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The study of the quality of *aeluropus lagopoides* in different phonological stages in Sistan region

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ABSTRACT: Phenology is one of important issues in the vast ecology science. The study of phenology is really important in regulating stocks' grazing and knowing digestibility and food value of herbal species in different vital steps of pasturing. This study has been done to determine food value, chemical compositions, and digestibility of aeluropus lagopoides which is from halophyte species in three phonological steps (growth, flowering, seeding). after gathering plant samples and milling them ,chemical compositions like dry material(DM) ,organic material(OM), protein(CP) , fat(EE) , carbohydrate (WSC), ash(ASH), cellular wall(NDF), cellular wall without hemicellulose(ADF) were determined. In order to determine solubility of dry matter of studied samples, fistula ting was determined by the use of nylon packaging method (in situ). Results showed considerable difference in chemical composition of studied plant in different phonological steps. As growth step proceeds, amount of dry matter and effective solubility reduced and the amount of cellular tissues increased. Totally, this plant may supply stocks caring necessities. So, it is suggested to be supplied in growth step in which it has a higher food value.

***Keywords*:** nutritive value, phonological step, nylon bag, Sistan.

INTRODUCTION

Phenology is one of the most extended issues in ecology and it means the study of vital changes in plants before seeding an one year old plants, the start of growth in many years old plants, leaving date and its duration ,the date of starting and ending of flowering, time of puberty and its falling and finally determination of the date of growth ending and hibernation period. During different phonological steps, digestibility and food value of different species are variable. By knowing phenology of important pasture plants in each region, the most suitable exploiting season and usage duration of ranging are determined and correct ranging systems are applied. Some species are poisonous in some stages of their growth process but not in other stages. Therefore, determining the best season for ranging stocks in a range based on vital steps is an important necessity in pasturing. (Mirbadin, 2004)based on the ideas of the most researchers, growth step is the most effective one in qualifying plants and most of dominant representative of forage quality are decreased by proceeding in growth step.(Holechek et al 2001,Chen et al 2001, Al qurran and Shatari 2003)

Tarkan (2009) sampled 8 different wheat species in eight ranges, which included eight different climates in three sample gathering phonological , and concluded that there is a meaningful relationship between crude protein level and the growth stage in different climates and the effect of climate on forage quality is more than soil. Kaboli(2001) , among different variables, introduced cellular wall without hemi cellulose ,(ADF),crude protein, and phosphorous as the most important indexes of determining forage quality and emphasized that adding stock consumption factor to above mentioned factors by Soest showed that ADF is the best index for representation of food value in a plant. Cellulose and hemi cellulose are digestible in stocks but Lignin is not (Garza, 1965). By increasing plant age, its protein is decreased. So, there is an adverse relationship between the amounts of protein and crude fiber in plant specie. Different studies show that by puberty advance, digestibility value of forages is decreased and their protein content reduces. (Ghorchi, 1994). Based on mentioned factors, the purpose of this research is the study of the quality of Boni range foliage quality in different phonological stages in Sistan region and determination of the best time for exploiting by stocks.

MATERIALS AND METHODS

This research has been done in three phonological stages (growth, flowering, seeding) to determine their food value, chemical compositions, and their ionic digestibility which is from halophyte species. After gathering plant species and milling them after drying plant species and their milling, chemical compositions by the use of approximate analysis method (AOAC, 1991) and measuring the components of cellular wall by the use of Van Soest method (Van Soest, 1991), in order to measure the decomposition percent of dry matter in studied plant species by the use of nylon packages method , were done.(Orskov, 1992).

Testing treatment samples, at first, were dried for 48 hours in 65 degree centigrade and then were milled in a mill with 2/5 millimeter hole. 5 g of each dried sample of each treatment were placed in a 6/5. 12 nylon packages with 45 nanometer diameter holes. Samples were drawn in stomach for 3, 6, 12, 24, 48, 72, and 96hours. After finishing incubation, each sack was taken out of stomach and was put in cold water for 30 minutes and was washed by hands completely. Then every one of them was placed into an oven for 48 hours in 65 degree centigrade. Then weighting was done. Then dry matter and organic matter by the use of (AOAC, 1990) were determined. In order to determine the decrease in studied eating matter after incubation and washing, two other sacks which included 5 grams of tested eating matter were shaken in 39 degree centigrade water for an hour. Sacks are washed and dried similarly, so decomposability of dry matter will be determined by in situ method in incubation period. Following equation is applied to evaluate digestibility of dry matter (Orskov and McDonald, 1979).

$P=a+b(1- e^{-ct})$

In this equation, p is the percent of decomposability in t time, and A is soluble particles, and b is non soluble particles which are potentially decomposable. (a+b) represents edible matters which are decomposable potentially and is shown in percent. C represents decomposability speed which is shown in(percent/ hour). Amount of effective decomposability y of stomach of forage complexes is calculated in following form: $EP= a=[b \times c/c + k]$

K represents the amount of stomach material stream.

Food stopping amount in stomach was evaluated based on stock's foliage consumption amount that Its amount is in 0/05 level. By the use of New way program, the amounts of solubility coefficients of a, b, and c were determined. And finally were analyzed by SAS software (2002). Diagrams were drawn by the use of Excel program.

