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A STUDY ON THE DETERMINATION OF THE MORPHOLOGICAL, YIELD AND QUALITY CHARACTERISTICS OF SOME SAINFOIN SPECIES (*ONOBRYCHIS* SPP.) NATIVE TO EAST ANATOLIA

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Abstract

Objective of the present study is to identify the species belonging to the genus *Onobrychis* (Fabaceae) growing native in and around Erzurum, and to determine their overall prevalence and morphological and quality characteristics. Species samples were collected from different locations in flowering periods of 2007, 2008 and 2009. At the end of the study, totally 10 genotypes were found representing 8 species and 2 sub-species. It was found that leaf length and leaflet frequency were the largest in *O. atropatana* var. *grandiflora*, the number of leaflets was the highest in *O. viciifolia*, the length and width of leaflets were maximum in *O. radiata*, the number of main branches and the number of fascicles in main branches were in *O. hajastana*, crude ash rate was highest in *O. stenostachya*, plant fresh and dry weight, ADF and NDF rate were highest in *O. cornuta*, where as crude protein rate was slightly higher in *O. stenostachya* subsp. *sosnowskyi* than other taxa.

Key words: Native species, Morphological characteristics, Sainfoin, Yield.

Introduction

Sainfoin (*Onobrychis sativa* L.) is defined as the king of forage crops due to its superior agricultural characteristics which can be adapted to Turkey's different ecological regions, higher yield and quality feed. Sainfoin can grow in arid, poor, pebbly and limy soils where alfalfa does not enjoy, and is resistant to salinity (Elçi, 2005). It has been grown extensively in Eastern Europe and West Asia (Sancak *et al.,* 2003). The number of studies related to the morphological structures and agricultural characteristics of sainfoin species are relatively few.

Linnaeus his *Species Plantarum*, treated *Onobrychis* species under *Hedysarum*. However, Miller (*Fabaceae*) established the genus *Onobrychis* and transferred several species under the new genus, previously placed under *Hedysarum* by Linnaeus (1753).

O. montana and *O. caputgalli* species are native to Europe. *O. montana* grows gregariously in mountainous areas (Tosun, 1974; Garshasbi *et al*., 2012). Elçi (1954), and Tarman (1954) reported that *O. cana, O. armena, O. hypargyrea* grew wild in arid and mountainous areas of Turkey. Previously 53 species of *Onobrychis* were reported from Turkey, however, Aktoklu (1995) in his Revision of *Onobrychis* Miller (Fabaceae) from Turkey reported 52 *Onobrychis* species and described two new varieties *O. fallax* Freyn & Sint var. *longifolia* Aktoklu and *O. atropatana* Boiss var. *grandiflora* Aktoklu. He also reduced *O. bornmuelleri* Freyn as a subspecies of *O. huetiana* Boiss. In all Aktoklu (1995) recognized 60 taxa including 52 species from Turkey.

Bakoğlu *et al*., (1999a) while studying *O. viciifolia* Scop. In Turkey found significant relationships between plant height, number of main branches, diameter of main branch, the number of fascicles in main branches and dry matter. Töke (2002) studied some agricultural and morphological features plant characteristics of sainfoin genotypes selected from natural vegetations of the zonal. Mean plant length of genotypes was 41.1 cm, the number of main branches was 13, the number of fascicles on main branch was 4 and length of fascicles was 18 cm. Avcı *et al*., (2011) studied morphological characteristics of 40 sainfoin species belonging to 5 different sections from different parts of Turkey.

Present study is aimed to identify the species of *Onobrychis* growing in and around Erzurum, Kars and Bayburt and determine their overall prevalence and some morphological and other characteristics.

Materials and Methods

The species of *Onobrychis* growing in the areas in and around Erzurum, Kars and Bayburt in East Anatolia were collected. Different areas at different altitudes in the aforementioned provinces where native sainfoin species were predetermined to grow were visited between late May and early June in order to gather the plant materials, images of the sainfoin plants were taken in flowering period, plant samples and seeds in seeding period (in September) were collected for herbarium. Study was conducted in 2007, 2008 and 2009 and plant materials were gathered; around Erzurum city centre, districts of Narman, Oltu, Olur, Pasinler, Horasan, Uzundere, Tortum Lake basin, Sarıkamış and Kağızman in Kars, Kop mountain in Bayburt and around Bayburt (Table 1).

