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Relationship Between *in situ* Conserved Wild Wheat Species, Associated Plants and Soil Characteristics

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Abstract: A comprehensive knowledge of the ecology and associating plant species of wheat progenitors is important for plant scientists. This study was designed as a case study to focus on the relation between 5 wild relatives of wheat (*Aegilops* spp. L. and *Triticum* spp. L.), their associated soil types and environmental and external variables in the Ceylanpınar State Farm of Şanlıurfa Province. The aim of the study was to explain the major physical factors affecting the existence of target species in the area. The following wild wheat species, which are all related with evalution of modern wheat were taken into consideration: *Aegilops speltoides* Tausch var. *speltoides* (goat grass), *Aegilops speltoides* Tausch var. *ligustica* (Savign.) Fiori (goat grass), *Aegilops tauschii* Coss. var. *meyeri* (Griseb. ex Ledeb.) (Tausch's goat grass) , *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell. (einkorn) and *Triticum turgidum* L. ssp. *dicoccoides* (Körn. ex Asch.& Graebn.) (emmer). Association was observed between the target species, *Poaceae* species and herbaceous plants, while no association was noticed with perennial plants. Strong association was observed between rockiness and emmer. Einkorn was associated with slightly stoniness and slight grazing while *Ae. speltoides ligustica* was related with very stony areas and excessive grazing.

Key Words: *Aegilops*, *Triticum*, *in situ* conservation, soil characteristics, wild wheat

Yerinde (*in situ*) Korunan Yabani Buğday Türleri, Eşlik Eden Bitkiler ve Toprak Özellikleri Arasındaki İlişkiler

Öz: Buğdayın atalarının ekolojileri ve bunlara eşlik eden bitki türlerinin etraflıca bilinmesi, bitki bilimiyle uğraşan bilim adamları için önem taşımaktadır. Bu çalışma Şanlıurfa'nın Ceylanpınar Tarım İşletmesinde bulunan 5 yabani buğday (*Aegilops* spp. L. ve *Triticum* spp. L.) akrabası ile bunların bulundukları yerlerin toprak tipleri, çevresel ve dış değişkenlerine yoğunlaşmak üzere uygulanan bir vaka çalışması niteliğindedir. Çalışmanın amacı, alanda bulunan hedef türlerin mevcudiyetini etkileyen temel fiziki koşulların ortaya konmasıdır. Modern buğdayların evrimiyle ilişkili olan aşağıdaki beş yabani buğday türü araştırma materyalini oluşturmuştur: *Aegilops speltoides* Tausch var. *speltoides* (keçi otu), *Aegilops speltoides* Tausch var. *ligustica* (Savign.) Fiori (keçi otu), *Aegilops tauschii* Coss. var. *meyeri* (Griseb. ex Ledeb.) (Tausch keçi otu), *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell. (yabani siyez) ve *Triticum turgidum* L. ssp. *dicoccoides* (Körn. ex Asch.& Graebn.) (yabani gernik). Hedef türler ile *Poaceae* familyası türleri ve eşlik eden otsu bitki türleri arasında ilişki bulunurken, çok yıllık bitkilerde benzer bir ilişki gözlenmemiştir. Taşlılıkla yabani gernik arasında kuvvetli bir ilişki bulunmuştur. Yabani siyezde hafif taşlılık ve hafif otlatmayla, *Ae. speltoides ligustica* türünde de çok taşlılık ve aşırı otlatma ile ilişkili bulunmuştur.

Anahtar Kelimeler: *Aegilops*, *Triticum*, *in situ* muhafaza, toprak karakteristikleri, yabani buğday

Introduction

Genetic diversity is the key for meeting food and feed demands of the growing population of the world. The universally accepted coverage of the term "genetic diversity" by the Convention on Biological Diversity (Anonymous 1996), includes not only the living entites but also their ecosystems and habitats especially soil, as integral part of it (Karagöz 2006).

