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CHANGES OF WEED FLORA IN CEREAL FIELDS OVER THE LAST 31 YEARS IN VAN, TURKEY

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Abstract

Agricultural activities carried out over time, and accordingly the developments in pest control methods, and climatic changes caused by the global warming affect the composition and density of weeds in agricultural areas. In order to determine and reveal the causes of this change, a survey was conducted on cereal fields in Van in 2017 and compared with the results of a 31 years old survey. A total of 71 weed species belonging to 23 plant families were identified in 2017, while 84 weed species belonging to 24 plant families were identified in 1986. Looking at the weed density in unit area, it was found that the weed averages were 41.8 in a square meter in 2017 and 82.8 in 1986. In both surveys, the number of weed species was almost equal to each other and the coefficient of Similarity Index (SI) for 2 surveys was calculated as 0.58 in terms of weeds. While the roughfruit corn bedstraw (*Galium tricornutum* Dandy.), tuberous cranesbill (*Geranium tuberosum* L.) and rye (*Secale cereale* L.) were detected as the most intensive species in 1986, the narrowleaf knotweed (*Polygonum bellardii* All.), goatgrass (*Aegilops* spp.) and summer pheasant's eye (*Adonis aestivalis* L.) were identified as the densest species in the recent study. When the weed distribution was assessed based on their abundances, the field bindweed (*Convolvulus arvensis* L.) with 21.3% frequency of occurrence and yellowweed (*Boreava orientalis*Jaub. & Spach) with 19.5% frequency of occurrence were detected as the most common weeds in 2017. The field bindweed (*Convolvulus arvensis* L.) was the most common weed type in both studies, while the yellowweed was found to be common only in 2017. When both studies were compared, it was seen that the total weed density had decreased at a significant level during the last 31 years, although there had been significant increase in the density of several weeds, such as the yellowweed (*Boreava orientalis* Jaub. & Spach). It is considered that this decrease was due to the increase in cultivation and pest control techniques.

Key words: Cereals, Weed flora, Density, Distribution.

Introduction

Cereals, especially the wheat, have a different significance among all agricultural products in human nutrition (Anon., 2017). Cereals are strategic products as they are raw materials or auxiliary materials for many industrial products, which can be directly consumed and processed through various processes. Besides, they have an important place in animal feeding as well as in human nutrition. They hold the first rank in terms of plantation area and production both in the World and Turkey. However, the wheat, with its wide adaptation ability, is the first in the world with its 220 million hectares planting area and 713 million tons of production (Anon., 2017). Within approximately 24 million hectares area where the cultivation is done in Turkey, the winter cereals (wheat, barley, rye and oats) take the largest share with 44%. The wheat and barley are grown in Van, Turkey on 78.700 and 6.800 hectares of the total of 200.000 hectares of the agricultural land, respectively (Anon., 2017).

Many crop protection problems are encountered in cereal cultivation. Weeds are the most significant among these problems. While the product losses from weeds are approximately 10-15% in developed countries, where as this rate reaches 45% in some Asian countries (Gursoy, 2014). However, the production loss originating from weeds has been reported as between 20-30% in Turkey (Bilgir, 1965; Güncan, 1975; Uygur *et al*., 1986; Doğan *et al*., 2004; Tepe, 2014). It is of great importance to know the distribution and densities of species, which are problematic for effective pest control with weeds (Turk & Tawaha, 2003; Shahzad *et al*., 2016). Although, the pest control techniques against weeds in wheat fields in Turkey are applied to some extent, the more radical solutions today are searched. Moreover, the integrated pest control systems are being revealed assessing all data (Durutan, 1987; Güncan, 2009). Number of studies have been carried out Turkey for the determination of weeds, which are problems in wheat fields, in different regions of Turkey (Uygur *et al*., 1986; Tepe, 1989; Mennan & Uygur, 1994; Taştan & Erciş, 1994; Boz *et al*., 2000; Tursun, 2002, Üstüner & Altın, 2003, Sırma & Kadıoğlu, 2010, Pala & Mennan, 2017, Gökalp & Üremiş, 2015).

The density and composition of weeds are influenced by plant production systems and agricultural practices. It is possible to mention about two types of floral changes in the agro-ecosystem. The first type is the fluctuations in species with the time. It is possible to explain this situation as agricultural activity, the change in pest control methods, primarily the use of herbicides, and short-term changes occurring in the weed population due to the climatic factors. The second type is the succession, which is named as the substitution of species with each other in time in a particular region. The succession is divided into two categories as; autogenic and allogenic. The allogenic type is seen in agricultural areas, and it is a long-term change of the weed population in an area based on agricultural practices and environmental conditions (Hartzler, 2000, Mennan & Işık, 2003a). It is known that changes in the climate due to the global warming cause changes in the spreading limits of weeds in agricultural ecosystems, the emergence of some new species, and the decrease in the effect of some important weeds or the complete elimination of these species (Patterson, 1995).