Locations were determined in the centre and districts of Erzurum province, Kars, Sarıkamış, Kağızman and the centre and districts of Bayburt province by visiting the locations and gathering plant samples for herbarium. Totally ten 10 plant samples were taken from each location and all the observations and analyses were carried out over these samples. Samples were sent to the Field Crops Department of Agriculture Faculty Ankara University for identification. In Ankara, 45 samples taken from the study area were compared to other herbarium and identified.

Table 1. Present the regions where taxons were gathered and determined.

Species	Flower colour	Regions where the samples were picked
O. atropatana var. *grandiflora*	corolla yellow, no vein	Sarıkamış-Kars
O. cornuta	corolla purple	Bayburt- Kop Mountain site
O. hajastana	corolla light pink	Aşkale-Erzurum, Sarıkamış-Kars
O. huetiana	corolla yellow	Tortum-Erzurum
O. huetiana subs. *bornmuelleri*	corolla yellow	Oltu, Olur-Erzurum
O. montana	corolla pink, dark purple veined	Aşkale-Erzurum
O. radiata	corolla stained white	Aşkale-Erzurum, Kağızman-Kars
O. stenostachya	corolla pink	Tortum-Erzurum, Sarıkamış-Kars
O. stenostcahya subs. *sosnowskyi*	corolla pink or cream	Tortum-Erzurum, Kağızman-Kars
O. viciifolia	corolla pink, dark purple veined	Oltu, Olur-Erzurum, Sarıkamış-Kars

Topics evaluated: Morphological characteristics of plant materials taken from the area were evaluated. In the first two years of the three-year study period, 10 plant samples from each predetermined point which was thought to shelter same species were gathered and all parameters such as plant length, the number of main branch, the number of fascicles, diameter of main trunk, plant habit were observed and measured (Anon., 2001) and Elçi & Açıkgöz (1994).

Plant characteristics: Parameters related to plant characteristics, evaluated are leaf length, the number of leaflets in leaf, frequency of leaflets, length of leaflets, width of leaflet, leaflet index (Töke, 2002), plant length the number of main branches and fascicles on main branches and wet and dry plant material weight (Tamkoç, 1985).

Feed quality analyses: Raw material rate was evaluated using the approaches in Kacar (1972). When raw ash rate was evaluated, ADF and NDF rates were calculated using the samples ground in Willey mill and burned at 550^0C (Anon., 2004).

Evaluation of data and statistical analysis: Data obtained from 10 different species were analysed for variance in SPSS software package. Variance analysis was done according to complete random experimental design and Duncan multi comparison test.

Results and Discussion

Morphological characteristics: Considering the habit of 10 plant species, *O. atropotana* var. *grandiflora,O. hajastana, O.huetiana, O. huetiana* subs. *bournmuelleri, O. radiata* and *O. viciifolia* were determined to be vertical; *O. cornuta* and *O. montana* were reported to be horizontal and *O.stenotachya* and *O. stenostachya* subs. *sosnowskyi* were semi horizontal.

Largest leaflet size was in *O. radiata* (29.60 mm) while the smallest size was in *O.cornuta* (9.20 mm). For the form of leaflet, *O. atropotana* var. *grandiflora* and *O. radiata* were found to be ovate; *O. montana* was oval; *O. cornuta, O. hajastana, O.stenotachya*, *O. stenostachya* subs. *sosnowskyi*, *O. viciifolia* were linear, *O.huetiana* and *O. huetiana* subs. *bournmuelleri* were elliptic.

The shortest leaf was 58.00 mm in *O. cornuta* and the longest leaf was 159.97 mm in *O. radiata*. Statistically significant difference was found between the species for leaf length caused by genotypic structure and environmental factors. Leaf length was found to be close in *O. radiata*, *O. viciifolia*, *O. cornuta*, *O. atropatana* var. *grandiflora* and *O. montana* species. *O. cornuta* was found to have the shortest leaves while the longest ones were in *O. radiata*. Bakoğlu *et al*., (1999a) and Töke (2002) reported leaf length to be 5.30 to 17.00 cm (mean 8.67 cm), 47 to 133 mm (mean 76.3 mm). These values are in convenience with the results of the present study.