Wheat is assumed to have originated from the Fertile Crescent (Harlan 1992). The Fertile Crescent is defined as an area that stretches from the Jordan Valley through Syria, Turkey, and the mountains of Iraq and Iran (Hawkes 1995). Wild relatives of wheat are wide spread in southeast Turkey. It is agreed that

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diploid wheat was first cultivated on Karacadağ Mountain in southeast Turkey and soon was dispersed to the other parts of the world (Heun et al. 1997, Diamond 1997, Nesbit and Samuel 1998, Lev-Yadun et al. 2000).

Due to the global importance of the area for wheat genetic resources, we initiated an *in situ* conservation project in the area and set up 6 Gene Management Zones (GMZs) to conserve 5 target wild wheat species, all of which contribute to evolution of modern wheat (Karagöz 1998, Karagöz et al. 1998). Three genomes, namely A, B (S) and D, are involved in the evolution. Dvorák (1998) claims that the B genome is related to the genome of *Ae. speltoides*, Gitte et al. (2006) declare that B genome is derived from *Ae. speltoides* and the A genome is derived from *T. urartu* which is closely related with *T. aegilopoides*. The donor of the D genome is reported to be *Ae. tauschii* (Kimber and Feldman 1987, Waines 1997, Gitte et al. 2006).

Habitat requirements of wild wheat relatives depend on the species. In general *Aegilops* species are frequent along road sides, edges of cultivated fields, and weeds among crops. Their distribution is limited to the Mediterranean-Central Asiatic Region with a climate of hot, dry summers and winter rainfall, changing inland to more dry continental weather with cold winters (van Slageren 1994).

Based on the data gathered from various parts of Syria, Sankary (1990) reported that all of the sites of *Aegilops* species had calcareous soils with pH between 7.0 and 7.8. He reported that *Ae. speltoides* occurred occasionally in hard limestone pockets of uncompacted soils and rarely occurred in basaltic sandy saline and nutrient-poor soils.

Townsend et al. (1968) desribed the specific habitat of the target species of our project as follows: *Ae. ligustica*: coppiced or denuded oak forests, on limestone slopes, roadside weed, wadi, dry cracked-mud river banks on the plains; *Ae. speltoides*: in degraded oak forests, coppiced or scrub, on roadside banks and irrigation bunds, dry grassy steppic hills and plains, disturbed and cultivated lands; *Ae. tauschii*: grassy steppic slopes, sandy desert, silty desert depressions, weed on disturbed or cultivated lands; *T. aegilopoides*: grassland on lower limestone mountain slopes, in degraded oak forests and oak scrub, sometimes in coppiced oak scrub, in old vineyards or fig gardens; and *T. dicoccoides*: in oak forests, open grassy places in coppiced oak scrub on limestone slopes.

Kimber and Feldman (1987) specify the soil type of wild wheat relatives as terra-rosa or alluvial for *Ae. speltoides* and *Ae. ligustica*, as terra-rosa and basalt for *T. dicoccoides* and *T. aegilopoides*, and as grey calcareous steppe marl, alluvial and sandy soils for *Ae. tauschii*.

Searching the whole flora of Turkey, Davis (1985) outlines that *Aegilops speltoides* prefers a variety of soil and habitat types including dry oak scrub, plains, rocky limestone hills, fallow fields, and edges of cornfields, 100 - 1200 meters elevation in Turkey, and it also might do well located in cultivated beds.

Valkoun et al. (1997) suggest that many wild cereal populations thrive in basalt soils or around piles of basalt rocks collected when fields are cleared. These rocks seem to protect the plants from grazing animals. Soil types are important for wild cereals, and populations that thrive on basalt, terra rosa, alluvial and possibly serpentine soils are known. Similarly especially in the Ceylanpınar State Farm and Karacadağ area of Turkey, basaltic rock clearing is a common practice to gain cultivation area, where such places provide refuge for wild wheat relatives.

Feinbrun-Dothan (1986) describes soil conditions of *Ae. speltoides* as humid alluvial soils and of *T. dicoccoides* as rocky places and soils developed on basalt hard limestone. Nevo et al. (2002) define *T. dicoccoides* as a common annual component in the herbaceous habitat of oak open park forest belt, together with related steppe like herbaceous plant formations.

