



The Species and Intensities of Weed Seeds Obtained from Wheat Flour Mill Plants in Turkey**

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ABSTRACT

Wheat production is more than 10% is in first place with potential in Konya plain of Turkey. Weed seeds mixed crop seeds cause quality and yield losses on production. This research was carried out to determine the species, intensity and frequency of weed seeds obtained from flour mill plants operating in Konya. Samples were taken from the 15 flour mill plants with working high capacity in the region. Identification of the weed seeds species in the sample was made. Comparison was made with live materials and reference documents by examining the seeds under a binocular while diagnosis of species. Also, the intensity and frequency of the species contaminated in wheat were determined. As a result of the study, 79 weed seed species belonging to 19 different families were identified. The species of families the most inclusive were Poaceae with 14 species and Leguminosae with 13 species. In order to determine intensity and frequency of species, weed seeds counted by hand, weighed in scale were recorded in laboratory. The highest weed seeds intensity as number and weight among the species were determined *Galium tricornutum* (rough bedstraw) with 16.16% and *Aegilops cylindrica* (jointed goatgrass) with 21.22% respectively. About the frequency of species, the most frequent species was *Convolvulus arvensis* (field bindweed) with 100%.

Introduction

Wheat is a crop plant which is essential for whole humanity. Many products are made from wheat today. Wheat means being full. The role and importance of flour obtained from wheat, bread and other products made from flour in human life is far too great. Wheat is a strategic product that is widely grown in the world, plays an important role in the nutrition and commercial life of many countries, is the most produced among crops and is used in human nutrition (Arisoy and Oğuz 2005).

In terms of world wheat production, China (133.6 million tons) ranks first. This country is followed by India (103.6 million tons), Russia (74.5 million tons) and USA (52.3 million tons). Turkey, on the other hand, ranks 11th in world wheat production with a production of 19 million tons (Anonymous 2019). It has an agricultural area of approximately 23 million ha in Turkey. Wheat is produced in approximately 7 million hectares of this area. Konya province ranks first in Turkey in terms of cultivation area (6.2 million dec-

ares) and production (1.92 million tons) (Anonymous 2020).

Today world population is increasing rapidly. Uncontrolled population growth is the most important fact gradually revealing the danger of hunger. Population growth increasing every day causes wheat yield to fall short. One of the most significant agricultural factors restricting wheat production is weeds because weeds cause decreases in the quality of wheat crop, and they also reduce yield of wheat produced in unit area. Weeds are the natural plants of agricultural and nonagricultural areas. Economically weeds mean, they are the plants which appear in and out of cultivated areas and do more harm than good for cultivated plants.

Weeds compete with crop plants for water, nutrients, space and light. These factors sometimes act alone and sometimes together. Because of some characteristics, they often have superior competitive power against crop plants. If measures are not taken, weeds can cause 20-40 % yield loss depending on the species of crop plants (Güncan 1982; Güncan and Karaca 2018; Zimdahl 2018; Güncan, 2019).

By contaminating with crop plant seeds, weed seeds decrease the nutritional value and spoil seed quality (Güncan 2002). In the research conducted in Turkey, it was determined that contamination rate of weed seeds

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in wheat product which was not passed through the selector was at an average of 1.17% numerically, at an average of 0.412% as weight (Güncan and Boyraz 2001). According to the findings, when wheat production in our country is accepted as 20 million tons, it is necessary to consider that 8.240 tons of weed seeds are consumed each year and sown again into the fields in case of not cleaning wheat product. The same researchers state that if the mentioned wheat is sown without cleaning, 5.600 weed seeds per decare will be carried into the field just through the contaminated wheat seeds. In other words, 5-6 weed seeds per m² are carried through the mentioned way and this might cause a significant level of weed contamination. Tursun et al (2006) reported that the most common weed seeds contaminated with wheat were *Sinapis arvensis*, *Hordeum vulgare*, *Lolium temulentum*, *Boreava orientalis* and *G. tricornutum* respectively, and *H. vulgare*, *B. orientalis*, *S. arvensis*, and *L. temulentum* by weight, respectively in Kahramanmaraş. Karaca and Güncan (2009), carried out a study to determine the contamination ratio of *Secale cereale* to wheat product. It was determined that wild rye seed was contaminated in wheat product with an average of 1.1536% numerically and 0.9522% by weight in Konya province.

