Forage quality indices of some important grass species of Iranian rangelands

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Keywords: Forage quality, metabolism energy, digestibility, crude protein, vegetative zones, Iran.

Introduction

To be informed of the forage quality indices is one of the fundamental essentials for determination of the amount of forage sufficient for the daily requirements of animal in rangelands and wildlife habitats. This amount would be different depending on the vegetative composition and consequently the forage quality (Arzani, 2009). In this regard, grasses are considered one of the most important plants in the vegetative composition of rangelands in the country's different climate zones that are grazed by the animals and meet a considerable amount of animal requirements (Arzani *et al.* 2010). Therefore, the values of forage quality indices (crude protein, acid detergent fiber, digestibility of dry matter, metabolisable energy) of 135 grass species were measured at different growth stages (vegetative growth, flowering, and seeding stage) and from different areas of the country.

Instruments and Methods

The studied areas spread over four vegetative areas, including steppes, semi-steppes, desert areas in the middle of Iran and temperate deserts in the north of the country. Moreover, from the total 135 selected species, 12 species are spread over steppe areas, 101 species are found in the semi-steppe areas, 10 species are located in the central desert areas and 12 species belong to the temperate desert areas of the north (Arzani *et al.* 2010).

For collecting the needed data, at each growth stage, 3 samples and, for each sample, at least five plants bases were taken from different parts of the rangeland. Samples were dried at 60º C for 24h, and ground in a mill to pass through 1 mm screen prior to analysis. To determine forage quality, CP, DMD and ME were evaluated. Crude protein was determined by the formula stated by Walton (1983). Nitrogen was measured using the Kjeldhal technique (AOAC, 1995). Acid detergent fiber (ADF) was measured using the procedure described by Van Soest (1963). As Weiss (1994) suggested, accurate data on digestibility of forages would greatly assist diet formulation and economic valuation of different forages. Although the value of accurate digestibility data is unequivocal, obtaining actual data is time consuming, expensive and requires large amounts of the forage samples that was not feasible in this study. Dry matter digestibility was estimated using the formula developed by Oddy *et al.* (1983):

$$DMD\% = 83.58 - 0.824\ ADF\% + 2.626N\%.$$

Results

The obtained results (Table 1) show that the maximum crude protein (14.29%) belongs to the vegetative growth stage in the semi-steppe area and the minimum amount (6.13%) is also related to the semi-steppe areas in the final growth stages. Furthermore, the highest amount of acid detergent fiber (50.30%) is related to the final growth stages in the central desert areas and the least amount (35.28%) belongs to the semi-steppe areas in the initial growth stages of the rangeland. Semi-steppe areas have the maximum digestibility of dry matter (60.48%) and metabolic energy (8.28 MJ/kg DM) in the initial growth stages while the temperate desert areas of the north have the minimum dry matter digestibility (44.82%) and metabolic energy (5.62 MJ/kg DM) in the final growth stages.

Table 1. Values of forage quality index in vegetative areas of Iran.

Vegetative Areas	Growth Stages	Forage Quality Index			
		CP (%)	ADF (%)	DMD (%)	ME (MJ/kg DM)
Steppes	Vegetative Growth	12.62±1.24	39.85±2.31	56.04±2.17	7.53±0.37
	Flowering	10.53±0.91	43.29±1.71	52.33±1.61	6.90±0.27
	Seeding Stage	7.87±0.91	45.29±1.71	49.57±1.61	6.43±0.27
Semi-Steppes	Vegetative Growth	14.29±0.34	35.28±0.64	60.48±0.60	8.28±0.10
	Flowering	9.45±0.31	41.36±0.59	53.57±0.55	7.11±0.09
	Seeding Stage	6.13±0.31	46.73±0.58	47.65±0.54	6.10±0.09
Desert Areas in the middle of Iran	Vegetative Growth	10.33±0.96	38.49±1.79	57.05±1.68	7.70±0.29
	Flowering	6.75±0.96	43.95±1.79	51.11±1.68	6.69±0.29
	Seeding Stage	4.76±1.24	50.30±2.31	45.77±2.17	5.78±0.37
Temperate Deserts in the north of the country	Vegetative Growth	9.57±0.88	35.90±1.64	58.02±1.54	7.86±0.26
	Flowering	6.63±0.91	43.53±1.71	50.50±1.61	6.59±0.27
	Seeding Stage	6.18±1.36	50.20±2.54	44.82±2.38	5.62±0.41

Overall, the mean crude protein in vegetative growth, flowering and seed production stages was 13.29 ± 0.31%, 9.08 ±0.29% and 6.22 ±0.30%, respectively. In addition, the mean digestibility of species in different vegetative areas was equal to 59.64 ±0.52% in vegetative growth stage, 52.99 ±0.48% in flowering stage, and 47.61 ±0.50% in the final growth stage. The mean metabolic energy for the species fluctuates from 8.14 ±0.09 MJ/kg DM in the initial growth stages to 7.01 ±0.08 MJ/kg DM in the flowering stage 6.09 ±0.08 MJ/kg DM in the final growth stages.

Conclusion

Based on the results, it can be concluded that the crude protein and digestible dry matter content of the grasses present in rangelands in different areas of the country would not be able to meet the daily requirements of an animal in the final growth stages. In addition, the metabolisable energy content of grasses from various areas of rangelands are adequate only in the initial growth stages regarding the provision of daily requirements for animals and in the other stages, dietary supplements should be used.

It indicates that grazing time influences the daily animal requirement and it is essential that the daily animal requirement be identified on the basis of forage quality in each growth stage. Also it indicates that animal requirements vary throughout the year and this information can be used to indicate when the quality of available forage is adequate to meet requirements. It is normal that on the basis of possible conditions of the year the forage quality may vary to some extent, however, the mentioned results can be used to indicate forage quality at different growth stages and the daily animal requirement in different years since the determination of forage quality is a costly procedure.

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