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Determining the Laboratory Digestibility and Producing Rotundus Cyperus and Common Reed in Sistan Area

Mansur Saravani[1], Qasem Jalil Vand[2], Zhila Mahmodian[3], Ebrahim Shahraki[4], Amir Shahsavan[5]
[1,5]Master of Animal Science, University of Zabol
[2,4]Faculty Member, University of Zabol, Iran
[3]Animal Science Graduate Student, University of Zabol
([1]Eb.shahraki@gmail.com)

Abstract- This study aims to explore the food value of rotundus cyperus and common reed in Sistan area in two-staged method (teli and teri) and the test of producing their gas (based on Mank Wastingas method) in various fields. The regarded samples from various areas of Sistan canebrakes during two years in gazing season in a completely random design were collected. The obtained samples are transferred to the laboratory after being treated and their chemical compounds were measured. The chemical compounds include dry matter, organic materials, raw protein, ash, solution carbohydrates, cellular walls and cellular walls without hemi cellulose. The results of digestible dry matter, organic materials and organic materials within the dry matter showed a significant difference for each plant ($P<0.05$). The digestibility of dry matter also showed a significant difference for each plant ($P<0.05$). The results obtained by the produced gas volume (milligram per milliliter) in different hours of incubation showed that common reed has the least produced gas volume compared with rotundus cyperus and digestibility in all times of different incubation. Generally, given the obtained results and data from the chemical compounds, it can be concluded that the digestibility of rotundus cyperus has a relative advantage than that of the common reed.

Keywords- *rotundus cyperus, common reed, Sistan, laboratory*

I. INTRODUCTION

The pastures round the Hamoun lagoon is a rich and accessible resource for the nutrition of animals. The space of Hamoun lagoon's canebrake (Pouzak, Saberi, Hirmand) is measured about 12278 hectares and the dominant vegetation of rotundus cyperus, common reed, Loie, Ghamish, Hezar Ney and Jegan (Asadi Moghadam and Nikkhah, 1982). Among the 28 types of collected plant from the Hamoun lagoon, common reed and rotundus cyperus has the highest frequency as 28% and 14%, respectively and the ranchmen in rotundus cyperus and common reed are often harvested from the Sistan plains' pastures since the late Tir month which is the time of plant maturity and then stored after being dried. Then, the dried plaint will be used for feeding the animals in the fall and winter (Nouri et.al, 2007). The plant types of common reed and rotundus cyperus grow in a wide level of pastures round the Hamoun Lake and then are used in feeding ruminating animals and this plant type can be replaced with some of widely used provender in the stipend of Sistan area's animals with practical and scientific methods and the costs related to nutrition in the ranch of this region can then be reduced. In the study done by Arzani et.al (2007) on the quality of 22 types of feeds of three provinces' pastures from the central and western areas is related to the quality of various types of feeds in the natural ability of the plant in attracting specific food matters and changing them into related plant fibers. Due to the fact that the experiments related to determining the nutritional value of fodders on the animals is time-consuming, using simple and cheap while accurate and trust-worthy methods is highly important. The teli and teri laboratory method and producing gass are among the methods that are used to estimate the digestibility of fodder and thus the metabolism of fodders using the digestion of organic materials in their dried matter can be predicted through this method (Mansouri et.al, 2003). In studying three pastures types of Lotfi et.al (2012), Grass Kelo et.al (2012) introduced four tree types using gas production and nylon bag, they introduced gas production method as a suitable one. The aim of this study is to measure the digestibility of dried matter, organic materials and organic materials into a dried matter of rotundus cyperus and common reed as well as determining the amount of producing fermentative gases of the above-mentioned samples in order to determine their food value within two stages during the gazing season.

II. MATERIALS AND METHODS

Given the wide variety of Sistan canebrakes, collecting samples were done completely at random and the planting samples of rotundus cyperus and common reed were harvested and dried in the late Khordad 2009 and 2012 in the seeds season from the pastures of Hamoun Lake during the gazing season during two consecutive years. Measuring the chemical compounds and laboratorial digestibility were done based on the suggested standard methods of AOAC (1990). Insoluble fiber in the neutral cleaner (NDF) and insoluble fiber in the acid cleaner (ADF) based on the method suggested by Van West et.al (1991) was measured. To measure the food value of rotundus cyperus and common reed, gas production and teri and teli methods were used. Digestibility measurement was calculated based on teri and teli methods (Matlibian et.al, 2009).

Gas production test obtained from feed fermentation using rumen micro-organisms within 24 hours along with other ultra-measurements (crude protein, crude yarn, crude fat and crude ass) was determined to estimate themetabolism energy of the feeds (Menke and Estingass, 1998).