Gökalp and Üremiş (2015) determined that the most common weed seeds contaminated numerically with wheat were *Avena sterilis*, *S. arvensis* and *G. tricornutum* and *A. sterilis*, *Silybum marianum* and *Hordeum murinum* by weight respectively in Mardin province. Baş et al. (2016), found that in their study to detect weed seeds contaminated with wheat crops, *Agrostemma githago* and *Caucalis latifolia* were numerically very dense. They found that *Adonis* sp., *Ranunculus arvensis* and *G. tricornutum* were heavily contaminated in the Eastern Black Sea Region. Pala et al. (2018) determined that the weed seeds were most intensely contaminated into the harvested wheat product belonged to the Poaceae family with 13 species. It was determined that the most common species were *Avena fatua* and *A. sterilis* in Diyarbakır province. In the research of Bozkurt and Tursun (2018) found that numerically, *S. arvensis*, *Cephalaria syriaca* and *Polygonum aviculare* were the most common weed seeds respectively. According to the weight ratio, the most common species were found as *Caucalis daucooides*, *C. syriaca* and *Galium aparine* in Muş province. In the studies conducted in Balıkesir and Çanakkale, *S. arvensis* and *G. aparine* were determined as the most frequently contaminated weed seeds numerically, while *H. vulgare* was the most contaminated species in both provinces by weight (Kaçan and Tursun 2019).

In a study conducted between the years of 1974 and 1990 in Germany, it was reported that weed seed contamination average rate of grains was 0.5 %, and this contamination increased to 2% in wheat (Fuchs and Voit, 1992). Similarly, in another study conducted in Spain, it was determined that weed seeds contaminated in grains dramatically (Trigo et al. 1991). Nikham et al. (2002) were carried out a survey in the Victoria in

Australia. Mainly wheat and barley seeds were collected. The main weed seeds in cereal samples were annual ryegrass (*Lolium multiflorum*), wild oats (*Avena* spp.), silver grass (*Vulpia bromoides* L.), lesser canary grass (*Phalaris minor*), brome grass (*Bromus* spp.) and paradox grass (*Phalaris paradoxa*).

Çetik (1985) reported that there are too many weeds growing in the cultivation areas of forage plants and in pasture-meadow areas in the Central Anatolia Region. The researcher stated that weed seeds quickly germinate under appropriate conditions, they might remain dormant for a long time under inappropriate conditions. It is stated that many of these weeds are eaten by animals. Güncan and Karaca (2018), on the other hand, states that some weeds are a good feed source for animals both in summer and winter, some of them are not eaten by animals when they are fresh in summer because of bitter substances that they contain, but when they are dried, their bitterness disappears and they are eaten hungrily by animals.

The aim of this study, to determine which weed species are contaminated with wheat by using the samples taken from under-sieve, purifier, washing and trieur parts in flour mill plants and the rate of contamination. It is known that weed seeds obtained from various sieve systems in flour mill plants are used as feed in animal husbandry in Turkey. However, a large number and species of weed seeds can be transported to agricultural fields with animal manures. No study has been found on this subject. Therefore, the species and intensities of weed seeds that can be transported to agricultural areas with animal manures will be revealed.

2. Materials and Methods

The material of this study conducted in 2012-2013 consists of weed seeds obtained from flour mill plants in Konya, weed seed collection, precision scale, binocular and diagnostic books.

Determining weed seeds and their intensities:

In the research, samples were taken from 15 flour mills with high operating capability in Konya province. These are the samples which were processed through different sieving systems such as sieve, purifier, washing and trieur parts of factory. Since the materials from which the seeds are obtained are of different weights and volumes, the samples were extracted from materials until 100 g of weed seeds were obtained per flour mill plant. One hundred grams of weed seeds obtained from each flour mill plant were separated according to their genus and species.

