Investigation on Effects of Phenological Stages and Species on Forage Quality of Rangelands (Iran)

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Investigation on effects of phenological stages and species on forage quality of rangelands(Iran)

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Introduction Forages are mainly used by livestock as a source of nutrition ; forage quality is defined as an expression of the characteristics that affect consumption , nutritive value , and the resulting animal performance . Many factors influence forage quality . The most important are forage species , and , stage of maturity at harvest . Secondary factors include soil fertility and fertilization , temperatures during forage growth , and variety . Among several factors , determinations of crude protein , digestible dry matter and metabolizable energy were considered more appropriate for evaluation range forage quality (Minson , 1987 ; Garza and Fulbright , 1988 ; Rhodes and Sharrow , 1990) .

Materials and methods This study was conducted in the Taleghan region located between 50°34′30″ to 50°44′18″ east longitude and 36° 10′4″ to 36°16′58″ north latitude within an area of 1325 km^2 and average rainfall of 500mm . Five samples for each species were gathered in the vegetative and mature stage . For each sample ten individual plants were randomly selected and clipped from 1cm above ground . So in each phenological stage 50 individual plants for each species were clipped . Samples were dried at 60℃ for 24 hours , then ground and analyzed . Forage quality was determined based on Crude protein percentage (CP) , Acid Detergent Fiber percentage (ADF) , Dry Matter Digestibility (DMD) , and Metabolizable energy (ME) . Nitrogen was measured by the micro kjeldehal technique (ADAC , 1980) using a kjeltec system . CP determined by the formula CP＝N* 6 .25 . ADF measured using method introduced by van Soest (1982) with a fibertec system . DMD estimated using the formula DMD%＝83 .58-0 .82ADF%＋2 .262N% as suggested by Oddy et al . (1983) . ME predicted using the equation M/D＝0 .17 DMD%-2 .0 described by the standing committee on agriculture (1990) where M/D in mega joules (MJ) per kg of feed DM , applicable at the maintenance level of feeding .

Results The results of forage quality analysis show that *Diplotaenia cuchrydifolia* contained high metabolisable energy (10 .67 MJ/kg DM) in the vegetative stage and *Agropyron tauri* contained the lowest amount of metabolisable energy (6 .42 MJ/ kg DM) in themature stage . In all species advancement of plant growth caused reduction in CP , DMD and ME content of forage and an increase of ADF percentage (Table 1) .

Table 1 *Forage quality and of species at vegetative and maturity stages .*

Species	Phonological stage	CP%		ADF%		DMD%		ME MJ/kg DM	
		Mean	Std	Mean	Std	Mean	Std	Mean	Std
Agropyron trichoforom	Vegetative	12 .48	0 .64	37 .46	0 .54	57 .96	0 .59	7 .85	0 .10
	Maturity	6 .18	0 .13	44 .44	0 .38	49 .56	0 .34	6 .42	0 .06
Dactylis glomerata	Vegetative	16 .68	0 .81	33 .42	0 .22	63 .05	0 .43	8 .72	0 .07
	Maturity	3 .97	0 .13	39 .96	0 .31	52 .32	0 .28	6 .89	0 .05
Hordeum bulbosum	Vegetative	29 .63	1 .04	26 .06	1 .17	74 .56	1 .37	10 .67	0 .23
	Maturity	9 .16	0 .19	34 .74	0 .62	58 .80	0 .59	8 .00	0 .10
lotus goeblia	Vegetative	15 .14	2 .01	20 .24	0 .94	73 .26	0 .82	10 .45	0 .14
	Maturity	7 .56	0 .15	37 .04	0 .55	56 .23	0 .51	7 .56	0 .09
Astragalus aegobromus	Vegetative	13 .26	0 .38	32 .36	1 .91	62 .49	1 .65	8 .62	0 .28
	Maturity	9 .29	0 .18	36 .64	0 .43	57 .29	0 .42	7 .74	0 .07

The effect of phenological stages on CP , ADF and ME was significant ($p<0.01$) in 2 stages (Table 2) . Among the species *Diplotaenia cuchrydifolia* and *Agropyron tauri* showed highest and lowest forage quality respectively . High percentage of CP , DMD , ME and low percentage of ADF were obtained from all species in vegetative stage of growth . In contrast at the mature stage CP , DMD and ME decreased and ADF increased .

Table 2 *Comparison of forage quality .*

Source of variation		Degree of freedom	Sum squarely	Mean of squares	F values	P-value
Phenology	CP	1	1302 .745	1302 .745	56 .446	0 .00
	ADF	1	937 .099	937 .099	36 .478	0 .00
	ME	1	47 .142	47 .142	56 .960	0 .00
Error	CP	48	1107 .816	23 .079		
	ADF	48	1233 .92	25 .689		
	ME	48	39 .727	0 .82		
Total	CP	49	2410 .561			
	ADF	49	2170 .191			
	ME	49	86 .869			

Conclusions Determining forage quality available to grazing animals assist to achieve their most timely utilization , helps predict nutrient deficiencies and suggest supplementation needs . The stage of growth greatly affects forage quality . However in the mature stage forage quality sharply decreases and dietary deficiencies may result .

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