III. Results

A. Chemical Compounds

The mean of the plant's chemical compounds of the two plants under study has been shown in Table 1. The plants showed a significant difference at the level of $P<0.05$ in terms of chemical compounds; however, they showed no difference during two stages of harvest. The mean of ass for rotundus cyperus was 25.04 and for common reed was 13.19. The mean of crude protein of rotundus cyperus was 4.52 and common reed was 2.21. Also, the mean of NDF and ADF of rotundus cyperus was 61.31 and 41.61, respectively, and for common reed was 74.32 and 46.02. Comparing the values in various studies show that there is a significant difference between the percentage of the crude protein of the samples and the growth stages in different climates and the impacts of climate in the quality of the feed is more than soil.

TABLE I. The mean of the percentage of chemical compounds of rotundus cyperus and common reed within two years

Stage of harvesting	The mean of the percentage of chemical compounds						
	DM	ASH	OM	CP	EE	NDF	ADF
rotundus cyperus 1	90.28[a]	13.34[b]	66.08[b]	6.21[b]	4.54[a]	61.79[b]	42.19[b]
rotundus cyperus 2	90.78[a]	13.04[b]	66.48[b]	6.92[b]	4.50[a]	60.82[b]	41.2[b]
rotundus cyperus 1	27.75[b]	25.20[a]	86.66[a]	7.08[a]	2.20[b]	74.74[a]	46.05[a]
rotundus cyperus 2	28.15[b]	24.88[a]	86.66[a]	8.97[a]	2.23[b]	73.95[b]	45.99[b]

*DM: dried matter, Ash: crude ash, OM: organic materials, CP: crude protein, EE: ether extract, NDF: neutral dissoluble fiber, ADF: acid dissoluble fiber

IV. The test of gas production of studied cares

The amount of produced gas by the plants under study in 2, 4, 6, 8, 12, 24, 48 and 96 hours of incubation (per milliliter of produced gas in 200 mg of dried matter) have been presented in Table 2. As can be seen in the table, by increasing the time of incubation, the amount of gas production has been increased. The mean of produced gas in 96 hours of incubation in rotundus cyperus was 3.57, 9.09, 10.56, 12.98, 17.44, 31.22, 42.74, 46.98 and 49.79 mg). By increasing the incubation time until 96 hours, the process of gas production for all the cares under study has been ascending that is in accordance with other studies (Mansouri et.al, 2003). The mean of produced gas in 96 hours of incubation in rotundus cyperus was 1.51, 3.85, 6.10, 7.61, 11.46, 21.92, 31.42, 35.05 and 36.06 percent, respectively. The amount of produced gas was mainly affected by the chemical compounds of the plant (Natsky et.al, 2008). According to the studies, the amount of producing gas will be increased by increasing the time of incubation (Maheri et.al, 2007). The relationship between gas production and some chemical compounds of the feeds has been indicated that the amount of gas production has a negative correlation with their crude fiber. Also, given the amount of this component in the growing season of the pasture plants are various; the amount of gas production during the growing season will also be changed (26).

TABLE II. Amount of produced gas in various time of incubation

Time /forages	2	4	6	8	12	24	48	72	96	B	C	SEM
rotundus cyperus 1	3.75a	9.09a	10.6a	12.91a	17.33a	31.22a	42.52a	46.93a	49.79a	48.79	0.037	0.030
rotundus cyperus 2	3075a	9.09a	10.7a	13.04a	17.55a	31.22a	41.95a	47.03a	49.80a	48.99	0.040	0.033
Common reed 1	1.52b	3.85b	6.10b	7.52b	11.64b	21.90b	31.44b	35.09b	36.12b	39.36	0.025	0.975
Common reed 2	1.50b	3.85b	6.11b	7.70b	11.64b	21.94b	31.40b	35.01b	36.01b	44.34	0.039	0.975

B: total volume of produced gas, c: constant of composition rate
*the numbers with similar numbers in each row has no statistically significant difference with each other ($P<0.05$).

V. The digestibility of organic materials, organic materials in dried matter and metabolite energy

The digestibility of organic materials, organic materials in dried matter and metabolite energy of the considered forages has been shown in Table 3. The digestibility of rotundus cyperus varies between 50.19 and 49.00. Also, the digestibility of common reed varies between 46.68 and 46.99. The difference between the digestion of organic materials and in rotundus cyperus and common Reed has been significant ($P>0.05$) in that the obtained results were compatible with the ones obtained by Sibel et.al (2009) and Shahsavan et.al (2009). The value of metabolite energy of the studied cares has been

shown in Table 3. The value of evaluated ME from the gas production data show a significant difference (P<0.05).