In the second phase of the research, weed seeds collected from samples were diagnosed. Following this process, weed seeds were counted by hand in the herbology laboratory and their weights were recorded after weighing on a precision scale. Besides, intensity (as number and weight) and frequency of occurrence were calculated for each weed seed in 1.500 g of sam-

ples collected from 15 flour mill plants. In the research, % intensity (as number and weight) and frequency of occurrence were calculated according to the following formula (Odum 1971; Uludağ 1993; Baş et al .2016).

$$\text{Intensity (\%)} = T/n \times 100$$

$$\text{Frequency (\%)} = M/n \times 100$$

T= Total number of weed seed in the collected sample

M= Number of samples in which weed species was encountered

n= Number of samples

$$\text{Weight (\%)} = A/B \times 100$$

$$\text{Number (\%)} = C/D \times 100$$

A= Weight of selected weed seed

B=Seed weight in total

C=Number of selected weed seed

D=Number of seeds in total

To name the weeds in Turkish, the book entitled “Türkiye’nin Yabancı Otları” by Uluğ et al (1993) and the dictionary entitled “Bitki Terimleri” by Akalın (1952) were used. For the morphological and biological characteristics of the plants, the book entitled “Türkiye’nin Çayır-Mera Bitkileri” was employed. While diagnosing weed seeds, the weed seed collection prepared in previous years by Academic Member Prof. Dr. Ahmet GÜNCAN from Selcuk University, Faculty of Agriculture, Department of Plant Protection was used.

Table 1

Number and weight of weed seeds determined from the wheat flour mill plants in Konya Provinces

Weed Species/Families	*Seed (number)	*Seed Weight (g)
Apiaceae (Umbelliferae)		
<i>Bifora radians</i> Bieb.	693	8.184
<i>Bifora testiculata</i> (L.) sprengex Schultes	535	5.808
<i>Caucalis daucoideis</i> L.	7	0.307
<i>Caucalis latifolia</i> L.	75	1.386
<i>Caucalis orientalis</i>	6	0.002
<i>Patroselinum</i> sp.	1	0.001
Asteraceae (Compositae)		
<i>Carthamus persicus</i> Willd.	91	0.18
<i>Centaurea deprassa</i> Bieb.	560	6.359
<i>Centaurea melitensis</i>	5	0.02
<i>Centaurea repens</i> L.	102	0.087
<i>Centaurea solstitialis</i> L.	2	0.005
<i>Cirsium lanceolatum</i> (L.) Scop.	14	0.129
<i>Onopordum acanthium</i> L.	350	2.274
<i>Onopordum caucalis</i>	1	0.006
Boraginaceae		
<i>Anchusa italica</i> Retz.	36	0.807
<i>Borago</i> sp.	24	0.179
<i>Lithospermum arvense</i> L.	5.954	18.728
<i>Lycopsis orientalis</i>	9	0.041
Brassicaceae (Cruciferae)		
<i>Boreava orientalis</i> Jaub and Spach	433	21.654
<i>Euclidium syriacum</i> (L.) R.Br.	140	0.714
<i>Neslia apiculata</i> Fisch.	872	4.142
<i>Rapistrum rugosum</i> (L.) All.	966	7.952
<i>Thilapsi arvense</i> L.	4.737	4.46
Caryophyllaceae		
<i>Agrostemma githago</i> L.	933	11.507
<i>Gypsophila</i> sp.	23.689	58.836
<i>Silene caucalis</i>	627	0.953
<i>Silene conoidea</i> L.	7.299	16.954
<i>Vaccaria pyramidata</i> Medik	13.566	37.4
Chenopodiaceae		
<i>Beta lomatogona</i> Fisch and Mey.	31	0.247
<i>Chenopodium</i> sp.	6.078	5.342

In addition, Bischof's (1978) book entitled “Common Weeds from Iran, Turkey, the Near East and North Africa” on weed diagnosis was used. Weed seeds that could not be identified in the study were stated as others.

3. Results and Discussion

In the research, 79 weed species belonging to 19 families were determined and identified. Among these identified species, Fabaceae which included 15 species and Poaceae which included 12 species were the families which had the most species.