The aim of the study was to explain the major physical factors affecting the existence of target species in the area.

Material and Methods

The following 5 wild wheat species were selected as target species for *in situ* conservation: *Aegilops speltoides* Tausch var. *ligustica* (Savign.) Fiori (*Ae. ligustica*), *Aegilops speltoides* Tausch var. *speltoides* (*Ae. speltoides*), *Aegilops tauschii* Coss. var. *meyeri* (Griseb. ex Ledeb.) (*Ae. tauschii*), *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell. (*T. aegilopoides*), *Triticum turgidum* L. ssp. *dicoccoides* (Körn. ex Asch.& Graebn.) (*T. dicoccoides*). Among the populations tested, *Ae. tauschii* Coss. var. *meyeri* (Griseb. ex Ledeb.) has not been described in the flora of Turkey before, and their relationship with the soil types is exposed in Turkey for the first time with this study. The materials are *in situ* conserved at 6 selected GMZ's in accordance with management plans developed for each one (Karagöz 1998).

Physical characteristics, associating plant species with target species, basic soil properties of each GMZ were determined through a series of vegetation surveys followed by seed sampling activities to determine genetic diversity revealed by isozyme variation of populations. To be able to give a complete picture of habitat of the GMZ's, 5 of the major associating plant species were studied during the vegetation surveys. Among the *in situ* conservation areas, GMZ 1 was the largest one with 3 dissimilar

physical and vegetation characteristics. Therefore, GMZ 1 was split into three parts, and each part was evaluated individually. After the GMZ selection procedures were completed, soils of GMZ's were analyzed.

For the purpose of representing each GMZ, which was selected on the basis of various criteria, soil samples were taken from the depth of 0-20 or 0-30 cm depending on the soil depth, dried, and sieved for laboratory analysis. The following analyses were performed at the Soil, Water and and Fertilizer Resources Central Research Institute, Ankara:

Soil reaction (pH): Determined in soil saturation extract as decribed by Tüzüner (1990).

Total salt (%): Calculated by converting the electrical conductivity value measured in saturated soil into total salt percentage (dS/m).

Texture class: Determined by the Bouyoucos Method, as expressed by Uzunoğlu (1992).

$CaCO_3$ (%): Calculated by the Scheibler Calcimeter Method, as stated by Tüzüner (1990).

Organic Matter (%): Determined by the Modified Walkley -Black Method (Walkley, 1946).

P_2O_5: Analyzed by the Olsen Phosphorus Analysis Method, as described by Tüzüner (1990).

K_2O: Calculated by the NH_4OAc Method, as decribed by Tüzüner (1990).

Stoniness: Stoniness was categorized into two as follows; (1) very stony, and (2) slightly stony. Areas with huge basalt blocks, rocks and stones larger than 30 cm of diameter with surface cover over 50% were recorded as "very stony"; and rest of the area were recorded as "slightly stony".

Associating plant species: Permanent sampling lines along 6 GMZ's were monitored to perform floristic studies (Noy-Meir et al. 1991a, b). In each of the sampling lines, 50 m long transects were stretched in various direction to cover the whole range of topographic and physical variation as well as slope and aspects of the GMZ. The number of transects changed between 3 to 8 depending on the size and topography of the area. On each of the transects, totally 10 sampling stations at 5 m distances were monitored. In every station, all the plants in 2 m diameter of circle were recorded (Karagöz 1998). Later the target species as well as all associating taxa, and, 5 plants with the highest frequency were recorded. Originally the number of associating plant species was 23. Since this number was too high to perform a Multiple Correspondance Analysis, we seperated the associating plant species into three categories as follows; (1) *Poaceae* (plants species of *Poaceae* family), (2) Herbaceous (herbaceous plant species other than *Poaceae* family), and, (3) Perennial plants.

