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Original Research Article

Effect of Using Different Levels of Date by-products on *in vitro* Digestion

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Abstract: The experiment was conducted from 9/3 to 11/4/2023 to study the effects of using increasing percentages of dried dates peels (0, 15, 30, & 45%) on the concentrated fodder to study its effect. on dry and organic matter digestion coefficients, methane gas production, volatile fatty acid, ammonia, pH, and total numbers of bacteria. The results show that there was a significant effect ($p \leq 0.05$) on the digestibility of dry and organic matter at 30% of date by-products. The results also showing that treatment T3 was superior in the production of total gas and methane gas for all incubation periods. The results also positive for the characteristics of ammonia nitrogen and Volatile fatty acids, T4 outperformed the rest of the treatments in total bacterial counts.

Keywords: Date peels, Rumen fermentation, Gas production.

INTRODUCTION

Date palm fruits have a high nutritional value, They are an excellent source of energy. They also contain approximately 80% sugars by fresh weight. They also contain large quantities of mineral and trace elements that are of great importance to the animal body, such as potassium, magnesium, iron, and some vitamins such as (A, B2, B6) (Abo Omar, 2017), These elements help maintain the activity and health of the digestive system, the balance of bodily fluids, and the health of the nerves.

The high cost and scarcity of traditional fodder in certain seasons are among the most important obstacles in the animal production process. Hence, research has now turned to finding alternatives for fodder from industrial and agricultural waste (date petals, fresh and dry pits, palm fronds, buckwheat, sabus, and rice husks). and its embryos) as non-traditional coarse fodder that can be used in feeding ruminant animals after treating them biologically, physically or chemically, (Abo Omar,2017). showed (Banna, 2010) there is no significant effect of replacing barley with increasing percentages of dates (0, 10, 20%) with, different nitrogen sources on the pH and volatile fatty acids, and a significant decrease at the level of ($p<0.05$) for the coefficient of digestion and decomposition of food compounds in The rumen when the percentage of dates was 20%, which agrees with (Taghinejad, 2015) when he studied the effect of feeding on date waste and Date peels at a rate of 0, 10 and 20%, until the substitution led to a decrease in the digestion coefficient of food compounds and their decomposition in the rumen at the level of 20% of Date peels . While Abo Omar (2017) when fattening local goat kids on diets containing increasing percentages of Date peels 0, 15, 30 and 45% did not obtain any differences between treatments 1, 2 and 3 for the characteristics of the digestibility coefficient of dry matter, organic matter and crude protein. And crude fiber, but it exceeded the fourth treatment by 45% of Date peels.

This study aims to establish the effects of using increasing percentages of dried Date peels (0, 15, 30, and 45%) from the concentrated diet, on the digestibility coefficient of dry and organic matter, in vitro rumen fluid fermentations, and the total of bacteria.

MATERIALS AND METHODS

The experiment was conducted in the Nutrition In vitro to study the effect of using increasing percentages of dried dates peels (0, 15, 30, and 45%) from the concentrated diet for the study. Its effect on dry and organic matter digestion coefficients, total gas production, in vitro methane gas, volatile fatty acid levels, ammonia nitrogen, pH, and total numbers of bacteria.

Digestibility of Dry Matter and Organic Matter (%)

The digestion coefficient of dry matter and organic matter was estimated according by method of (Tilley & Terry, 1963) whereby a 0.5 gm transported to the digestion tubes with the addition of 50 ml of the mixture rumen fluid and artificial saliva, Carbon dioxide gas added twice daily to create anaerobic conditions. The tubes were incubation in a water bath at, a temperature of 39º C for 48 hours with the water bath agitated twice a day. Then the samples are filtered. Only which represents the products of the two stages of microbial, digestion and for enzyme, the precipitate is dried at a temperature of 105 ° C for 24 hours to calculation, of the dry matter digestibility (DMD), then the samples are placed in the furnace at a temperature of 550-600 ° C for 2 hours to determination the of ash and calculate of organic matter digestion (OMD).

Determination of Gas Production

The total gas (TG) and methane gas (MG) production in the in vitro was estimated according to the method of Menke & Steingass (1988) by 0.2 g was taken form ration and move to a 100 ml glass syringe with the transport of 10 ml of Rumen fluid, with 20 ml of artificial saliva and injection of carbon dioxide gas to the rumen fluid. All injections were placed in a water basin at temperature of 39ºC, for 24 hours. 4 Replicates were taken for each sample and 4 blank samples were made. then 4 ml of 4% sodium hydroxide was added to 2 of the samples that had not been divided to calculate methane gas production according to the method of researcher Fievez *et al.*, (2005).

