Li and Qiang, 2009 have identified 74 species of weeds belonging to 20 families in rice fields. These families are Poaceae (15), Asteraceae (11) and Polygonaceae (9).

As a result of the surveys conducted in Lower Seyhan, a total of 21 water weed species belonging to 14 plant families were identified (Soyak and Uygur, 2009). In the study conducted in Adana region, Amaranthaceae 1, Asteraceae 3, Chenopodiaceae 1, Euphorbiaceae 1, Fabaceae 2, Poaceae 10, Portulaceae 1, Urticaceae 1, Verbenaceae 1 were determined. As a result of the counts, 27 weed species belonging to 16 families were identified. The most frequently encountered species were *Portulaca oleracea* (38.89%), *Echinochloa colonum* (33.33%), *Amaranthus viridis* (30.00%), *Cynodon dactylon* (30.00%) and *Cyperus rotundus* (26.67%) were identified as the most common species at the canal edge (Tetik and Uygur, 2010).

With other studies on spreading of weed seeds with irrigation channels in the world and Turkey; Wilson, 1980; Saavedra et al., 1990; Ferrero and Maggiore, 1992; Cuevas, 1993; Rojas and Agüero, 1996; Miller, 1996; Catalán et al., 1997; Moreira, 1998; Zuo RanLing et al., 2007; Li and Qiang, 2009; Soyak and Uygur, 2009; Tetik and Uygur, 2010; Erbaş and Doğan 2015 with similar.

There are many biotic and abiotic factors affecting weed density. Abiotic factors such as irrigation systems, wind, agricultural methods, soil chemical and physiological characteristics, climate factors and Biotic factors such as human, animal, insect and birds play an important role in the spread of weed seeds.

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