Grazing pressure: All the sampling areas were freely grazed by the small ruminants. Grazing pressure is somewhat a visionary concept and recorded on the basis of visual observations, depending on the plant cover, amount of organic residuals from the grazing animals and existance-absence and/or abundance-scarcity of some indicator plants. Abundance of *Heteranthelium piliferum, Hordeum murinum* and *Hordeum marinum* as well as scarcity of *Fabaceae* species have been taken as indication of excessive grazing. Grazing pressure were recorded in two categories namely (1) Excessive and (2) Moderate.

Study area: Study area lays in the northern part of the Fertile Crescent adjacent to the Syrian border. The distance from the summit of Karacadağ Mountain to northern border of the farm is about 80 km. The farm covers a total surface of 175.650 ha. Altitude ranges between 370-560 m above sea level. The climate of the farm is characterized as arid Mediterranean with a total average annual rainfall of 330 mm. Distribution of the rainfall is uneven. Annual average temperature is 18.2 ^{0}C. Clay contents of the soils are generally high (12-68 %), and the organic matter content is between 1-3 %. Soil reaction is generally neutral or slightly alkaline with pH values between 7.7 and 8.3. Nitrogen content is low, P and K contents are medium and high, respectively (Karagöz 1998).

The farm accomodates several habitat types such as cultivation areas, arid pastures, rocky stream valleys, and stony waste areas. The area is generally flat. Wild areas which comprise about 41 % (71.238 ha), constitutes a suitable environment for many plant species including wild wheat relatives. It was reported that 217 plant genera, 407 species, 46 sub-species and 42 varieties belonging to 51 families inhabit the farm (Adıgüzel and Aytaç 2001). The marginal areas are grazed year long by small ruminants.

Due to the the importance of the area for plant genetic diversity, the steppes of Ceylanpınar State Farm were later identified as one of the Important Plant Areas of Turkey by Turkish World Wide Fund for Nature (Adıgüzel and Aytaç 2005). The Ceylanpınar Steppes accommo-date 6 endangered species on European scale and 49 rare species on national scale. The total number of endemic species was reported as 13 in the farm.

The farm is located on old eocene and miocene limestone formations and basalts. Locally there exist clay stones and quaternary aged young formations. The farm is split into two parts by a narrow valley stretching in north-south direction. Soil depth in the valley is too shallow and big basaltic blocks cover the area. Although such areas are weak in plant cover they constitute refuge for some of the target species to form good stands. All of the GMZ's were set up in marginal areas with shallow soils where there was no agricultural potential. ,

Apart from dark-colored, deep, clay soils with vertic properties, typic torrent formed on basalts in the North eastern part of the farm. The great majority of the soils formed over underlying parent materials and sediments, which are rich in calcium carbonate, resulting in highly calcareous and clay soil properties. Huge basalt rocks resulting from volcanic action of Karacadağ cover some local surface areas, particularly in close vicinity of Gürgürbaba site (GMZ 1), which is located essentially on a geologic formation of lime stone origin.

Multiple Correspondance Satistical Analysis was performed on the data set by means of SPSS Version 11.5. Following observations were taken in the GMZ's during the survey studies to perform multiple correspondance analysis:

Results and Discussions: Grazing has been controlled by the farm administration for over 60 years; therefore the plant cover of Ceylanpınar State Farm has not been subject to intense changes caused by human activities. Although grazing is still practiced by the small ruminants of the farm as well as the nomadic graziers, wild wheat populations were able to sustain themselves in major parts of the farm. Target species were mainly in marginal uncultivated lands or abandoned cultivation areas with shallow soils. In some instances, *Ae. speltoides* and *Ae. ligustica* were observed at the edges of cultivation areas with cultivated crops. Rest of the target species occurred only in their specific habitat and soil types.

Site description, soil chemical and physical properties, and the target species at the GMZ's are given in Table 1, and, location, size, target species, 5 associating plant species, stoniness-rockiness, and status of grazing in GMZ's are given in Table 2.