The lowest number of leaflets among the species 11.30 in *O. cornuta* while the highest number is 18.30 in O. *viciifolia* (Table 2). There is statistically significant difference between species for leaflet number caused by genotypic structure and environmental factors.

It was determined that leaflets take place in various parts of plant accents and independently in leaf stems. Such differences are important to show the genotypical structures. Töke (2002) reported the number of leaflets to be 9 to 31 (mean 16.9), respectively, which are in convenience with the results in the present study.

It can be seen from Table 2 that lowest leaflet frequency is 4.88 mm in *O. montana* and the highest is 10.94 mm in *O. atropatana* var. *grandiflora*.

Frequency of leaflets is related to the distance between two leaflets. As the number of leaflets increases this distance decreases. Even though leaflet frequency is high in some species distance between leaflets may be larger. The reason for this is that leaflets take place at a point where leaf stem is connected to the branch. In some species, leaflets can grow from the point where leaf stem is connected to branch. In such plants, the number of leaflets is more and leaflet frequency is lower (Töke, 2002). These characteristics result from genotypic structure and can be used as a distinguishing characteristic.

When data about leaflet length is evaluated, it can be seen that the lowest leaflet length is 9.20 mm in *O. cornuta* and the highest is 29.60 mm in *O. radiate* (Table 2).

Table 2. Plant characteristics of species.

Species	Leaf length	The number of leaflet	Frequency of leaflets	Length of leaflet	Plant length	The number of main branches	The number of fascicles on main branches	Wet plant weight	Dry plant weight
	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$
O. atropatana var. *grandiflora*	159,20 ± 6,994 **a***	15,20 ± 0,675 **cd***	10,94 ± 0,514 **a***	23,90 ± 0,957 **b***	44,30 ± 1,876 **e***	3,4 ± 0,295 **de***	7,00 ± 0,702 **bc***	105,30 ± 3,278 **b***	32,38 ± 1,015 **b***
O. cornuta	58,00 ± 6,994 **d**	11,30 ± 0,675 **e**	5,49 ± 0,514 **fg**	9,20 ± 0,957 **f**	33,00 ± 1,876 **f**	3,3 ± 0,295 **de**	3,60± 0,702 **d**	192,20 ± 3,278 **a**	66,75 ± 1,015 **a**
O. hajastana	113,84 ± 6,994 **b**	15,90 ± 0,675 **bc**	7,35 ± 0,514 **cde**	18,30 ± 0,957 **d**	62,12 ± 1,876 **bc**	5,0 ± 0,295 **a**	9,20 ± 0,702 **a**	108,90 ± 3,278 **b**	17,85 ± 1,015 **e**
O. huetiana	110,84 ± 6,994 **b**	13,40 ± 0,675 **d**	8,17 ± 0,514 **cd**	12,20 ± 0,957 **e**	49,60 ± 1,876 **d**	4,4 ± 0,295 **abc**	7,60 ± 0,702 **abc**	84,50 ± 3,278 **c**	28,04 ± 1,015 **c**
O. huetiana subs. *bornmuelleri*	106,00 ± 6,994 **b**	16,40 ± 0,675 **abc**	6,45 ± 0,514 **ef**	20,30 ± 0,957 **cd**	57,40 ± 1,876 **c**	2,8 ± 0,295 **e**	8,10 ± 0,702 **ab**	83,30 ± 3,278 **c**	28,56 ± 1,015 **c**
O. montana	81,20 ± 6,994 **c**	17,00 ± 0,675 **abc**	4,88 ± 0,514 **g**	11,40 ± 0,957 **ef**	31,40 ± 1,876 **f**	4,7 ± 0,295 **ab**	6,70 ± 0,702 **bc**	63,20 ± 3,278 **d**	23,84 ± 1,015 **d**
O. radiata	159,97 ± 6,994 **a**	16,30 ± 0,675 **abc**	9,91 ± 0,514 **ab**	29,60 ± 0,957 **a**	69,80 ± 1,876 **a**	3,0 ± 0,295 **de**	4,00 ± 0,702 **d**	102,30 ± 3,278 **b**	31,62 ± 1,015 **b**
O. stenostachya	124,30 ± 6,994 **b**	17,70 ± 0,675 **ab**	7,79 ± 0,514 **cde**	17,90 ± 0,957 **d**	62,00 ± 1,876 **bc**	5,0 ± 0,295 **a**	5,40 ± 0,702 **cd**	70,70 ± 3,278 **d**	25,48 ± 1,015 **cd**
O. stenostcahya subs. *sosnowskyi*	116,40 ± 6,994 **b**	17,50 ± 0,675 **ab**	6,88 ± 0,514 **def**	21,30 ± 0,957 **bc**	64,47 ± 1,876 **b**	3.9 ± 0,295 **bcd**	5,40 ± 0,702 **cd**	53,60 ± 3,278 **e**	18,22 ± 1,015 **e**
O. viciifolia	157,30 ± 6,994 **a**	18,30 ± 0,675 **a**	8,91 ± 0,514 **bc**	20,80 ± 0,957 **cd**	51,50 ± 1,876 **d**	3,6 ± 0,295 **cde**	7,60 ± 0,702 **abc**	71,90 ± 3,278 **d**	26,32 ± 1,015 **cd**
Mean	**118,70**	**15,90**	**7,68**	**18,49**	**52,56**	**3,91**	**6,46**	**93,59**	**29,91**