In order to find out this change in weeds for many years, the types, density and distribution of weeds in wheat areas in Van were studied and compared with the results obtained by Tepe (1989), which was one of the first study carried out in cereal fields in Van in 1986. With this study, the changes in species, density and abundances of weeds were tried to be revealed during the last 31 years.

Material and Method

The study was conducted between the months of May and June in 2017 in cereal growing areas in Van province. Van is located in the Eastern Anatolia Region between 43, 41° eastern longitudes and 38, 49° northern latitudes. According to Köppen-Geiger climate classification system, the region has D type continental climate and Dsb type sub-climate type "hemi boreal climates" (Öztürk *et al*., 2017). The long-term average temperature of Van is 9.4°C and has an average rainfall of 387.2 mm in the last 79 years (Anon., 2018).

Weed species in cereal areas and their densities and distributions in unit area were determined. Van province has 13 districts. The surveys were carried out in 10 districts in a total of 445 fields. Başkale, Çaldıran and Bahçesaray districts could not be visited and sampled due to security reasons. Considering its climatic and geographical characteristics, the Van province and its surroundings is divided into 5 different regions. The number of sampling was based on the areas of cultivation in these regions (Table 1).

Table 1. Some characteristics and number of samples of surveyed regions (TUİK, 2017)

Regions	Sowing area (ha)	Sample numbers	Temperature (°C, 2017)	Precipitation (mm, 2017)	Altitude (m)	Soil properties
I. İpekyolu-Tuşba-Edremit	25.7	140	9.60	415.6	1687	Alluvial in plains, soils brown and reddish-brown in other parts. Soil moisture and ground water are higher than other regions
II. Özalp-Saray	17.2	130	6.65	314.6	2046	Alluvial in plains, soils non-chalkybrown
III. Erciş	11.5	70	9.40	287.2	1690	Alluvial in plains, soils non-chalkybrown
IV. Gevaş-Gürpınar-Çatak	8.0	75	9.23	440.7	1858	Alluvial in plains, soils non-chalky brown, the higher areas are mountainous and rocky
V. Muradiye	5.8	30	10.21	302.7	1707	Alluvial in plains, soils non-chalkybrown
Total	**68.2**	**445**	**9.20**	**352.2**		

Table 2. Some agricultural characteristics of two surveys in cereal production in Van.

Agricultural practices	1st survey (1986)	2nd survey (2017)
Sowing area (ha)	107.259	68.152
Sowing type	by hand/ machine	by machine
Fertilizing	DAP*	DAP/NPK
Tillage	Plough	Plough and different implements
Rotation	Wheat, clover, sainfoin	Wheat, barley, clover, sainfoin
Herbicide uses	Limited	2-3 different herbicides*
Average precipitation for long years (mm)	387.0	388.5
Average temperature for long years (°C)	8.8	9.2

* Van Directorate of Provincial Agriculture and Forestry

The first and second surveys in the cereal planting areas in Van were conducted in 1986 by Tepe (1989) and 2017, respectively. The survey was carried out between the post-tillering and jointing of the cereal. Some of the agricultural characteristics of both surveys in the cereal cultivation areas are given in Table 2.

The density of weeds in the unit area was determined according to the method suggested by Güncan (1972) by counting the weeds in a square meter after choosing the sampling fields representing the region. The quadrate, which had an area of 1 square meter used for this purpose, was randomly located on the field and the sampling was initiated at least 10 meters from inside the field edges to remove the edge effect. Attention was given to ensure a minimum distance of 3 km between the fields where the sampling was done. The sampling was carried out based on the areal size of fields; 3 frames for the fields up to 5 decares, 5 frames for the fields between 5-10 decares and at least 8 frames for the fields that are larger than 10 decares (Bora & Karaca, 1970). The density of weeds per square meter was calculated by taking the average of the samples collected from the area. At the same time, the weeds were pressed and dried based on the herbarium technique by taking samples from weeds then brought to the herbology laboratory of the department of plant protection, the faculty of agriculture of the Van Yuzuncu Yil University. The identification of the weeds has been made according to Davis (1966-1989) and confirmed by comparing with samples in the laboratory.

