



Determination of The Nutritive Value of Some Weed Species

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Abstract

This research was carried out to determine quality properties of some weed species. In this research, 9 different weed species were used as materials which were collected from Kayseri pasture areas of Turkey. At the end of research, quality properties of weed species were ranged from lowest to highest for average dry matter (DM) 14.2-51.1%, average crude protein (CP) 7.1-22.5%, crude ash ratio 9.0-17.5%, acid detergent fiber (ADF) 22.8-41.0%, neutral detergent fiber (NDF) 29.4-47.8%, digestible dry matter (DDM) 57.0-71.2%, dry matter intake (DMI) 2.5-4.1% and relative feed value (RFV) 110.9-213.6. Among the pasture plants studied, higher crude protein level than averages of species following plants may have importance, respectively: *Polygonum cognatum*, *Amaranthus retroflexus*, *Sanguisorba minor*, and *Kochia sp.* For relative feed value has been remarked: *Cirsium vulgare*, *Polygonum cognatum*, *Amaranthus retroflexus*, *Sorghum halepense*, and *Kochia sp.*

Keywords: Weed species, acid detergent fiber (ADF), neutral detergent fiber (NDF), relative feed value (RFV), digestible dry matter (DDM), crude protein (CP)

Bazı Yabancı Ot Türlerinin Besin Değerinin Belirlenmesi

Özet

Bu araştırma, bazı yabancı ot türlerinin kalite özelliklerini belirlemek amacıyla 2011-2012 yılında yürütülmüştür. Araştırmada, Türkiye'nin Kayseri ilinin mera alanlarından toplanan 9 farklı yabancı ot türü materyal olarak kullanılmıştır. Araştırma sonunda, yabancı otların kalite özelliklerinden kuru madde (KM) oranı %14.2-51.1, ham protein oranı (HP) %7.1-22.5, ham kül oranı %9.0-17.5, Asit deterjan fiber (ADF) %22.8-41.0, Nötr deterjan fiber (NDF) % 29.4-47.8, sindirilebilir kuru madde (SKM) %57.0-71.2, kuru madde tüketimi (KMT) %2.5-4.1 ve nispi yem değeri (NYD) 110.9-213.6 arasında değişim göstermiştir. Çalışılan mera bitkileri arasında en yüksek ham protein oranına sahip olan türler sırasıyla; *Polygonum cognatum*, *Amaranthus retroflexus*, *Sanguisorba minor* ve *Kochia sp.*'dir. Nispi yem değeri bakımından ise *Cirsium vulgare*, *Polygonum cognatum*, *Amaranthus retroflexus*, *Sorghum halepense* ve *Kochia sp.* türleri ön plana çıkmaktadır.

Anahtar kelimeler: Yabancı ot türleri, asit deterjan fiber (ADF), nötr deterjan fiber (NDF), nispi yem değeri (NYD), sindirilebilir kuru madde (SKM), ham protein (HP)

Introduction

Weeds constantly invade crop fields and pastures; therefore, it is important to know the potential quality of individual weed species in making management decisions concerning weed control (Abaye *et al.*, 2009). There are a lot of plants in natural pasture areas. These plants have important role in feeding of animals. In addition to natural forage crops, these plants were preferred sometimes by animals. This kind of plants usually

does not prefer in rangelands. However, the number of valuable plants decreases in pasture composition, animals prefers these kinds of plants as secondarily. Nutritional properties of these secondarily preferred plants are inadequate in literatures.

These plants which take place in pasture composition can be preferred by different animal species. At the same time, these plants covering pasture areas prevent from soil erosion problems.

Detailed and updated data about these plant species in the study were supplied from Flora of Turkey (Davis, 1965-1982). There are some literatures about our studied plants for some quality properties. Kamalak *et al.* (2005) have stated that *Sinapsis arvensis* in early, mid and late flowering stage; for DM, CP, ADF, NDF and crude ash values as 95.9-96.5%, 7.7-13.2%, 56.4-65.8%, 66.5-74.1% and 5.6-8.6%, respectively. CP contents were changed from 12.12% (Acar and Guncan, 2002) to 20.65% (Kaya *et al.*, 2004) in *Poligonum aviculare*. Stordahl *et al.* (1999) have pointed out in *Amaranth* species (*A. cruentus* L. and *A. kypochondriacus* L.) at 8 weeks after planting, CP, ADF and NDF percentages were found 23, 26 and 36% respectively. In *Amaranthus retroflexus* %, crude ash and % percentage reach to 18.2%, 22.8% DM and 3.4% CP, respectively (Sekeroglu *et al.*, 2006). Sleugh *et al.* (2001) have stated that different *Amaranthus* ssp. at different growing stages for CP, ADF and NDF values were change between 8.0-28.5%, 15.0-35.4% and 26.0-47.0%, respectively. Basbag *et al.* (2010) have stated that *Amaranthus retroflexus*, *Sinapsis arvensis* and *Centaurea iberica* in mid flowering stage; for CP values as 23.3%, 25.7% and 26.6%, respectively.