According to the results obtained in the research, the weed seed having the highest number was *G. tri-cornutum* (Fam: Rubiaceae) with the number of 39.539 *P. aviculare* and *Polygonum convolvulus* (Fam: Polygonaceae) follow this species with the numbers of 38.313 and 37.736 respectively. The fewest number of weed seed is 1 and it belongs to *Trifolium alexandrinum*, *Medicago hispida*, *Medicago sativa*, *Nicis benedictus*, *Onopordum caucalis*, *Patroselinum* sp. The heaviest weed seed was *Aegilops cylindrica* (Fam: Poaceae) with 289,077 g *A. fatua* (Fam: Poaceae) and *P. convolvulus* (Fam: Polygonaceae) follow it with 150,764 g and 133,449 g respectively. The weed seed having the lowest weight is *Trifolium alexandrinum* (Table 1).

Table 1(Continue)

Number and weight of weed seeds determined from the wheat flour mill plants in Konya Provinces

Convolvulaceae		
<i>Convolvulus arvensis</i> L.	9641	94.612
Dipsacaceae		
<i>Cephalaria aristata</i> (C.) Koch	682	2.962
<i>Cephalaria syriaca</i> (L.) Schrad.	46	0.45
Fabaceae (Leguminosae)		
<i>Lathyrus aphaca</i> L.	67	0.893
<i>Lathyrus</i> sp.	213	0.429
<i>Medicago hispida</i> Gaertn.	1	0.038
<i>Medicago rigidula</i> (L.) All.	3	0.155
<i>Medicago sativa</i> L.	1	**0
<i>Melilotus officinalis</i> (L.) Desr.	2.627	4.626
<i>Onobrichis sativa</i> Lam.	4	0.47
<i>Trifolium alexandrinum</i>	1	**0
<i>Vicia fabae</i>	37	4.669
<i>Vicia pannonica</i>	495	21.7
<i>Vicia peregrina</i> L.	8	0.226
<i>Vicia sativa</i> L.	246	14.355
<i>Vicia villosa</i> Roth.	60	1.433
Labiatae (Lamiaceae)		
<i>Marrubium peregrinum</i>	298	0.426
<i>Salvia sclarea</i> L.	24	0.077
Lilliaceae		
<i>Allium</i> sp.	8	0.038
<i>Ornithogalum narbonense</i> L.	5	0.039
Malvaceae		
<i>Althaea</i> sp.	14	0.97
<i>Malva parviflora</i> L.	6	0.048
Poaceae (Gramineae)		
<i>Aegilops cylindrica</i> Host.	6.997	289.077
<i>Alopecurus myosuroides</i> Huds.	221	0.358
<i>Avena fatua</i> L.	7.050	150.764
<i>Avena sativa</i>	1.354	32.3
<i>Avena sterilis</i> ssp. <i>Ludoviciana</i>	29	0.363
<i>Lolium multiflorum</i> Lam.	1.335	7.539
<i>Lolium temulentum</i> L.	847	7.694
<i>Panicum italicum</i>	3.244	13.023
<i>Phalaris minor</i> Retz.	4.890	11.112
<i>Poa bulbosa</i> L.	560	1.121
<i>Secale cereale</i> L.	2.535	95.892
<i>Setaria lutescens</i> (Weigel ex Stuntz) F. T. Hubbard	4.058	12.791
<i>Sorghum halepense</i> (L.) Pers.	38	0.144
<i>Sorghum</i> sp.	193	3.797
Polygonaceae		
<i>Polygonum aviculare</i> L.	38.313	91.329
<i>Polygonum convolvulus</i> L.	37.736	133.449
<i>Rumex crispus</i> L.	96	0.125
Ranunculaceae		
<i>Adonis aestivalis</i> L.	4	0.039
<i>Adonis flammea</i> Jacq.	3	0.019
<i>Consolida orientalis</i> (Gay) Schröd.	1.264	1.587
<i>Ranunculus arvensis</i> L.	499	6.064
Resedaceae		
<i>Reseda lutea</i> L.	2.894	2.968
Rubiaceae		
<i>Galium aparine</i> L.	7.885	24.8
<i>Galium tricornutum</i> Dandy.	39.539	111.679
Scrophulariaceae		
<i>Veronica triphyllos</i> L.	391	0.436
Solanaceae		
<i>Hyoscyamus niger</i> L.	238	0.226
Diğer		
<i>Nicis benedictus</i>	1	0.025
Others	39.475	140.024
TOTAL	284.025	1.500