The abundance and frequency of occurrence (FO) of weeds determined in the study was identified by the formula as given below (Odum, 1971):

$$FO\ (\%) = N / M \times 100$$

where;
N is the number of encounters for the weed in samples,
M is the total number of sampling.

Table 3. Weed species in wheat fields in Van province, their frequencies and densities.

Weed species	Regions*						2017		1986
	I	II	III	IV	V	Genera	Density (m^2)	Frequency (%)	Density (m^2)
Achillea millefolium L.	D		C			D	0.05	0.89	
Acroptilon repens (L.) DC.	C	C				D	0.06	1.56	
Adonis aestivalis L.	B	B		C		B	2.03	17.26	1.95
Aegilops spp.	B					B	3.63	2.01	
Agropyron repens P. B.									0.04
Agrostemma githago L.	B	D	D	D		C	0.48	5.60	0.05
Allium sp.									0.02
Alopecurus myosuroides Hudson.									0.04
Alyssum desertorum Stapf									1.94
Amaranthus retroflexus L.	D		D	B		C	0.11	1.79	0.06
Anchusa arvensis (L.) M. Bieb.	C	D		B		C	0.73	8.07	0.96
Anchusa sp.	C			D		D	0.06	1.12	0.05
Anthemis wiedemanniana Fisch. & Mey	C					C	0.12	2.46	0.08
Aristolochia maurorum L.				C		D	0.04	0.22	0.52
Atriplex lasiantha Boiss.									0.02
Bongardia chrysogonum (L.) Spach.									0.09
Boreava orientalis Jaub. et Spach.	D	B		C		B	1.91	19.50	0.15
Bromus sp.									0.03
Bromus tectorum L.	C	D	C	C		C	0.63	6.72	0.28
Buglossoides arvensis (L.) Johnston	C	D				D	0.05	1.12	0.60
Bunium paucifolium DC.	B	D		C	B	C	0.86	14.79	0.23
Capsella bursa-pastoris L. Medik.	C					D	0.02	0.67	
Cardaria draba (L.) Desv.		C				C	0.17	0.89	0.55
Carduus sp.				C		D	0.01	0.22	0.01
Caucalis platycarpos L.				C		D	0.04	1.12	
Centaurea balsamita Lam.	C	B		B		C	0.81	8.96	
Centaurea depressa Bieb.	B	B		B	C	B	1.47	18.60	0.26
Centaurea iberica Trev. Ex. Sprengel.									0.03
Centaurea pseudoscabiosa Boiss. & Buhse.									0.02
Centaurea virgata Lam.									0.01
Cephalaria syriaca (L.) Schrad.									0.39
Cerastium perfoliatum L.	B	D		D	D	C	0.33	5.60	
Ceratocephalus testiculatus (Crantz) Roth.									
Chenopodium album L.	D	C	B	C	C	B	1.23	8.96	1.18
Chondrilla juncea var. *juncea* L.									0.27
Cichorium intybus L.	C	C	C	C	C	C	0.21	5.60	0.06
Cirsium arvense (L.) Scop.	D	B		B	C	C	0.77	11.43	0.94
Cnicus benedictus L.			C	D		C	0.11	2.01	0.25
Conringia orientalis (L.) Andrz.									0.63
Conringia perfoliata (C. A. Mey.) Bosch.									0.35
Consolida anthoroidea (Boiss.) Schrod.	C					D	0.04	0.44	0.21
Convolvulus arvensis L.	B	B	C	C	C	B	1.39	21.30	1.41
Convolvulus galaticus Rostan ex Choisy	C	C				C	0.45	4.03	
Crambe orientalis L.	D					D	0.03	0.67	
Cynodon dactylon (L.) Pers.	C			D		C	0.10	0.44	
Descurainia sophia (L.) Webb ex Prantl		D		D		D	0.07	1.79	0.01
Equisetum arvense L.		C				D	0.05	1.79	
Erodium sp.	D		D			D	0.01	0.44	
Eromopyrum bonapartis (Spran.) Nevski.									0.85
Eryngium campestre L.	D					E	0.01	0.22	
Eryngium sp.									0.03
Euclidium syriacum (L.) R. Br.									1.20
Euphorbia helioscopia L.									0.17
Euphorbia heteradena Jaub. et Spach.	B	C		C	D	C	0.35	4.93	0.47
Euphorbia sp.									0.04

Table 3. (Cont'd.).