Materials and Methods

Weed samples were collected from pasture areas of Kayseri, Turkey in the year 2011. Weed were collected from Kayseri Develi town (Table 1). Generally, terrestrial climate is dominant in the region. The average annual temperature is 15.8°C, precipitation is 481.6 mm and the average relative humidity is about 53.8%. The average temperature can reach 30°C in July and August. The lowest average temperature can be 7°C in December and January. The earliest frost in the region is usually at the end of October and the last frost around end of April. Most rain falls in winter, and there is almost no rainfall from July to September. The highest humidity (70%) occurs in winter, lowest (27%) in summer. Soils of weed sampling sites have slightly alkaline loamy-sand soils with poor organic matter content.

Weed sampling was performed from May to September during the flowering periods. Weed samples were dried at 70°C in a drying cabin (Memmert ULM 800) for 48 hours. Weed samples were shade-dried and milled to pass through a 1 mm sieve for subsequent analysis. ADF, NDF were analyzed by Ankom Fiber Analyzer (Model 220), CP were calculated by Kjeldahl method, after samples were ground. Ash values were determined at 550°C for 6 hours in oven.

DDM, DMI and RFV were calculated by using following equations (Morrison, 2003):

$$\text{DDM} = 88.9 - (0.779 \times \text{ADF})$$

$$\text{DMI} = 120 \div \text{NDF}$$

$$\text{RFV} = (\text{DDM} \times \text{DMI}) \div 1.29$$

Variance analyses performed for experimental results by using SAS (SAS Inst., 1999) software in accordance with randomized block design. LSD test was performed to test the significance of differences among averages.

Table 1. English names and families of plant species

Plant Species	Family	English name
<i>Cirsium vulgare</i>	Asteraceae	spear thistle
<i>Polygonum cognatum</i>	Polygonaceae	madimak/ indian knotgrass
<i>Cichorium intybus</i>	Asteraceae	chicory
<i>Sinapsis arvensis</i>	Brassicaceae	charlock
<i>Centaurea iberica</i>	Asteraceae	iberian knapweed
<i>Amaranthus retroflexus</i>	Amaranthaceae	red-root amaranth
<i>Sanguisorba minor</i>	Rosaceae	burnet
<i>Sorghum halepense</i>	Poaceae	johnson grass
<i>Kochia sp.</i>	Amaranthaceae	-----

Results and Discussion

NDF, ADF, CP, DM, DMI, DDM and RFV contents of all investigated weed were obtained as follows; 40.2 %, 33.5 %, 11.8%, 12.8%, 37.1%, 3.1%, 62.6 % and 149.8 %, respectively (Table. 2).

There were statistically ($p < 0.01$) differences among weeds species in the chemical composition. CP contents of these weeds ranged from 7.1% to 22.5%. The highest CP content was obtained from *Amaranthus retroflexus*, while the lowest CP content was obtained from *Cirsium vulgare*. Our results of CP in *Amaranthus retroflexus* were similar with the findings of some authors (Lawrence *et al.*, 1989; Hoveland, 1995; Abaye *et al.*, 2009; Basbag *et al.*, 2010). On the other hand, our findings for CP in *Amaranthus retroflexus* were higher than the results of Moyer and Hironaka (1993), but our findings for crude protein in *Kochia sp* were similar with the findings of Moyer and Hironaka (1993). Our findings for CP in *Sinapsis arvensis* and *Centaurea iberica* were lower than the results of Basbag *et al.* (2010), likewise our results for CP in *Sorghum halepense* were lower than the results of Kazemi *et al.* (2009).

Table 2. Average Neutral Detergent Fiber (NDF), Acid Detergent Fiber (ADF), Crude Ash, Crude Protein (CP), Dry Matter (DM), Dry Matter Intake (DMI), Digestible Dry Matter (DDM) (%) Percentages and Relative Feed Value of Different Plant Species.