* In the 1.500 g sample

** Quite close to 0

When Table 2 is examined, numerically the most intensive species according to the % calculations were *G. tricornutum* with 16.17 %, *P. aviculare* with 15.67 % and *Polygonum concolvulus* with 15.43 % respec-

tively. While *A. cylindrica* had the highest intensity with 21.22% as weight, *A. fatua* with 11.07% and *P. convolvulus* with 9.80% followed them. When frequency of occurrence is taken in to consideration, it is

seen that *Convolvulus arvensis* with the rate of 100 % was present in all samples. This species was followed by *Lithospermum arvense*, *Gysophila* sp., *P. aviculare*, *S. cereale* and *Vaccaria pyramidata* with the rate of 93,33%.

Similarly, Tursun et al. (2006), Gökalp and Üremiş (2015) and Baş et al. (2016) found *G. tricornutum* and *A. sterilis* as the most contaminated species the wheat crop in their studies. Also Bozkurt and Tursun (2018) found that numerically, *P. aviculare* were the most common weed seeds respectively.

Table 2

Number (%), weight (%) and frequency (%) of weed seeds obtained from the wheat flour mill plants in Konya Province

Weed Species	Seed Number (%)	Seed Weight (%)	Frequency (%)
<i>Adonis aestivalis</i>	0.0016	0.0028	13.3333
<i>Adonis flammea</i>	0.0012	0.0266	13.3333
<i>Aegilops cylindrica</i>	2.8613	21.2244	86.6666
<i>Agrostemma githago</i>	0.3815	0.8448	33.3333
<i>Allium</i> sp.	0.0032	0.0026	13.3333
<i>Alopecurus myosuroides</i>	0.0903	0.0262	46.6666
<i>Althaea</i> sp.	0.0057	0.0071	6.6666
<i>Anchusa italica</i>	0.0147	0.0592	33.3333
<i>Avena fatua</i>	2.8829	11.0693	86.6666
<i>Avena sativa</i>	0.5536	2.3715	73.3333
<i>Avena sterilis</i> ssp. <i>Ludoviciana</i>	0.0081	0.0266	13.3333
<i>Beta lomatogona</i>	0.0126	0.8158	20
<i>Bifora radians</i>	0.2833	0.6008	53.3333
<i>Bifora testiculata</i>	0.2187	0.4264	13.3333
<i>Boreava orientalis</i>	0.1770	1.5898	53.3333
<i>Borago</i> sp.	0.0098	0.0131	6.6666
<i>Carthamus persicus</i>	0.0372	0.0132	40
<i>Caucalis daucoides</i>	0.0028	0.0254	33.3333
<i>Caucalis latifolia</i>	0.0306	0.1017	60
<i>Caucalis orientalis</i>	0.0024	0.0001	6.6666
<i>Centaurea deprassa</i>	0.2290	0.4668	86.6666
<i>Centaurea melitensis</i>	0.0020	0.0014	13.3333
<i>Centaurea repens</i>	0.0417	0.0651	66.6666
<i>Centaurea solstitialis</i>	0.0008	0.0003	6.6666
<i>Cephalaria aristata</i>	0.2788	0.2174	40
<i>Cephalaria syriaca</i>	0.0188	0.0330	26.6666
<i>Chenopodium</i> sp.	2.4855	0.3922	53.3333
<i>Cirsium lanceolatum</i>	0.0057	0.0094	40
<i>Consolida arientalis</i>	0.5168	0.1165	80
<i>Convolvulus arvensis</i>	3.9425	6.9465	100
<i>Euclidium syriacum</i>	0.0572	0.0524	66.6666
<i>Galium aparine</i>	3.224	1.8212	53.3333
<i>Galium tricornutum</i>	16.1689	8.1996	86.6666
<i>Gysophila</i> sp.	9.6872	4.3198	93.3333
<i>Hyoscomus niger</i>	0.0973	0.0195	26.6666
<i>Lathyrus aphaca</i>	0.0273	0.0655	46.6666