From the viewpoint of associating flora species, the most wide spread one was *Hordeum spontaneum.* This species was observed in 7 out of 8 selected zones as one the five major plant species. *Hordeum spontaneum* was followed by *Taeniatherum caput-medusae*, *Aegilops* spp. (*Ae. triuncialis* and *Ae. biuncialis*) with a frequency of 5/8 and 4/8 GMZ's respectively. *Bromus* spp (*B. tectorum* and *B. danthoniae*), *Centaurea* spp. (*C. solstitialis* and *C. virgata*), *Gundelia tournefortii*, and *Salvia* spp. (*S. sclarea* and *S. syriaca*) were represented twice in 2 out of 8 areas, whereas the rest of the species occurred only in one of the GMZ's.

Among the target species the most widespread ones with highest adaptation capacity were *Ae. speltoides* and *Ae. ligustica*. Both of the species were observed in the dryest and relatively wetter parts as well as on flat, hilly, and undulating areas. The two species appeared to have adapted to a variety of soils of alluvial, limestone, or basaltic origin. Our observations are compatible with most of the cited references including Sankary (1990), Townsend et al. (1968), Kimber and Feldman (1987) and Feinbrun-Dothan (1986).

Ae. tauschii populations were paid special attention to have an idea of their habitat selection because of the reason that the populations occurred almost 1^0 west of normal area of distribution defined by van Slageren (1994). Soil type of the GMZ's allocated for this species were quite similar to each other. They were situated on hilly land with shallow clayey soils high in lime content (GMZ 3, GMZ 6 and GMZ 5). Our findings are parallel with those of Townsend et al. (1968) and Kimber and Feldman (1987).

Triticum species are better adapted to more fertile lands than *Aegilops* species. Sites selected for *T. aegilopoides* indicate vertic properties, which are characterized by high clay content, dark and deep soils formed on basalt in the Saraççeşme location. Climatic data also reveal that the area selected for this species (GMZ 4) receives more rainfall than the rest. Additionally the nutrient content of the GMZ was lower than all the others. Our observations on soil properties of *T. aegilopoides* are quite compatible with Kimber and Feldman (1987) as well as Townsend et al. (1968). *T. dicoccoides* populations occurred only among the wadis covered with basaltic rocks on shallow soils overlying limestone parent material. Such areas were only the slopes that were facing Karacadağ Mountain, and the basaltic rocks had been carried from the mountain as a result of a volkanic erruption. This species is more palatable than the others so that the animals tend to graze this species more eagerly than the others. Although the area is as dry as many of the GMZ's, wild emmer thrives among basalt blocks than rest of the other soil types. Association of wild emmer with basaltic rocks may indicate the affinity of this genus with basaltic material, or it may also be attributed to the physical conditions provided by basalt rocks that enables them escape from grazing.

Component loadings graph (Figure 1) suggests that, based on the data sets there was certain degree of mathematical similarity between target plant species and stoniness/rockiness of the area, therefore these two categories had the potential to affect each other. On the other hand, associating plant species and grazing pressure lay in separate areas.

It is clear from the multiple correspondance analysis graph (Figure 2) that strong association was observed between stoniness and emmer.

Table 1. Site description, soil chemical and physical properties and the target species at the GMZ's

GMZ No	Site description		Soil depth (cm)	Texture class	Total salt (%)	pH	Lime (CaCO3 %)	Usable plant nutrients (kg/ha)		Organic matter (%)
	Taxanomic soil group	Physiography						P_2O_5	K_2O	
GMZ 1 a Gürgürbaba	Lithic torriorthent	Valley shoulder, flat, dryland	0-30	Clay Loam	0.062	7.81	12.4	23.2	1 648	2.28
GMZ 1 b Gürgürbaba	Lithic torriorthent	Steep side of Valley, basaltic, dryland	0-30	Clay Loam	0.051	7.58	22.6	69.6	4 792	3.36
GMZ 1 c Gürgürbaba	Lithic torriorthent	Valley bottom, flat, dryland, seasonally wet	0-20	Clay Loam	0.080	7.74	17.3	56.8	3 100	2.29
GMZ 2 Beyazkule	Lithic torriorthent	Flat, dryland, abondoned cultivation	0-20	Clay Loam	0.075	7.30	28.2	28.4	1 528	1.36
GMZ 3 Cavani	Lithic torriorthent	Hilland	0-30	Clay Loam	0.057	7.63	27.5	46.5	1 442	2.19
GMZ 4 Saraççeşme	Typic torrert	Flat marginal area among arable lands	0-30	Clay Loam	0.065	7.67	23.7	14.2	1 192	1.52
GMZ 5 Gökçayır	Typic paleortid	Undulating, marginal, dry	0-20	Clay Loam	0.044	7.60	38.4	64.6	2 038	2.28
GMZ 6 Horsmiran	Typic torriorthent/ torrert	Hilland	0-30	Loam	0.040	7.91	39.9	111.1	3 686	1.79