Weed Species	NDF (%)	ADF (%)	Crude Ash (%)	CP (%)	DM (%)	DMI (%)	DDM (%)	RFV
<i>Cirsium vulgare</i>	29.4 f	28.2 e	13.0 c	7.1 g	42.2 bc	4.1	66.5 b	213.6 a
<i>Polygonum cognatum</i>	37.0 e	35.2 c	10.2 e	16.3 b	39.3 c	3.4	60.5 e	159.4 cd
<i>Cichorium intybus</i>	47.8 a	41.0 a	9.4 f	10.5 e	30.1 e	2.5	57.0 g	110.9 g
<i>Sinapis arvensis</i>	45.5 b	40.6 a	9.4 f	12.6 d	35.8 d	2.6	57.2 g	117.1 f
<i>Centaurea iberica</i>	42.6 c	37.7 b	15.2 b	10.7 e	51.1 a	2.8	59.5 f	129.8 e
<i>Amaranthus retroflexus</i>	38.5 d	22.8 f	17.5 a	22.5 a	14.2 f	3.1	71.2 a	171.8 b
<i>Sanguisorba minor</i>	44.9 b	32.7 d	10.0 e	13.0 d	44.5 b	2.7	63.5 c	131.4 e
<i>Sorghum halepense</i>	37.4 e	34.4 c	9.0 f	8.5 f	44.6 b	3.2	62.1 d	154.8 d
<i>Kochia sp.</i>	38.6 d	29.0 e	12.3 d	14.2 c	32.2 e	3.1	66.3 b	159.8 c
LSD	0.75	1.08	0.49	0.55	3.24	0.08	0.93	4.71
Significant Degree	**	**	**	**	**	**	**	**
Average	40.2	33.5	11.8	12.8	37.1	3.1	62.6	149.8

**p<0.01

NDF content ranged between 29.4% and 47.8% , depending on the weed species. ADF content varied from 22.8% to 41.0%, depends on the weed species. The highest ADF and NDF contents were obtained from *Cichorium intybus*, while the lowest ADF content was obtained from *Amaranthus retroflexus* and the lowest NDF content was obtained from *Cirsium vulgare*. These results of ADF and NDF in *Sinapis arvensis* and *Amaranthus retroflexus* were in agreement with the findings of Kamalak *et al.* (2005) and Abaye *et al.* (2009), but our findings about ADF and NDF values in *Sinapis arvensis* and *Centaurea iberica* were higher than Basbag *et al.* (2010). However, our results of ADF in *Sorghum halepense* were higher, but NDF in the same weed was lower than the result of Kazemi *et al.* (2009). Our results of ADF and NDF in *Amaranthus retroflexus* were higher than the result of Lawrence *et al.* (1989).

Crude ash content ranged between 9.0% and 17.5%, depending on the weed species. The highest content was obtained from *Amaranthus retroflexus*, while the lowest content was obtained from *Sorghum halepense*. Variation in chemical composition among weed species could be partly due to genotypic factors that control accumulation of foliage nutrients (Rubanza *et al.*, 2005). Although crude ash contents of *Sinapis arvensis*, *Centaurea iberica* and *Amaranthus retroflexus* were considerably lower than that obtained by Basbag *et al.* (2010), ash content of *Sorghum halepense* was higher than the found of Kazemi *et al.* (2009).

DM contents of the weed species ranged from 14.2% to 51.1%. The highest DM was obtained from *Centaurea iberica*, while the lowest DM was

obtained from *Amaranthus retroflexus*. Although DM of *Sinapis arvensis*, *Centaurea iberica* and *Sorghum halepense* were considerably higher than that obtained by Basbag *et al.* (2010) and Kazemi *et al.* (2009), DM of *Amaranthus retroflexus* was lower than the found of Basbag *et al.* (2010).

DDM, DMI and RFV of the plant species ranged from 57.0% to 71.2%, from 2.5% to 4.1% and from 110.9 to 213.6, respectively. The lowest parameters were determined in *Cichorium intybus*, while the highest DMI and RFV were obtained from *Cirsium vulgare* and the highest DDM was obtained from *Amaranthus retroflexus*. Although DDM of *Amaranthus retroflexus* was similar with the findings of some authors (Lawrence *et al.*, 1989; Hoveland, 1995; Abaye *et al.*, 2009; Basbag *et al.*, 2010), DDM of *Sinapis arvensis* and *Centaurea iberica* were lower than the found of Basbag *et al.* (2010). Our findings for DMI and RFV in *Sinapis arvensis*, *Centaurea iberica* and *Amaranthus retroflexus* were considerably lower than the results of Basbag *et al.* (2010).

Conclusion

As a result, if we consider higher CP level than averages of species following weeds may have importance: *Polygonum cognatum*, *Amaranthus retroflexus*, *Sanguisorba minor*, and *Kochia sp*; for RFV *Cirsium vulgare*, *Polygonum cognatum*, *Amaranthus retroflexus*, *Sorghum halepense*, and *Kochia sp.* These weed species could be interesting alternative animal feed sources and valuable in the ruminant feeding. Nevertheless, more experiments were required for better determination of these weed species

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