

Local Forage Ecotypes and Their Importance in Turkey

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Abstract: Although not convenient for the modern agriculture, local ecotypes are of importance for being breeding materials since their genetic variations are diverse. Turkey is a rich country in the number of forage ecotypes. Cultivation history of especially alfalfa, common vetch, sainfoin, forage pea, chickling vetch and bitter vetch dates back to very ancient times. However, these genotypes are facing to extinct today and their importance has begun to be realized in the respect of sustainable and organic crop yielding as well as due to the increased global warming and water shortage threats. This paper was prepared to summarize some information about local forage ecotypes in Turkey and to mention about their importance.

Introduction

Forms which have been grown for long periods in a certain area and gained characteristics unique to them are termed to be local ecotypes. These forms can also be called local populations or ecotypes and have adapted to the ecology of the area where they are grown. Their yielding may be low because of undeveloped genetic capacity; however, their resistance to disease and harmful insects and adaptation ability are considerably high. Local ecotypes are plant forms which are prevalent in the areas where they are grown; their culture can go back to very ancient times and they can be formed by the mixtures of different types (Açıköz 2001).

Local ecotypes represent the genetic diversity of a country together with wild species. However, with the development of high yielding bred cultivars local species have lost their significance and have faced extinction threat in many regions all over the world. This threat is so big that today local ecotypes of several vitally important plants, such as wheat, are beginning to disappear. With the green revolution, they were largely eroded being replaced with the newly developed cultural species in the countries e.g. India, Pakistan, Iran and Iraq. Local species are not convenient for modern agriculture. They can not pass maturity stage timely and their yielding capacity is low. (Tosun et al. 1978) found in their study, where they carried out experiments over local alfalfa ecotypes taken from Erzurum, Ağrı and Kayseri and the cultivars with foreign origin that foreign cultivars had 30 % more yielding rate than the ecotypes. Today, developed plant breeding techniques have shown their effects on local species adversely and caused these genotypes to extinct. However, these forms whose significance will certainly be realized in the future should absolutely be conserved. Perhaps, there may be a time in the future when plant breeder will back to native species and local populations will be needed to regain genes carrying some plant characteristics which have been lost. There are already a number of bred cultural species forms from local ones. In bred species, genetic variation is too uniform to develop new varieties.

Conservation of local plants is beginning to gain importance today. However, there is a great controversy on how this effort can be achieved. Regional genetic materials in many countries have been taken under conservation through gene banks. Although this method is costly and time consuming, it guarantees the success. Under the control of gene banks, local species can be conserved and they are sometimes planted in order to maintain their vitality. In addition to conservational aims, these registered genotypes can easily be sent to different regions in order to perform various aims (Şengül 2009).

Another way to conserve local genotypes is to take these species under protection where they are grown and to encourage their cultivation. Such efforts are carried out for both plant and animal materials in the countries where they are cultured.

Livestock breeding is an important occupancy in many parts of Turkey. Cultivation of forage species has gained importance in the areas where livestock breeding is extensive. However, the number of forage species under cultivation is not much. The most cultivated forage species in Turkey is alfalfa (*Medicago sativa* L.), which is followed by common vetch (*Vicia sativa* L.), sainfoin (*Onobrychis sativa* L.) and silage maize (*Zea mays* L.). In addition to these species, cultivation of bitter vetch (*Vicia ervilia* L. Willd.), chickling vetch (*Lathyrus* sp.), fodder beet (*Beta vulgaris* var. *rapa*), Hungarian vetch (*Vicia pannonica* Crantz.), sorghum (*Sorghum* sp.) and red clover (*Trifolium pratense* L.) species are performed to a lesser degree. Majority of these forage species are bred species and in especially the western part of the country, where developed agricultural and livestock techniques are applied, almost all of these species are bred forms. Local species are more prevalent in mountainous areas of Black Sea, Middle Anatolia and Southeast Anatolia regions, where mechanised cultivation techniques are less developed. In the following parts of the paper summarized information tried to be given about these local ecotypes.

Alfalfa (*Medicago sativa* L.)

Local alfalfa ecotypes in Turkey are divided into four categories; Eastern Anatolia (including Erzurum, Ağrı and Van), Kayseri, Karaağaç and Bayındır. Local alfalfa species in Turkey are the forms whose rosettes are horizontal in autumn (Gençkan 1983). Eastern Anatolia ecotype can develop semi-horizontally and is considerably resistant to both cold and arid conditions. Stems are thin and branched abundantly. Its leaves are narrow and like a long spear. Its flower colour is dark purplish (Elçi 2005). Eastern Anatolia alfalfa begins growing in spring late and ends its growth early in entering winter. It can be cut twice or thrice in one season and it gives the highest yielding rate at the first cutting. It has a very large longevity and can yield crop for 20 to 30 years. A new alfalfa variety, Savaş, which is more suitable to be grown in the region, has been derived from these local ecotypes through selection. (Şengül 2003) reported in his study on the genotypes of Eastern Anatolia alfalfa that its plant characteristics have greatly changed.

Local alfalfa ecotypes of Kayseri and Karaağaç are the forms which can develop vertically and conveniently to the conditions of Middle Anatolia. Flower colour of Kayseri population is brighter than that of Eastern Anatolia alfalfa. Its development stages can require long vegetation period. Kayseri ecotype is sensitive to leaf disease and its regeneration is slower and they are not uniform. This ecotype is more prevalent in Middle Anatolia and its passage regions. Kayseri and Karaağaç alfalfa ecotypes have long life-span, though not longer than that of Eastern Anatolia ecotypes (Soya et al. 1997).