Differences between means represented by different letters are very significant ($p< 0.01$)

Leaflet length was reported to be 10 to 25 mm, 10 to 30 mm, 20 to 30 mm, 5.0 to 22.00 mm (mean 14.80 mm), 9 to 20 mm (mean 16 mm) by Açıkgöz (2001), Gençkan (1992), Elçi & Açıkgöz (1994), Bakoğlu *et al*., (1999a) and Töke (2002), respectively. Values related to leaflet length were in convenience with other studies.

The lowest leaflet width is 2.30 mm in *O. cornuta* while the highest width is 12.30 in *O. Radiate* (Table 2). Açıkgöz (2001), Gençkan (1992), Elçi & Açıkgöz (1994), Bakoğlu *et al*., (1999a) and Töke (2002) found leaflet width to be 3 to 8 mm, 3 to 8 mm, 5 to 10 mm, 2.00 to 5.0 mm (mean 2.9 mm), 3 to 10 mm (mean 5 mm) respectively, which are in agreement that the results in the present study.

It is seen from Table 2 that the lowest plant length is 31.40 cm in *O. montana* while the highest is 69.80 cm in *O. radiata*. Even though no difference was found to be present between *O. huetiana* and *O. viciifolia, O. cornuta* and *O. montana* and *O. hajastana* and *O. stenostachya*, other species were different from each other. Species were significantly different from each other for plant length.

Plant length was found in literature to be 30 to 90 cm, 100 to 120 cm, 62.5 to 112 cm, 81.09 to 104,89 cm, 81 to 88 cm, 30 to 60 cm, 30 to 60 cm, 90.9 to 35 cm, 87.5 cm (maximum) 64.39 cm (mean), 65.23 to 75.71 cm, 25.93 cm (maximum), 62.5 to 112 cm, 20 to 83 cm by Davis (1970), Açıkgöz (2001), Sağlamtimur *et al*. (1986), Alibegoviç *et al*. (1989), Avcı *et al*., (1996), Gençkan (1992), Gülcan & Anlarsal (1993), Andiç (1995), , Bakoğlu (1999a), Hakyemez (2000), Yüksek & Ölmez (2000), Ünal & Fırıncıoğlu (2002) and Töke (2002) respectively which are convenient the results in the present study.

Smallest number of main branches was seen to be 2.8 in *O. huetiana* subs. *bornmuelleri* while the largest number was 5.0 in *O. hajastana* and *O. stneostachya* (Table 2). Species showed differences for the number of main branches caused by genotypic structure. Having more main branches is important for selection in Sainfoins. Sainfoins branching more are known to be tolerant to harmful insects (Elçi *et al*., 1996). Koç & Tan (1997) reported that increase in the number of main branches means an increase in the number of fascicles on main branches, leaf rate and raw protein rate. *O.hajastana* was found to have maximum main branch number among other species, the number of fascicles on main branches, and raw protein rate in the present study conveniently the others.

Bakoğlu *et al*., (1999a) reported that main branch number is 9.0 to 35 (19.74 mean) while Töke (2002) found this number to be 1.0 to 72 with a mean of 13.00. The number of main branches was found in the present study to be considerably lower than other studies in literature.