Weed species	Regions*						2017		1986
							Density (m^2)	Frequency (%)	Density (m^2)
Falcaria vulgaris Bernh.	D	C	C		B	C	0.40	4.48	1.07
Fumaria sp.	B	C	C	B		B	1.93	17.26	5.23
Galium aparine L.	B	C		B	B	B	1.65	19.28	
Galium tricornutum Dandy				B		C	0.79	2.46	13.68
Geranium tuberosum L.	C	C		C		C	0.76	18.16	11.92
Gladiolus atroviolaceus Boiss.	C					C	0.36	1.79	0.01
Glycirrhiza glabra L.									0.05
Heterocaryum szovitsianum (Fisch. & C. A. Mey.) A. DC.	C	C	C		A	B	1.90	9.41	0.03
Hyoscyamus niger L.		C				C	0.10	1.12	0.01
Hypecoum pendulum L.	D					D	0.03	0.44	0.68
Lathirus sp.									0.03
Lepidium perfoliatum L.	C	D	B	D		C	0.23	4.03	
Marrubium vulgare L.	C					D	0.06	0.22	
Medicago sativa L.	C	D	B	B	B	B	1.55	15.69	
Melilotus officinalis (L.) Desr. C	D	D	C	C	C		0.11	4.48	
Mentha pulegium L.			C		C	D	0.09	2.24	0.17
Minuartia hamata (Hausskn.) Mattf.	C					C	0.25	0.89	
Muscari sp.									0.09
Neslia apiculata Fisch.	C		D		D	D	0.06	2.69	0.77
Nigella latisecta P. H. Davis.									0.01
Onopordum sp.		C	D			D	0.08	2.01	
Papaver dubium L.									1.37
Papaver macrostomum Boiss. et Huet Ex Boss.	C	B	D	B	C	C	0.56	10.98	1.77
Phragmites communis (Cav.) Trin. ex Steud.									0.58
Plantago lanceolata L.			B			C	0.18	2.24	
Poa annua L.	C					D	0.07	0.67	
Poa bulbosa L.	B		B			B	1.14	6.50	0.15
Polygonum bellardii All.	C	B	A	C	C	B	6.16	16.59	6.94
Polygonum sp.									0.17
Ranunculus arvensis L.	B	B		C	C	B	1.30	11.43	5.40
Ranunculus damascenus Boiss & Gaill.									2.89
Roemeria hybrida (L.) DC.									2.19
Rumex crispus L.									0.02
Salsola ruthenica Iljin.					D	E	0.01	0.22	0.02
Salvia sp.									0.39
Scandix iberica M. Bieb.									0.39
Scariola viminea (L.) F. W. Schimidt									0.14
Secale cereale L.			B			C	0.28	0.89	4.29
Senecio vulgaris L.	C		D			C	0.24	2.01	
Setaria viridis (L.) P. Beauv.									0.07
Silene sp.		C		D		D	0.04	1.79	0.08
Sinapis arvensis L.		D	C	C	A	B	1.10	4.2	0.30
Sisymbrium altissimum L.									0.09
Sonchus asper subsp. *glaucescens* (L.) Hill.									0.02
Taraxacum sp.			C			D	0.02	0.67	
Thalaspi sp.									0.13
Tragopogon pratensis L.	C	B		D		C	0.53	8.29	0.89
Trigonella monantha C. A. Meyer	D					D	0.01	0.44	1.40
Turgenia latifolia (L.) Hoffm.	C	D		C		C	0.23	6.50	1.30
Vaccaria pyramidata Medik.	C	D	B	C	B	C	0.38	7.17	0.30
Veronica sp.									0.09
Vicia spp.	C		D	C		C	0.11	3.36	1.18
Viola occulta Lehm.									0.06
Xeranthemum annuum L.	B	D				C	0.60	5.82	
Total density (m^2)	42.70	28.87	55.00	39.63	51.05		41.74		82.82

*A: Very dense, more than 10 weeds per square meter, B: Dense, between 1-10 weeds per square meter, C: Moderately dense, between 0.1 to 1weeds per square meter, D: Less dense, between 0.01 to 0.1weeds per square meter, E: Rare, less than 0.01weeds per square meter (Tepe, 1989)

In addition, the Similarity Index (SI) between two surveys was calculated according to Odum (1971) using the following formula as given below:

$$SI\ (\%) = (A + B) / 2C \times 100$$

where;
A is the number of weed species in first survey,
B is the number of weed species in second survey,
C is the number of common weed species in both surveys.