Chemical composition results

The average of chemical compositions of Boni ranging foliage (Aeluropus Lagopoides) is shown in table1. Chemical composition of Boni specie had a meaningful difference in different phonological steps ($p<0/05$). Crude protein percent between phonological stages was in 11/33 to 15/23 ranges which had the highest percent in growing period.

Crude fat percent in growing period was more than two other periods (2/5 %). Amount of cellular wall (NDF), and cellular wall without hemi cellulose (ADF) increased as growth period proceeds. ADF in growing step of studied specie with an average of 15/02 percent is lower than flowering step with an average of 18/30 percent and seeding step with an average of 26/00 ($p<0/05$). The highest amount of NDF in seeding stage was 39/12 percent in comparison to two other steps. As the age of plant grows, cellular wall is thicker and the amount of crude tissues and lignin increase. These changes are logically the results of increasing corporal carbohydrates and include mostly cellulose hemi cellulose and, lignin and by increasing plant density are necessary for its permanence. These changes are affected by two factors, increasing stem to root ratio and increasing the amount of corporal carbohydrates, which are by increasing plant age. Therefore, along with plant puberty, percent of dry weight, fiber and lignin increase. In such a way that by increasing plant protein amount and decreasing ADF and NDF, they have the best decomposability of dry matter.

Dry matter decomposability

Obtained results from the in situ analysis of dry material decomposability of studied plants are shown in table 2. Disappearing of dry matter from incubation sacks in stomach increased with increasing incubation time (diagram 1). The highest amount of decomposability in part (a) related to Boni growth step (58/10) and in flowering and seeding stages were 45/23 and 49/12, respectively. The highest amount of decomposability of insoluble but decomposable part (b) was related to flowering stage(43/26 percent) and growing and seeding stages with 36/45 and 27/18 respectively. A meaningful difference was observed between b coefficients in phonological steps of studied plant for the insoluble but decomposable particles. ($p<0/05$).

C (decomposability constant rate) showed a meaningful difference among testing treatments. ($p<0/05$) (table2).A+B coefficient (potential decomposability power) had a meaningful difference in growing step ($p<0/05$) that decomposability coefficient of growing stage (77/35) is more than flowering stage(76/35%) and seeding stage(65/88%). Based on table 2 data, the difference in decomposability coefficients of studied species is meaningful.

G rowing stage has the best decomposability percent of dry material among phonological stages. Arskov et al (2000) expressed that increasing crude protein and soluble materials in dry materials of a plant lead to increase in decomposability.

The average percent of effective decomposability of dry matter in hour , in different growth stages of studied specie showed a meaningful difference.(p<0/05) the highest percent of decomposability of dry matter for passage speed was obtained as 0/05 for growth step. Totally, based on obtained results and data from in situ tastings of growth stage of Boni specie, it has had the highest decomposability percent of dry matter in different times of incubation.

Table 1. the average of chemical compositions and mineral elements of Aeluropus Lagopoides) in different phonological stages (percent)

(ADF)	(NDF)	(EE)	(CP)	(Ash)	(OM)	(DM)	Phonological stage
^{c}13/02	^{c}27/39	^{a}2/66	^{a}15/23	^{a}54/06	^{c}45/94	^{b}94/17	*groowing*
^{b}18/90	^{b}28/58	^{b}1/21	^{b}11/97	^{c}44/44	^{a}55/36	^{a}95/48	*floowring*
^{a}25/00	^{a}38/12	^{b}1/12	^{b}10/41	^{b}44/20	^{b}56/80	^{c}95/82	*seeding*

Numbers with the same alphabet in each row have meaningful statistical difference. (p<0/05)

Table 2.decomposibility of Boni dry matter in different times of incubation and its measuring in different phonological stages

ED(K=0.05)	c	a+b	b	a	Phonological stage
^{a}69/07	^{c}0/027	^{a}92/46	^{b}35/24	^{a}55/10	groowing
^{ab}68/82	^{a}0/081	^{b}83/35	^{a}40/85	^{c}42/52	floowring
^{b}60/07	^{b}0/047	^{c}73/03	^{c}25/79	^{b}46/05	seeding

Numbers with the same alphabet in each row have no meaningful difference.(p<0/05).a: rapid decomposition part, b: slow decomposition part, a+b: decomposability potential, ED: effective decomposability in passage speed of 5% in hour

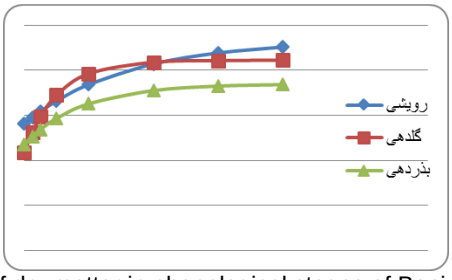

Diagram 1. decomposability percent of dry matter in phonological stages of Boni specie in different incubation times

Due to the special climate condition , little rainfall, and salty soil of Sistan and Baluchistan and the shortage of foliage to supply food necessities of this region's stocks, Boni (Aeluropus Lagopoides) which has a human consumption and is able to be grown in salty soil and water, will supply part of food necessities of stocks in Sistan region

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