The smallest number of fascicles is 3.60 in *O. cornuta* while the largest is 9.20 in *O. hajastana* (Table 2). Bakoğlu *et al*., (1999a) found this value to be between 3.5 and 12.8 with an average of 6.59. Higher rate of flower organs is an important characteristic for natural breeding and under normal grazing conditions it is more likely for plants to form seed. Töke (2002) stated that the number of fascicles on main branches may change from 1 to 11 with a mean of 4.0, which also supports the findings in the present study.

It was found that the smallest hay weight was 53.60 in *O. stenostachya* subs. *sosnowskyi* while the highest was 192.20 g in *O. cornuta* (Table 2). Şengül (1995) found in a study on different ecotypes of alfalfa that green plant material yield was 40.08 g in 1993 and 59.87 g in 1994 with a mean of 49.02 g in the range of 6.0 g to 75.50 g which is convenient with Şengül (1995).

The lowest dry matter yield was found to be 17.85 g in *O. hajastana* and the highest rate was 66.75 g in *O. cornuta* (Table 2). Şengül (1995) found in a study on different ecotypes of alfalfa that dry plant material yield was 8.06 g in 1993 and 10.75 g in 1994 with a mean of 9.29 g in the range of 1.0 g to 22.49 g which is lower than the present study which may result from climatic differences.

Feed quality analyses: The lowest raw protein rate was found to be 10.61% in *O. cornuta* and the highest was 15.79% in *O. stenostachya* subs. *sosnowsky*i. According to Table 3, raw protein difference between the species was found to be statistically significant. Findings in the present study are supported by the related literature (Açıkgöz, 2001; Bal *et al*.2006; Bingöl *et al*., 2008; Scharenberg *et al*., 2008).

When considered the raw ash rates, it is seen that the lowest rate is 7.50% in *O. huetiana* while the highest is 11.16% in *O. stenostachya* subs. *sosnowskyi*. From table 3 it can be concluded that there is no statistically significant difference between *O. atropatana* var. *grandiflora*, *O. stenostachya* and *O. viciifolia,* other species are significantly different from each other for this parameter.

The rate of ash composed of mineral and inorganic matters is a characteristic determining the quality of feed. Since this rate represents the ratio of inorganic matters, lower raw ash rate means lower leaf to stem rate (Kacar 1977). Tan and Menteşe (2000) reported that lower ratio of leaf to stem results from temperature increases. Yeldan (1984) stated that as the plants mature raw cellulose rate in stems and leaves increases; since the increase is faster in stems than leaves, as leaf to stem ratio decreases raw cellulose rate increases; and raw ash rate decreases. From this point of view, the reason for lower raw ash rate in 2009 than 2008 may result from climate conditions.

As stated by several authors (Avcıoğlu, 1975; Avcıoğlu *et al*., 2000) raw ash rate is a quality criteria showing limited variation thus supporting the findings of present study (8.24 to 11.16%). Findings in literature related to raw ash rate also support the present study (Bal *et al*., 2006).

It can be seen when ADF data is taken into consideration that the lowest ADF rate is 23.93% in *O. stenostachya* subs. s*osnowskyi* while the highest ADF rate is 46.72% in *O. cornuta* (Table 3). According to Table 3, even though the difference between *O. hajastana*, *O. radiata*, *O. huetiana* and *O. huetiana* subs. *bornmuelleri* is not statistically significant, the difference for ADF between other species is statistically significant.

ADF rate closely associated with the digestibility of plant material (Ball *et al*., 2001; Rayburn 2004) can change depending on the plant species (Ball *et al*., 2001), growing season (Lacefield *et al*., 1999), leaf to stem rate (Ball *et al*., 2001) and various cultural practices (Kelsey *et al*., 1973).

Results of the studies related to ADF rate (Dahlberg *et al*., 1988; Bastian *et al*., 2005; Bal *et al*., 2006; Bingöl *et al*., 2008; Scharenberg *et al*., 2008) are in close convenience with the findings of present study.

It can be seen when NDF rates were evaluated that the lowest NDF rate is 39.80% in *O. viciifolia* while the highest is 57.45% in *O. cornuta* (Table 3).