Results and Discussion

In 445 samples, total of 71 weed species belonging to 23 families were defined as being; 1 sample in Equisetopsida, 2 samples in Liliopsida and 20 samples in Magnoliopsida classes as a result of the study in cultivation areas of the Van province (Table 3). In the first survey conducted in 1986 by Tepe (1989), total of 84 weed species belonging to 24 different plant families were identified in 350 samples. Two families belong to the Liliopsida and 22 of them belong to the Magnoliopsida classes. In both surveys, the total number of weed species was found to be close to each other. The Similarity Index (SI) of weeds was determined as 58% in wheat during both survey periods. In the study carried out in 2017, the most species were detected in Asterace (14) and Poaceae (6) families. Similarly, the Asteraceae family held the first rank with 13 species and the Brassicaceae family held the second rank with 12 species in the first survey (Tepe, 1989).

According to the density of weeds, the weeds were detected approximately as 41.8 and 82.6 in 2017 and 1986, respectively. In the last survey, *Polygonum bellardii* was found to bevery dense, which was followed by *Aegilops* spp. *Adonis aestivalis*, *Fumaria* sp. and *Heterocaryum szovitsianum*. On the other hand, *Galium tricornutum* was found as very dense in the first survey followed by *Geranium tuberosum, Secale cereale, Polygonum bellardii* and *Chenopodium* sp. According to the density of weeds, approximately 41.8 and 82.6 weeds were detected in 2017 and 1986, respectively. In the last survey, *P. bellardii* was found to bevery dense followed by *Aegilops* spp. *Adonis aestivalis, Fumaria* sp. and *H. szovitsianum*. On the other hand, *G. tricornutum* was found as very dense in the first survey followed by *Geranium tuberosum, Secale cereale, P. bellardii* and *Chenopodium* sp. In the first survey, two plants (*G. tricornutum, Geranium tuberosum*) with a weed density of more than 10 per square meter were found. However; the *P. bellardi* held the first rank as very dense species with 6.1 plants per square meter in 2017. Comparing both studies, there seems a decrease in the weed density over the last 31 years. It is considered that the reason of this decrease is due to the development of cultivation and pest control techniques in time.

In the study conducted by Cirujeda *et al*., (2011), the similar results were obtained and it was determined that grass weeds had increased, the weed density in unit area had decreased and the frequency of occurrence for most weeds in unit area had decreased as a result of improving agricultural practices according to the results of weed change in the cereal within last 30 years in Spain. In another study carried out in Finland, the weed change in the spring wheat has been examined in the last 10 years and it was determined that the frequency of species such as; *Galium spurium, Lamium* spp., *Lapsana communis* and *Poa annua* had increased due to the decrease in the first tillage process, and the increasing use of glyphosate had reduced the number of *Elymus repens* (Salonen *et al*., 2001). The similar results were also obtained by Hald (1999) and it was emphasized that the reduction in weed density was extremely important for the wildlife ecology.

Assessing both survey periods based on the frequency of occurrence of weeds, *Convolvulus arvensis* (21.30%) is seen as the most common species encountered in all districts in each survey according to 2017 data. *Boreava orientalis* (19.50%), which is the second in ranking in terms of frequency of occurrence, has significantly increased its abundance compared to the first study. *Galium aparine* (19.28%), which is third in ranking, was encountered in all regions except the Erciş region in the second study while it was not seen in the first study. *Centaurea depressa* (18.60%), another very commonly encountered species, was only observed in the Çatak region. It is seen that the abundance of this species has also increased. *Fumaria* sp. and *Adonis aestivalis* were identified as the other species with 17.26% frequency of occurrence. *P. bellardii*, which was encountered in the second survey with 16.59% frequency of occurrence, was seen in all districts in both surveys. This weed was among very dense species found in the Erciş region in the first survey.

As it is known, the governmental support is given to the production of forage crops in order to meet the food deficit in animal production and encourage the production of forage crops. Accordingly, there has been a significant increase in the area of *Medicago sativa* plantation in Van in the recent years (Tepe *et al*., 2017). This has led to the emergence of alfalfa a perennial herb that is rarely encountered in the first study, as a weed in dense cereal fields (15.69%). *Bunium paucifolium* is another weed that increases both its intensity and abundance compared to the first study. It was encountered in all regions except the Çatak and Erciş regions. Similarly, it was seen in all regions except the Erciş region and has a 14.79% frequency of occurrence in the study in 2017. *Cirsium arvense* is not the weed, which occurs only in the Erciş region, but it was also encountered in all regions as it had been in the first study with 11.43% frequency of occurrence. The other two plants more than 10% in abundance are *Ranunculus arvensis* (11.43%) and *Papaver macrostomum* (10.98%) when evaluated in terms of frequency of occurrence. Although these two plants showed abundance in all districts, *R. arvensis*was not encountered in the Erciş region. In the first survey, it was stated that these plants did not have the same abundance rates.