Determination Characteristics of Rumen Fluid

Ammonia nitrogen concentration (NH3-N), (mg/100 ml) Taking about of 10 ml from rumen fluid after the incubation stage and placed in a 50 ml tube, then 5 ml of 0.1 Normality hydrochloric acid was added to it, and the tube was placed at freezing temperature until chemical analysis according to the method (A.O.A.C, 2005).

Determination of the total volatile fatty acids (VFAs) (mmol/100 ml) (Menke & Steingass,1988).

Statistical Analysis

Data analysis during the experiment was statistically analyzed according to the procedures of SAS (2012) Duncan's (1955).

Table 1: Chemical composition of experimental ration

Components	Yalow corn	Soybean meal	Barley	Date peels	What bran
DM	90.10	90.10	91.00	91.00	90.10
CP	8.9	46.0	10.75	6.20	14.00
EE	4.61	2.00	1.45	1.01	4.00
CF	2.65	5.81	6.65	24.40	14.50
NFE	70.93	30.0	68.13	53.85	5
Ash	2.01	6.30	4.02	5.54	6.00

Table 2: Components of experimental feedstuff

Feedstuff	Ration %			
	1	2	3	4
Date peels	0	15	30	45
Barley	45	30	15	0
Soybean meal	8	10	11.5	13
Wheat bran	30	30	30	30
Yalow corn	15	13	11.5	10
Salt (NaCl)	1	1	1	1
Limestone	1	1	1	1
Total	100	100	100	100
Crud protein	14.05	14.10	14.07	14.04

Table 3: Chemical composition of experimental ration

Components	Ration			
	1	2	3	4
DM	89.70	90.70	89.73	90. 03
CP	14.05	14.11	13.98	13.86
EE	2.70	2.58	2.48	2.375
CF	8.20	10.93	13.64	16.35
NFE	58.34	58.36	54.61	52.14
Ash	4.41	4.72	5.02	5.31

RESULTS AND DISCUSSION

1-Digestibility Coefficient of Dry Matter and Organic Matter

The results showed that there were significant differences ($p \leq 0.05$) in the digestibility coefficient of the dry matter and the organic matter under study, as treatment T3 outperformed all treatments, and treatment T4 outperformed treatments T1 and T2. These results were consistent with the results of Table No. 4 in terms of the superiority of the third treatment for most characteristics. The studied treatments included the rest of the treatments, which may have resulted in the provision of suitable conditions for the growth and activity of rumen bacteria, thus improving the digestion of dry matter and organic matter. This is consistent with what was indicated by Al-Banna (2010) in an experiment they conducted on lambs when they were fed crushed palm fronds at an amount of 600 g/day as coarse fodder and substitution three percentages of yellow corn and barley for the concentrated diet with roughage Date peels. The first treatment was 0% The second, third and fourth treatments. at 50, 75, and 100%, respectively. It also agrees with (Hasan, 2015).

Table 4: The effect of using increasing percentages of Date peels on the digestibility of dry matter and organic matter

	Treatment				Significant
	1	2	3	4	
Date peels%	0	15	30	45	
DDM	70.04±3.09 c	71.23±1.2 2 bc	72.80±2.97 a	71.93±2.33 b	*
DOM	73.67±2.12 c	74.32±3.20 bc	75.54±3.14 a	75.03±3.24 b	*

Different letters within the line mean the presence of significant differences, NS = no significant Differences in the column * there is a significant, difference at the level (0.05) T1= control T2= 15% date. peels T3= 30% date peels T4= 45% date. peels

2-Total Gas and Methane Production

The results of the study showed a significant increase ($p \leq 0.05$) in the level of gas produced after 6, 12, and 24 hours of incubation. The third treatment, which was 30% a third of dates, outperformed all treatments. The same treatment also outperformed the amount of methane gas produced. The reason for this may be attributed to the fact that this level of date slurry led to the provision of suitable conditions that encouraged the bacteria to produce total gas as well as methane gas, which is considered a source of energy loss in ruminant diets, while the lowest level of methane gas production was in the fourth treatment, when the date slurry level was 45% of the ration used. in the current study. As shown in figure 1 Production of total gas and methane.