NDF is an indicator of the rate of cellulose, hemicellulose and lignin in the wall of plant cell and associated with the consumption of feed (Sarvar *et al*., 1999). NDF rate of plant material can change depending on plant species, development period, leaf to trunk ratio and various cultural applications (Kelsey *et al*., 1973; Lacefield *et al*., 1999; Ball *et al*., 2001). NDF is formed by adding hemicellulose to ADF components (Van Soest, 1991**).** Thus, it is expected that NDF rate is higher than ADF. NDF is different from ADF in that they can be digested by animals (Fisher *et al*., 1995*)*. Since legumes have less fibre rate they have larger digestibility rate (Collins, 1988) and they do not lose their feeding quality quickly when they get matured (Smith, 1986). Therefore, legumes carrying components of cell wall in lower rates have higher digestibility rate (Demarquilly & Chenost, 1969; Noceck & Grant 1987).

Table 3. Quality analyses of species.

Species	Raw protein	Raw ash	ADF	NDF
	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$	$\overline{X} \pm S\overline{x}$
O. atropatana var. *grandiflora*	13,61 ± 0,014 g*	9,25 ± 0,033 e*	43,72 ± 0,155 b*	54,81 ± 0,165 b*
O. cornuta	10,61 ± 0,014 k	7,66 ± 0,033 h	46,72 ± 0,155 a	57,45 ± 0,165 a
O. hajastana	14,99 ± 0,014 b	10,96 ± 0,033 b	33,65 ± 0,155 e	44,88 ± 0,165 f
O. huetiana	11,00 ± 0,014 ı	7,50 ± 0,033 ı	33,77 ± 0,155 e	44,68 ± 0,165 f
O. huetiana subs. *bornmuelleri*	14,65 ± 0,014 d	10,12 ± 0,033 d	33,55 ± 0,155 e	45,36 ± 0,165 e
O. montana	14,14 ± 0,014 e	10,26 ± 0,033 c	40,31 ± 0,155 c	52,27 ± 0,165 c
O. radiata	11,10 ± 0,014 h	8,24 ± 0,033 g	33,81 ± 0,155 e	45,96 ± 0,165 d
O. stenostachya	13,80 ± 0,014 f	9,21 ± 0,033 ef	34,37 ± 0,155 d	44,58 ± 0,165 f
O. stenostcahya subs. *sosnowskyi*	15,79 ± 0,014 a	11,16 ± 0,033 a	23,93 ± 0,155 g	40,48 ± 0,165 g
O. viciifolia	14,87 ± 0,014 c	9,15 ± 0,033 f	30,78 ± 0,155 f	39,80 ± 0,165 h
Mean	**13,45**	**9,35**	**35,46**	**47,03**

Conclusion

In the study, *Onobrychis hajastana*, *Onobrychis stenostachya, Onobrychis stenostchya* subsp. *sosnowskyi, Onobrychis radiata, Onobrychis huetiana, Onobrychis huetiana* subsp. *bornmuelleri, Onobrychis viciifolia, Onobrychis cornuta, Onobrychis atropatana* var. *grandiflora, Onobrychis montana* species of sainfoin one of the elements in Iran – Turan phytogeographic region, taken from Erzurum, Kars and Bayburt were identified and their morphology was evaluated.

According to the results of the study, 10 different genotypes were determined from 45 different plant materials taken from the study area, two were sub-species, *Onobrychis stenostchya* subsp. *sosnowskyi, Onobrychis huetiana* subsp. b*ornmuelleri* one was a variety (*Onobrychis atropatana* var. *grandiflora*).

Significant differences were found to be present in genotypic structures of the species as the result of the study due to the differences in rainfall temperature in growing season affecting significantly all the characteristics evaluated in the study such as leaf length, the number of leaflets, frequency of leaflet, leaflet length, leaflet width. Effect of such a condition was clearly seen in the study by causing pre-maturation and low crop yield. It was stated when considered the characteristics of species determined in the study that among the species studied *O. atropatana* var. *grandiflora, O. radiata, O. stenostachya, O. stenostachya* subs. *sosnowskyi* and *O. viciifolia* are forefront for their favourable characteristics to be used in sainfoin breeding as plant materials.

It may be concluded from the results of the study that among prevalent native Sainfoin species *O. atropatana* var. *grandiflora, O. hajastana, O. huetiana, O. huetiana* subs. *bornmuelleri, O. radiata* and *O. viciifolia,* can be used as hay while *O. montana*, *O. stenostachya* and *O. stenostachya* subs. *sosnowskyi* can be evaluated in rangelands.

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