In both surveys, the change in the density of *Sinapis arvensis* is remarkable. The density of *S. arvensis*, which is one of the most important weeds in the cereal cultivation areas, was 0.3 plant in a square meter in 1986, however it increased to 1.1 in the second survey. The density of another important weed, the *Boreava orientalis*, was 0.14 plant in a square meter, however this reached 1.91 in a square meter in 2017. It was determined

that the density of both weeds had significantly increased in the survey in 2017. Especially in the Muradiye region, the density of *S. arvensis* was detected high (11.5 plant in a square meter). Van, where the survey was carried out, is one of the latest wheat harvest areas in the Eastern Anatolia Region. The harvesting of wheat is done by harvesters, which operate all around the region in the order of harvesting period and provided by leasing system in the city where the agricultural mechanization is poor (Baydar, 2001). This situation brings out some problems, mainly the weeds. It is thought that the seeds of some weeds such as the *B. orientalis* and *S. arvensis* have entered the region with machines and increased their density in this way.

It was determined in the study carried out that Erciş was the region with the highest weed density and Özalp-Saray was the region with the lowest weed density. It can be said that this difference between the regions is due to the cultivation techniques (groundwater level, irrigable land), soil and climate characteristics (Table 1).

Fertilization, specifically the nitrogen fertilization is considered as an important reason why some weed species increase in one area (Ellenberg, 1979; Froud-Williams, 1987). In a study conducted by Mennan and Işık (2003b), it was stated that *Cirsium arvense, Sinapis arvensis* and *Galium aparine* are among the species that have increased in 25 years in onion cultivation areas. However, in a similar study conducted in the corn by the same researchers, it was seen that the species such as; *Abutilon theoprastii, Solanum nigrum, Polygonum convolvulus, Portulaca oleracea, Datura stromonium, Ranunculus arvensis, Galium aparina* and *Artemisia vulgaris* had become important within last 30 years (Mennan & Isik, 2003a). In both studies it was stated that the fertilization was a significant cause of the change in weed flora and these results showed similarity with the study carried out.

One of the most important factors affecting the distribution of weed is the contaminated seed. In a study carried out in the region, it was determined that 13.1% of weed seeds mix with *Triticum aestivum* and the highest mixing ratio was 12.4% in the rye plant (Tepe, 1998). Another important result of the study was that while the region's farmer has been using its own seed for more than 30 years, this has led to an increase in the problem of some weeds. However, the integrated pest control technique applied in the region has led to a decrease in the weed density over time.

Conclusion

As a result of the study carried out, 71 weed species belonging to 23 plant families in 2017 and 84 weed species belonging to 24 plant families in 1986 were identified. According to the density of weeds in unit area, it was determined that the weed averages were 41.8 and 82.8 plantsper square meter in 2017 and 1986, respectively. The total weed density has fallen at a remarkable level during the last 31 years. It is thought that these variations in the weed populations have been caused by the change in cultivation and pest control techniques and climatic factors. In both surveys, the values were detected close to each other in terms of number of species, and the coefficient of Similarity Index (SI) for weeds was calculated as 0.58 for both surveys. In the last study conducted, the narrowleaf knotweed (*Polygonum bellardii* All.), goatgrass (*Aegilops* spp.) and pheasant's eye (*Adonis aestivalis* L.) were determined as very dense species. However, it was seen that roughfruit corn bedstraw (*Galium tricornutum* Dandy.), tuberous cranesbill (*Geranium tuberosum* L.) and rye (*Secale cereale* L.) were very dense species in 1986. When weeds were evaluated based on their abundances, the field bindweed (*Convolvulus arvensis* L.) with 21.3% frequency of occurrence and the yellowweed (*Boreava orientalis* Jaub. & Spach) with 19.5% frequency of occurrence were detected as the most abundant weeds. The field bindweed (*Convolvulus arvensis* L.) is the most abundant weed in both studies. However, the yellowweed is abundant only in 2017. When both studies were compared, it was observed that the density and abundances of the wild mustard (*Sinapis arvensis* L.) and yellowweed (*Boreava orientalis* Jaub. & Spach), which are the most significant weeds known, had increased in cereal areas in Van.

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