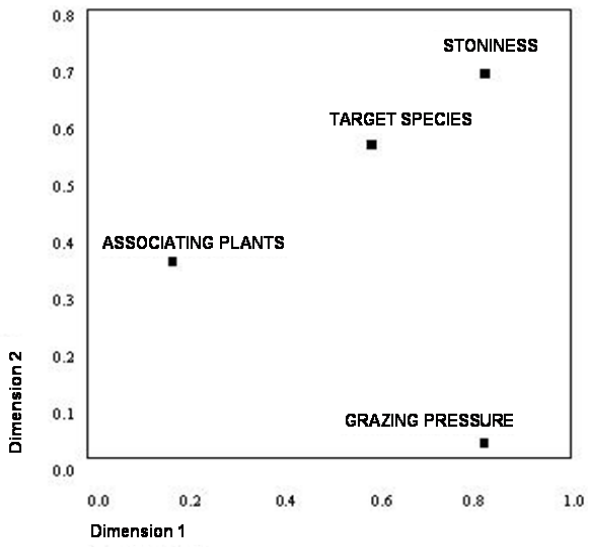

Figure 1. Component loadings graph

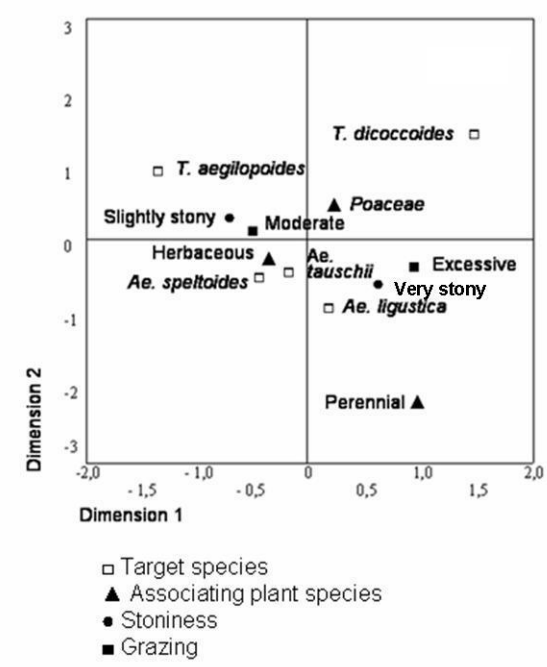

Figure 2. Multiple correspondance analysis graph

Table 2. Location, size, target species, 5 associating plant species, status of associating plant species, stoniness-rockiness, and status of grazing in GMZ's

