Scientific Papers. Series A. Agronomy, Vol. LIX, 2016
ISSN 2285-5785; ISSN CD-ROM 2285-5793; ISSN Online 2285-5807; ISSN-L 2285-5785

HERBAGE YIELD AND QUALITY OF WHEAT STUBBLE AND SORGHUM SUDAN-GRASS PASTURES

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Abstract

Summers are hot and dry and winters are cool and precipitated in regions with dominant Mediterranean climate. Since the pastures totally dry out during hot-dry period, sheep usually graze over wheat stubble in Turkey. The present study was conducted to investigate the herbage yield and quality of wheat stubble and Sorghum Sudan-grass pastures during summer dry periods and to compare live weight gains of the sheep grazed over these pastures. In sorghum Sudan-grass pastures, sheep (4 Karacabey merino race sheep x 3 replications) freely grazed in each plot for two-and-a half month (July-August-September) when the plants had 50-75 cm heights. Similar grazing treatments were also performed over wheat stubble. Dry herbage yields of wheat stubble and sorghum sudan-grass pastures were respectively observed as 2.82 ton/ha and 10.0 ton/ha. Considering the herbage quality of the wheat stubble, crude protein was 6.28 %; NDF was 66.54%. ADF was 37.88%, ADL was 4.37%, DMD was 60.25%, ME was 2.18 Kcal/kgKM. The same values were respectively observed as 11.33%, 61.13%, 31.58%, 2.99%, 67.27%, 2.43% in sorghum sudan-grass pasture.Traditional sheep grazing can be performed over wheat stubble pastures, but supplementary energy feed with CP should be provided. Sorghum sudan-grass can also be cultivated as an alternative to traditional stubble grazing. In this case, there is no need for supplementary feeds.

Key words: *wheat stubble, sorgumsudan grass, herbage yield, herbage quality, sheep grazed.*

INTRODUCTION

Cereal cultivation is implemented over the entire country in Turkey except for eastern Black Sea region. Cereals are cultivated over 117.132.230 da land area in Turkey and wheat is cultivated over 67% of these lands corresponding to 78.668.874 da land area (Tuik, 2016). Sheep are traditionally grazed on wheat stubble after grain is harvested from June to September. The sheep usually graze without supplements. The nutritional quality of stubble is low, owing to low nitrogen content and digestibly (Landau et al., 2000). However, stubble lands sometimes have increasing feed quality because of quite high grain losses during the harvest. As an alternative to traditional stubble grazing, sorghum-sudan grass pastures can be established in dry summer periods. The characteristicity of sorghum hybrids include fast establisment and vegetative growth, low soil fertility demand, as well as cutting and grazing management facilities. Sorghum hybrids have been used in rotation a grazing on summer annual grass for decades (Rodrigues, 2000). High forage production, 14.6Mg/ha of the dry mass with high nutritive value forage (7.5% crude protein) in 4 to 6 cuttings is observed in the experiments (Bean et. al.,2013). The present study was conducted to investigate the herbage yield and quality of wheat stubble and sorghum sudan-grass pastures during summer dry periods.

MATERIALS AND METHODS

The study was conducted at the July to mid October at the Bandırma Sheep Breeding Research Institute, located in northwestpart of Turkey. Bandırma has a typical Mediterranean climate: the mean annual precipitation 684.6 mm falls mainly in winter and spring. The rainy season typically begins in October and ends in

May, while summers are dry and hot. The mean annual temperature is 15.0°C.

The soil at Bandırma is generally neutral, unsaline and has clay or clay-loam texture with low or medium lime content, medium organic matter content, low or sufficient phosphorus content, sufficient or high potassium and magnesium contents, high calcium content, sufficient copper and manganese, high iron and low or sufficient zinc contents.

Summer pasture was established with sorghum-sudan grass hybrid in June. In sorghum sudan-grass sowing, 30 kg/ha sowing rate and 50x10 sowing spacing were used. Together with sowing, 80 kg/ha nitrogen was applied once to the soil (Beyaert and Roy, 2005). Plants were grazed when they reached to a height of 50-75 cm (Lewandowski et al., 2012). Wheat fields are harvested in June in the region. Over wheat stubble and sorghum sudan-grass pastures. 4 fences (2.5 x 2.5 = 6.25 m^2) were surrounded and prevented from grazing. Free grazing was performed over each plot with 4 Karacabey merino race sheep (4 sheep x 3 replications). Grazing was initiated on July 29. 2015 and plant samples were taken from the grazing plots on August 21, September 17 and October 9, 2015. Then the fence replaced to another place.

Collected samples were dried at 60°C for 48 h, and ground in a mill to passt hrough 1 mm screen priorto analyses. All analyses were carried out on duplicate samples and results reported on DM basis. Nitrogen content was measured by the Kjeldahl method (AOAC, 2000). Crudeprotein wascalculated as Nx6.2, NDF, ADF and ADL were measured using the procedure described by Van Soest et al.,(1991).

Data were analyzed by analysis of varianceusing MINITAB program, and meand were compared using Duncan's multiple range test at the $P \leq 0.05$ level.

RESULTS AND DISCUSSIONS

Grazing was initiated over sorghum sudan-grass and wheat stubble on July 29. 2015. Plant samples were taken from each plot in 20 day intervals. The greatest dry herbage yield (10.0 ton.ha^{-1}) was observed in sorghum sudan-grass pasture and the value was observed as 2.82 ton.ha^{-1} in wheat stubble pasture. Since sorghum sudan-grass height was quite low when the grazing was initiated, the lowest yield was also observed in this date. Yield increased in the other four periods but placed in the same statistical group (Table 1). Since sorghum sudan-grass has regrow ability, plants regrew after grazing and thus produced high herbage yields in each sampling period. Sapıtmaz and Özaslan Parlak (2015) in a study in a region with dominant Mediterranean climate grew sorghum sudan-grass as the second crop and reported total dry herbage yield (as 3 cuttings) as 33.69 ton.ha^{-1}.