<i>Lathyrus</i> sp.	0.0053	0.0314	6.6666
<i>Lithospermum arvense</i>	2.4348	1.3750	93.3333
<i>Lolium multiflorum</i>	0.5459	0.5535	80
<i>Lolium temulentum</i>	0.3463	0.5649	46.6666
<i>Lycopsis arientalis</i>	0.0036	0.0030	33.3333
<i>Malva parviflora</i>	0.0024	0.0035	13.3333
<i>Marrubium peregrinum</i>	0.1218	0.0312	60
<i>Medicago hispida</i>	0.0004	0.0027	6.6666
<i>Melilotus officinalis</i>	1.0742	0.3396	73.3333
<i>Medicago rigidula</i>	0.0012	0.0113	20
<i>Medicago sativa</i>	0.0004	0	6.6666
<i>Neslia apiculata</i>	0.3565	0.3041	80
<i>Nicis benedictus</i>	0.0004	0.0018	6.6666
<i>Onobrichis sativa</i>	0.0016	0.0034	26.6666
<i>Onopordum acanthium</i>	0.1431	0.1669	73.3333
<i>Onopordum caucalis</i>	0.0004	0.0004	6.6666
<i>Ornithogalum narbonense</i>	0.0020	0.0028	6.6666
<i>Panicum italicum</i>	1.3265	0.9461	53.3333
<i>Patroselium</i> sp.	0.0004	*0	6.6666
<i>Phalaris minor</i>	1.996	0.8158	86.6666
<i>Poa bulbosa</i>	0.2290	0.0823	66.6666
<i>Polygonum aviculare</i>	15.6675	6.7055	93.3333
<i>Polygonum convolvulus</i>	15.4316	9.7980	73.3333
<i>Ranunculus arvensis</i>	0.2040	0.4452	60
<i>Rapistrum rugosum</i>	0.3950	0.5838	80
<i>Reseda lutea</i>	1.1834	0.2179	86.6666
<i>Rumex crispus</i>	0.0392	0.0091	46.6666

Table 2 (Continue)

Number (%), weight (%) and frequency (%) of weed seeds obtained from the wheat flour mill plants in Konya Province

<i>Salvia sclarea</i>	0.0098	0.0056	33.3333
<i>Secale cereale</i>	1.0366	7.0405	93.3333
<i>Setaria lutescens</i>	1.6594	0.9391	53.3333
<i>Silene caucalis</i>	0.2564	0.0699	6.6666
<i>Silene conoidea</i>	2.9848	1.2447	86.6666
<i>Sorghum halepense</i>	0.0155	0.0105	26.6666
<i>Sorghum</i> sp.	0.0789	0.2787	13.3333
<i>Thilapsi arvense</i>	1.9371	0.3274	66.6666
<i>Trifolium alexandrinum</i>	0.0004	*0	6.6666
<i>Vaccaria pyramidata</i>	5.5476	2.7464	93.3333
<i>Veronica triphyllos</i>	0.1598	0.0320	26.6666
<i>Vicia fabae</i>	0.0151	0.3428	6.6666
<i>Vicia pannonica</i>	0.2024	1.5981	33.3333
<i>Vicia peregrina</i>	0.0032	0.0165	6.6666
<i>Vicia sativa</i>	0.1005	1.0539	26.6666
<i>Vicia villosa</i>	0.0245	0.1052	13.3333
TOTAL	99.9145	99.9722	

* Quite close to 0

Intensity (Numerically)

0,0 6 % ≤ very intensive
 0.02-0.06 % Intensive
 0.01-0.02 % quite intensive
 0.01% ≥ rarely encountered weed seeds

Frequency of Occurrence:

50 % ≤ very frequent
 25-50 % frequent
 10-25 % quite frequent
 10 % ≥ rarely encountered weed seeds

In his study conducted in Van, Tepe (1998) determined that *S. cereale* took place on the top in terms of weight and numerical contamination. In our study, the mentioned species ranked among the top five and its frequency of occurrence was found as 93,3333 %. Also Karaca and Güncan (2009), determined that *S. cereale* seed was contaminated in wheat product with an average of 1.1536% numerically and 0.9522% by weight in Konya province.