GMZ No and Name	Location in the farm	Size (ha)	Target species	5 associating plant species	Status of associating species	Stoniness, rockiness	Status of grazing
GMZ 1 a Gürgürbaba	Central south	12	*Aegilops speltoides* var. *ligustica*, *Triticum turgidum* ssp. *Dicoccoides*	*Hordeum spontaneum* *Bromus danthoniae* *Phlomis bruguierie* *Taeniatherum caput-medusae* *Gundelia tournefortii* var. *armata*	*Poaceae* *Poaceae* Herbaceous *Poaceae* Herbacous	Very stony	Excessive to moderate
GMZ 1 b Gürgürbaba	Central south	7	*Triticum turgidum* ssp. *dicoccoides*	*Hordeum spontaneum* *Hordeum bulbosum* *Lolium rigidum* var. *rigidum* *Taeniatherum caput-medusae* *Aegilops triuncialis* subsp. *triuncialis*	*Poaceae* *Poaceae* *Poaceae* *Poaceae* *Poaceae*	Very stony	Excessive to moderate
GMZ 1 c Gürgürbaba	Central south	11	*Aegilops speltoides* var. *ligustica,* *Aegilops speltoides* var. *speltoides*	*Hordeum spontaneum* *Hordeum bulbosum* *Aegilops triuncialis* subsp. *triuncialis* *Vitex pseudo-negundo* *Paliurus spina-christi*	*Poaceae* *Poaceae* *Poaceae* Perennial Perennial	Very stony	Excessive to moderate
GMZ 2 Beyazkule	Central east	35	*Aegilops speltoides* var. *ligustica,* *Aegilops speltoides* var. *speltoides*	*Taeniatherum caput-medusae* *Turgenia latifolia* *Centaurea virgata* *Salvia sclarea* *Onopordum carduchorum*	*Poaceae* Herbaceous Herbaceous Herbaceous Herbaceous	Slightly stony	Moderate to limited
GMZ 3 Cavani	Southeast	6	*Aegilops tauschii* var. *meyeri*	*Hordeum spontaneum* *Aegilops biuncialis* *Aegilops triuncialis* subsp. *triuncialis* *Bromus tectorum* *Echinops orientalis*	*Poaceae* *Poaceae* *Poaceae* *Poaceae* Herbaceous	Slightly stony	Moderate to limited
GMZ 4 Saraççeşme	Northeast	25	*Triticum monococcum* ssp. *aegilopoides,* *Aegilops speltoides* var. *speltoides*	*Hordeum spontaneum* *Taeniatherum caput-medusae* *Lolium rigidum* var. *rigidum* *Convolvulus reticulatus* subsp. *reticulatus* *Scabiosa rotata*	*Poaceae* *Poaceae* *Poaceae* Herbaceous Herbaceous	Slightly stony	Moderate to limited
GMZ 5 Gökçayır	South	2	*Aegilops tauschii* var. *meyeri*	*Hordeum murinum* subsp. *Glaucum* *Gundelia tournefortii* var. *armata* *Onopordum carduchorum* *Cousinia stenocephala* *Salvia syriaca*	*Poaceae* Herbaceous Herbaceous Herbaceous Herbaceous	Very stony	Excessive to moderate
GMZ 6 Horsmiran	West	30	*Aegilops tauschii* var. *meyeri*	*Hordeum spontaneum* *Centaurea solstitialis* *Aegilops biuncialis*. *Taeniatherum caput-medusae* *Aegilops triuncialis* subsp. *triuncialis*	*Poaceae* Herbaceous *Poaceae* *Poaceae* *Poaceae*	Slightly stony	Moderate to limited

Soil type preferences of emmer populations described by Feinbrun-Dothan (1986) are compatible with our findings. Weaker association was observed between einkorn and slightly stony areas, as well as *Ae. ligustica* and very stony areas. *Ae. ligustica* was related with stoniness and excessive grazing. Association was observed between the *Poaceae* species, herbaceous plants and target species, while no association was noticed with perennial plants.

Until now, research activities on wild wheat species were mainly concerned with genetic studies such as hybridization, origin and genetic relationship with cultivated wheat species (Heun et al. 1997, Özkan et al. 2002, Hegde and Waines 2004), genetic variation (Eser et al. 1998, Bilgiç 2002), resistance to certain stress conditions or diseases (Fahima et al. 1998, Hız et al. 2008), and, certain quality aspects (Koksel et al. 2008). However few studies have been conducted on ecology, grazing and associating plant species. As a matter of fact most of the previous papers, describing the habitat selection of wheat progenitors are based on observations rather than properly planned and performed research studies.

Having possessed a variety of topographic, soil, aspect and climatic zones, the farm provides opportunities to have an understanding of affinities between selected wild wheat progenitors and habitat types, associating plant species as well as farm animals induced activities.

Finally, strong association between wild emmer and basaltic rocks; tolerence of *Ae. ligustica* to excessive grazing and association of wild wheat progenitors with *Poaceae* and herbaceous species are the main findings of this study.

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