Local alfalfa ecotype of Turkey, which is convenient to country's coastal regions, is Bayındır. It is prevalent in the west of Anatolia and Aegean Region. It has a long development period and can be cut many times. Its longevity is shorter than that of other ecotypes.

Sainfoin (*Onobrychis sativa* L.)

Sainfoin is an important forage species which can widely grow in the arid regions of Turkey. It is cultivated in the Middle and especially the Eastern parts of Anatolia and their local populations are given the names of the cities, where they are grown. The cities of Erzincan, Kars, Ağrı, Van, Erzurum and Ardahan are the places where sainfoin is grown much. Common name for all of these species is Erzincan ecotype. The reason for local sainfoin ecotypes to grow more widely in Eastern regions of Turkey is that Eastern Anatolia region is included in the genetic source areas of *Onobrychis* species. This species is considerably resistant to aridity and cold conditions. It can be cut once or twice depending on the seasonal rainfall. Life-span of this vertically growing ecotype is 4 to 6 years. Its growth is slower in the sowing year and in this period it develops only rosettes and can sometimes form flowers. Flower corollas are pink.

Common Vetch (*Vicia sativa* L.)

Common vetch is among the species grown for both its hay and seeds in Turkey since ancient times. Therefore, Anatolia has local common vetch forms almost in all regions. However, these local plants have been eroded from their cultivated areas, in especially the western parts, where modern cultivation techniques are employed. Local common vetch populations are more prevalent in the Eastern part of the country. As is known, origin of common vetch is Southwest Asia and Mediterranean Region, which is why its local ecotypes have been very wide in the country since very early times.

Plant and seed characteristics of local common vetch species can show great diversity. Plant forms are generally climbing; it has small leaves with tendrils. Flower colour is pink, violet or yellowish-green or brown. Its seeds are round-like and flat like a lentil; colours of seeds can be grey, yellowish, brown or black. Many of the cultured species have been bred from these local species through selection. According to (Gençkan 1983), common vetches cultivated in Turkey have been derived from the subspecies of *Vicia sativa* subsp. *obovata*. It was also reported that forms of these subspecies are grown in both Anatolia and Thrace (Uluocak 1984). (Açıkgoz 2001) stated that common vetches have been grown in Anatolian soils since very ancient times and seeds of this species were encountered in the excavations belonging to 5000 to 7000 B.C.

(Avcı 1994) found in his study, where he used four bred common vetch species, two lines and six local ecotypes taken from eastern parts of Turkey, that weight of 1000 seed was lower in local ecotypes than that of bred genotypes and length of maturity stages was larger in the former than latter while some local ecotypes could give equal hay and seed yielding with bred forms.

Bitter Vetch (*Vicia ervilia* Willd.)

Cultivation of this plant in Turkey goes back to 5000 to 6000 B.C. It is a short (20 to 40 cm length) and vertically developing species and very resistant to arid conditions. Its flowers are whitish yellow and seeds are brown. They are grown to produce grain feed. Bitter vetch is cultivated in Aegean, Mediterranean, Middle and Southeast Anatolia Regions of Turkey. It is very difficult to harvest this species mechanically since it is short and it has lower pod very close to the ground. Therefore, seeds have to be picked up manually. This difficulty causes the cultivation of this species to reduce consistently. For instance, during 1970s this species was sown in an area of 70.000 ha, however, this rate was reduced to 2.000 ha in 2000s.

In order to prevent bitter vetch cultivation from disappearance, Ankara University Agriculture Faculty has begun to conduct studies. Local bitter vetch samples collected from all regions of Turkey were characterised and taken under protection. From these collected populations, lines and varieties that are more yielding and convenient to machinery cultivation were developed (Ekiz & Özkaynak 1984).

Chickling Vetch (*Lathyrus sativus* L.)

It is a species which began to be grown in Turkey in early ages. Stems are clearly flanked (angled). Leaves have 1 or 2 leaflets and long tendrils; and are spear-like in shape. Flowers are whitish-blue. This species is grown locally in the mountainous areas in Southeast Anatolia region of Turkey to produce grains or hay. Seeds of local species are greyish. It is known with the local name *culban* where it is cultivated in Turkey. It is *L. sativus* species that is cultivated the most, though hairy vetch (*L. hirsutus* L.) is grown relatively low (Uluocak 1984). Local species of this plant have been collected and studies began to be carried out to develop culture species from these collected forms (Karadağ 1999). Total sowing area of this species is 600 ha in statistics in Turkey (Anonymous 2005).

Forage Pea (*Pisum arvense* L.)

This species is a forage plant grown mostly for its seeds. It is an annual; 40 to 80 cm height and climbing stems; broad leaved; and with dark flowers and seeds. Local ecotypes of forage pea are known with the local name of *külür* in the Northeast of Turkey. These populations are extensively grown in the eastern Anatolian cities of Bayburt, Kars and especially Ardahan. Since it prefers humid and cool climatic conditions, it is cultivated more in the mentioned region. Cultivation of local forage pea ecotypes decreases consistently. It has a sowing area of nearly 3.800 ha (Anonymous 2005). The largest difference of local ecotypes from cultured forms is that local ones have dark flowers and seeds. Its flowers and seeds are violet in colour. In order to protect local ecotypes of this plant in Turkey, (Tan et al. 2009) began to conduct studies. In the scope of these studies, totally 61 genotypes collected from north-eastern Anatolia were taken under conservation and their characteristics were defined and registered. In addition it was found as the consequence of these studies that hay and seed yielding rates of local forage pea ecotypes were 270 to 854 kg/da and 51 to 254 kg/da respectively. Since its genetic variation is very high, lengths of plant and its development period and lodge degree of the materials are very different.

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