Once again, in their study including the West of Anatolia, Güncan and Boyraz (2001) reported the species intensively contaminated in wheat as *S. cereale*, *Vicia* spp., *G. aparine* and *G. tricornutum*. In our study, *G. tricornutum* took place on the top numerically and ranked forth as weight. *S. cereale* also had a considerable percentage in terms of weight and frequency of occurrence.

Similarly, in their study conducted in Samsun, Mennan and Işık (2003) determined that *G. aparine* took place on the top in terms of intensity, Tursun et al. (2006) determined that *G. tricornutum* ranked fifth. Also Kaçan and Tursun (2019) were determined *G. aparine* as the most frequently contaminated weed seeds numerically in wheat crop.

Among the species determined as a result of the study, *A. aestivalis*, *A. flammea*, *A. githago*, *Chenopodium* sp., *C. syriaca*, *C. aristata*, *Cirsium lanceolatum*, *H. niger* L. *temulentum*, *L. multiflorum* and *V. pyramidata* have been reported to be toxic to humans and animals in different literature (Watt et al. 1962; Muzik (1970); Seçmen and Leblebici 1987; Picon et al. 1991; Suter 2002; Wagstaff 2008; Anonymous 2021).

4. Conclusion

It can reduce the contamination of weed seeds in wheat product to minimum by taking some measures such as; using pure seeds, passing through a selector,

performing cultural and chemical control in the weedy fields. Today in Turkey, many weed seeds continue to contaminate in wheat product and maintain their development because of the reasons mentioned above. Definitely, in order to prevent this situation, it is our responsibility to raise the awareness of our farmers, to avoid incorrect agricultural practices being applied and to take necessary measures and to put them into practice.

Wheat is purchased from the Central Anatolia and outside region of the flour mill plants in Konya. As a result of the study, the detection of species with different ecological demands such as *Alopecurus myosuroides*, *A. sterilis*, *Bifora testiculata*, *C. syriaca* and *Sorghum halepense* shows this result. Thus, different species of weeds enter the region. Weed seeds from flour mill plants are also fed to animals as forage. There is a risk of contamination of animal manures and thus agricultural lands due to climate change. In addition, weed species that are not in the region can be transported to the agricultural lands of the region with the use of animal manure. Therefore, weed seeds obtained from flour mill plants should not be fed to animals as forage. Or it should be aged for at least 6 months. Also, toxic species such as *Lolium* spp., *Chenopodium* sp., *Cephalaria* spp., *Adonis* spp., *A. githago*, *Hyoscyamus niger*, *V. pyramidata* present in weed seeds can harm animal health. The alkaloids contained in these toxic weeds can cause reactions and threaten human and animal health.

On the other hand, highly contaminating species are known as major weeds in farmlands. The species such as palmer amaranth (*Amaranthus palmeri*) are often reported to be herbicide-resistant and have been increasing in recent years worldwide (Gaines et al. 2010). Herbicide resistant weed seeds have been reported as contaminants in commercial grains (Michael et al. 2010; Shimono et al. 2010). The international grain

trade is also a major pathway of introduction because various weed seeds contaminate grain commodities (Hulme 2009; Asai et al. 2007; Shimono and Konuma, 2008; Michael et al. 2010; Asav and Kadioğlu 2014; Wilson et al. 2016).

With the increasing wheat import, weed seeds contaminated with wheat enter the country. The weed that adapts to a region can reach the economic thresholds level within a few years. In this way, a weed that was not previously found in the country may appear as a problem in the future.

5. References

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