TABLE III. THE DIGESTIBILITY PERCENTAGE OF ORGANIC MATERIALS, ORGANIC MATERIALS IN DRIED MATTER AND METABOLITE ENERGY AND FOLIAGE, COMMON REED AND ROTUNDUS CYPERUS

Digestibility of foliages	OMD	DOMD	ME (kg/MG)	SEM
rotundus cyperus 1	50.19 a	55.82a	61.39a	0.219
rotundus cyperus 2	49.00a	54.24a	60.15a	0.065
Common reed 1	46.99b	49.20b	50.87b	0.002
Common reed 2	46.68b	49.55b	50.75b	0.054

OMD: digestibility of organic materials
DOMD: digestibility of organic materials in dried matter, ME: metabolite energy

VI. DISCUSSION

A. Chemical Compounds

Sampling from the first and second stages of chemical compounds and crude energy of common reed and rotundus cyperus has been shown in Table 1. The mean of crude protein showed a significant difference in the two plants (P>0.05). The mean of crude protein of common reed (8.52) is more than the mean of rotundus cyperus protein (6.57) which was compatible with the results obtained by Mashayekhi et.al (2005) over the common reed. Given that the allotment of ruminating animals requires at least to 8 to 10% of crude protein (NRC, 2000), the sampling types can thus meet a percentage of required foliages of the animals. Along with increasing the plant's age, the cellular wall will be more dried in that these changes are caused by two factors namely increasing the ratio between stalk and leaf as well as increasing the values of constructive carbohydrates mainly cellulose, hemi-cellulose and Lignin. Increasing the mean of CP of common reed relates to having more leaves of this type. Distel et.al (2005) reported that the more the ratio between leaf to stalk is reduced, the ratio between the cellular wall, stalk and Lignin will be increased and the CP value will be decreased. In the current study, the mean of cellular wall without hemi-cellulose (ADF) of the common reed (46.02) is more than the mean of rotundus cyperus (41.61). Van Soust (1991) showed that ADF has the highest index for expressing the food value than the crude fiber and cellulose and generally, the less the value of ADF in the plant, the value of digestible matters will be increased. The studied samples have suitable protein with low fiber and probably less nutrition due to existing secondary combinations and salt. Meanwhile, the limitation of foliage production in most dry regions requires that the utilization methods of these types are taken into consideration. However, increasing the age and the factors of high temperature and high light in the plants cause reducing the quality of foliage that is compatible with the Tohidi results (2007).

B. Digestibility

The mean of organic materials digestibility, organic materials in dried matter and metabolite energy of rotundus cyperus and common reed within two sampling stages has been shown in Table 3. The mean of digestibility of dried matter showed a significant difference in the two kinds (P>0.05). The digestibility of the dried matter in rotundus cyperus was 49.60% and common reed was 46.68%. Such condition regarding the digestibility of organic materials of rotundus cyperus and common reed was observed as 55.03 and 49.38%, respectively. However, the digestibility of organic materialss is one of the main determining factors of the foliage food value, which varies from 85% of spring foliages to 50% in winter foliages. Menkeh and Stingass (1998) reported that there is a direct relationship between gas volume and ash value that is compatible with the current study. Khanoum et.al (2007) reported that the difference in the metabolite energy of the various foods reflects the difference in the fermentable carbohydrates and their accessible nitrogen that is compatible with the current study. The results of this study are compatible with the ones obtained by Shirmardi (2004) and Mousavi (1995). They reported that after reaching of pasture's foliages to the beginning of blossoming, their digestibility reduces to 0.5 per each day.

C. Gas production

The mean of gas production in various times and potential production of common reed and rotundus cyperus in sampling stages has been compared in Table 2. As can be observed, there is a significant difference in the two plants (P>0.05).

The variance range of gas production within 96 hours for the mean of two harvesting stages of common reed and rotundus cyperus was significantly varies from 49.79 to 36.06 ml (P>0.05). In the results of researchers (Bobaker et.al, 2005), this point was mentioned that the secondary metabolites and cellular walls cause digestibility reduction and as a result reducing gas production in the incubation times. Given the positive correlation between gas production and disappearing of dried matter, it is expected that rotundus cyperus with the highest gas production in all hours of incubation has the highest digestibility that is compatible with the current study. According to ultra-measurements of gas production, the mean of c and b components, the studied plant types showed a significant difference with each other (P<0.05). The highest power of gas production (part b) and the speed of gas production (part c) relate to rotundus cyperus. The mean of metabolite energy estimation based on the results of gas production (the equation suggested by Menk & Steingass (1998) based on various stages of harvesting of common reed and rotundus cyperus in Sistan was obtained 60.77 and 0.81 MG/kg of dried matter. Kamalak et.al (2005) concluded that the difference in the results is probably due to chemical compounds, environmental conditions and their abilities in absorbing nutrients from the soil. The value of ME in rotundus cyperus was more than common reed. The digestibility and the ability for composition of dried matter and organic materials as well as metabolite energy increases with reducing crude fiber, NDF, ADF and Lingin (4), in that common reed was not excepted from this rule. The metabolite energy changes may be due to the difference in the combination of samples in various parts of Sistan and the difference in the soil features and the climatic effects over the pastures' foliages. The results of this study were compatible with the findings of Shakeri (1999) and Long (1999).

VII. CONCLUSION

Generally, given the obtained data and results from the chemical compounds, composition and digestibility within two stages of harvesting, it can be concluded that the studied plants have suitable food values given the high production volume can use as a good food source to meet the needs of animals' foliages. However, the food value of rotundus cyperus is higher than that of common reed. Also, the limitations in the foliage shortage in dry regions requires that serious attention be paid to natural types and providing their cumulative production in order to be used in the animals' foliage and improving the performance of animal production.

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