While low crude protein levels were observed in wheat stubble pasture, the values were quite high in sorghum sudan-grass pasture. The crude protein contents were at the highest levels at the beginning of grazing period and the values decreased throughout the grazing period. NDF, ADF and ADL ratios were higher in wheat stubble pasture. NDF and ADL values were lower at the beginning of grazing period. However, increasing NDF values were observed in the other periods, but the difference between them was not significant. The greatest ADL ratio was observed in the last periods.

While sorghum sudan-grass pasture had high digestible dry matter content (67.27%), the value was lower (60.25%) in wheat stubble pasture. Significant differences were not observed in digestible dry matter contents of different periods. The case for metabolic energy was similar digestible dry matter (Table 2). Guessous (1992) reported after 30-day grazing that crude protein content decreased by 30% and digestibility decreased by 12%. While grazing over wheat stubble, sheep initially graze the grains, and then graze leaves and stems. Therefore, decreasing nutritional components were reported for stubble (Guessous et al., 1989). A decrease was also seen in protein ratio of the present study, but a quite low decrease was observed in digestibility. An increase was observed in crude protein ratio of the samples taken on September 17. It rained before sampling period and foliation was observed, thus a slight increase was observed in crude protein ratio. Landau et al., (2000) reported low nutritional quality and digestibility for stubble. In present study, crude protein and digestibility of stubble were lower than sorghum sudan-grass.

Table 1. Dry herbage yields of wheat stubble and sorghum Sudan-grass pastures in different periods throughout the grazing season (ton/ha)

Pastures	Day of Sampling				
	07.29.2015	08.21.2015	09.17.2015	10.06.2015	Means
Wheatstubble	2.33	2.72	3.29	2.94	2.82**a**
Sorgum-sudangrass	3.37	11.92	11.61	13.09	10.0**b**
Means	2.85**b**	7.32**a**	7.45**a**	8.02**a**	6.41

$P_{Pastures}$: 0.000.$P_{Day\ of\ sampling}$: 0.000.P_{PxD}:0.000

Table 2. Herbage quality of wheat stubble and sorghum sudan-grass pastures in different periods throughout the grazing season (CP, NDF, ADF, ADL,DMD, ME)

Pastures	Day of Sampling				
	07.29.2015	08.21.2015	09.17.2015	10.06.2015	Means
			CP (%)		
Wheatstubble	5.79	6.19	7.04	6.09	6.28 **a**
Sorgum-sudan grass	15.94	9.15	9.71	10.52	11.33 **b**
Means	10.87 **a**	7.67 **b**	8.38 **b**	8.31 **b**	
	$P_{Pastures}$: 0.000.$P_{Day\ of\ sampling}$: 0.001.P_{PxD}: 0.000				
PasturesNDF (%)					
Wheatstubble	65.07	67.00	68.96	65.15	66.54 **a**
Sorgum-sudan grass	55.36	60.13	62.96	66.10	61.13 **b**
Means	60.21 **b**	63.56 **a**	65.96 **a**	65.62 **a**	
	$P_{Pastures}$: 0.000.$P_{Day\ of\ sampling}$: 0.000.P_{PxD}: 0.002				
Pastures			ADF (%)		
Wheatstubble	36.98	37.85	39.39	37.29	37.88 **a**
Sorgum-sudan grass	30.07	30.67	32.26	33.31	31.58 **b**
Means	33.52	34.25	35.82	35.30	
	$P_{Pastures}$: 0.000.$P_{Day\ of\ sampling}$: 0.075.P_{PxD}: 0.236				
Pastures			ADL (%)		
Wheatstubble	4.47	4.17	4.64	4.22	4.37 **a**
Sorgum-sudan grass	2.43	3.03	2.92	3.57	2.99 **b**
Means	3.45 **b**	3.60 **ab**	3.78 **ab**	3.89 **a**	
	$P_{Pastures}$: 0.000.$P_{Day\ of\ sampling}$: 0.040.P_{PxD}: 0.001				
Pastures			DMD (%)		
Wheatstubble	61.26	60.29	58.57	60.91	60.25 **b**
Sorgum-sudan grass	68.95	68.28	66.52	65.34	67.27 **a**
Means	65.10	64.29	62.54	63.13	
	$P_{Pastures}$: 0.000$P_{Day\ of\ sampling}$: 0.075.P_{PxD}:0.236				
Pastures			ME (Kcal/kgKM)		
Wheatstubble	2.21	2.18	2.12	2.20	2.18**b**
Sorgum-sudan grass	2.49	2.47	2.40	2.36	2.43**a**
Means	2.35	2.32	2.26	2.28	
	$P_{Pastures}$: 0.000. $P_{Day\ of\ sampling}$: 0.075.P_{PxD}: 0.236				

CONCLUSIONS

Dry herbage yield, crude protein content, NDF, ADF, ADL, DMD and ME values of wheat stubble were significantly lower than sorghum sudan-grass. Cereals are cultivated over large areas in Turkey. Traditional sheep grazing can be performed over wheat stubble pastures, but supplementary energy feed with CP should be provided. Sorghum sudan-grass can also be cultivated as an alternative to traditional stubble grazing. In this case, there is no need for supplementary feeds.

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