Table 5: The effect of using increasing percentages of date peat on the production of total gas and methane gas

	Treatment				Significant
	1	2	3	4	
Date peels%	0	15	30	45	
Total gas 6h	8.00±1.15 c	12.00±1.54 b	15.33±0.66 a	11.02±0.56 bc	*
Total gas 12h	16.00±2.30 d	20.66±0.66 ab	22.00±0.57 a	16.03±1.10 cd	*
Total gas 24h	33.00±1.52 cd	36.00±1.45 b	40.00±0.57 a	31.00±0.54 d	*
CH4	9.00±1.52 cd	12.00±0.57 ab	12.33±1.20 a	8.32±0.30 d	*

Differences in the column * there is a significant. Difference. at the level (0.05) T1= control T2= 15% date peels T3= 30% date peels T4= 45% date peels

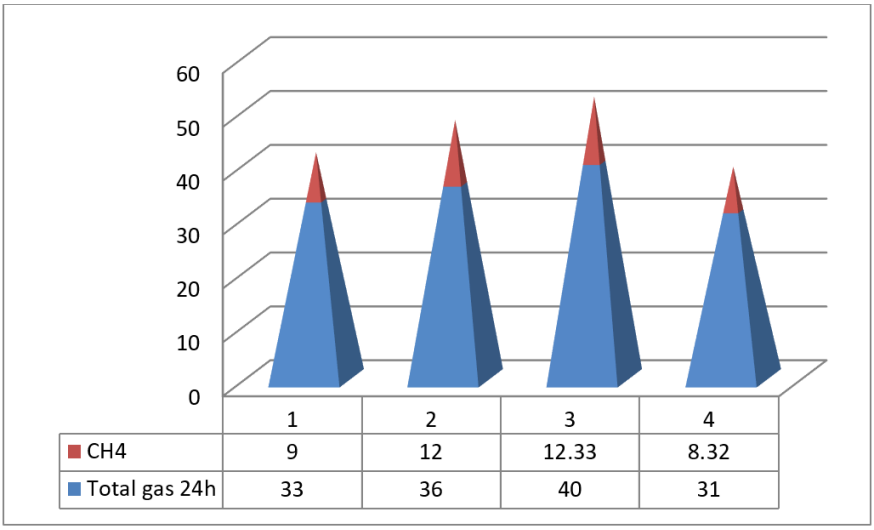

Figure 1: Production of total gas and methane gas

3-Rumen Fermentations

The study results showed that there were significant differences ($p \leq 0.05$) for the ammonia nitrogen characteristic as well as the total volatile fatty acids, as the T3 treatment, which was 30% one-third of dates, was superior to the two treatments T1 and T2, but it did not differ from the fourth treatment, T4, for both characteristics. The total number of bacteria was exceeded by the T4 treatment, which was 45% by one-third of dates, over all treatments. The reason for this may be attributed to the provision of ideal conditions for the microorganisms' needs of energy and nutrients necessary for the ideal growth of bacteria, as demonstrated by the results in the two characteristics of ammonia nitrogen and the total volatile fatty acids necessary for the activity of the microorganisms. While the level of wetness did not significantly affect the pH of the rumen fluid at all levels, the results of this study are consistent with what was obtained by Abo Omar (2017) when fattening local goat kids on stakes that contained increasing percentages of Date peels of 0, 15, 30 and 45%. There were differences between treatments 1, 2 and 3 for the characteristics of the digestibility coefficient of dry matter, organic matter, crude protein and crude fiber, but they were superior to the fourth treatment 45% Date peels.

Table 6: The effect of using ascending percentages of Date peels on some rumen fluid fermentations

	Treatment				**Significant**
	1	**2**	**3**	**4**	
Date peels%	0	15	30	45	
PH	6.32±0.16	6.60±0.05	6.22±0.18	6.30±0.06	N.S.
NH3-N	15.85±0.07 c	15.90±0.15cd	18.83±0.12 a	18.03±0.09 ab	*
TVFAs	4.10±2.08 c	4.23±1.20 b	4.71±1.12 a	4.53±2.23 ab	*
SCFA	0.72±0.02 bc	0.72±0.02 bc	0.92±0.01 a	0.83±0.02 b	*
Total bacteria CFU X^7	6.33±1.20 c	6.66±0.88 cd	13.02±0.57 bc	18.02±0.56 a	*

Differences within the same column * there is a significant, difference at the. level (0.05) T1= control T2= 15% date peels T3= 30% date peels T4= 45% date peels.

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