قسم : الفسيولوجيا .
كلية : الطب - جامعة أسيوط.
رئيس القسم : أ.د. / مصطفى جابر.

تأثير الغذاء على بروتوزوا الكرش في الماعز

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استعمل ثلاث من الماعز البلدية ومركب لها ناصور الكرش الصناعي لدراسة تأثير نوع وزمن التغذية على تركيز بروتوزوا الكرش .

تم تغذية الماعز لمدة ٣٠ يوم كفترة تأقلم قبل أخذ العينات على البرسيم كعليقة خضراء . والذرة العويجه والردة والتبن كعليقة مركزة . كانت الحيوانات تغذى مرة واحدة في اليوم . وأخذت العينات مرتين يوميا كل ستة ساعات وكل اثنين وعشرون ساعه بعد التغذية .

وصل اجمالي عدد البروتوزوا بعد ٦ ساعات من التغذية ١٦٠٤٤٥٩/ سم^3 على العليقة المركزة ، ٤٧٤١٤٨ /سم^3 على العليقه الخضراء . وبعد ٢٢ ساعه من التغذية كان العدد ١٠٨٠٦٦٧/سم^3 على العليقه المركزه و ٥٩٠١٠٣ /سم^3 على العليقه الخضراء .

نمت على العليقه الخضراء ٨ أجناس هي : ايزو تريكا بروستوما ، ايزوتريكا انتستينالز ، دبزيتريكا ريوميناتم ، انتود نيم سمبلكس، أنتود ينيم كود يتم ، دبلود ينيم ، دبلود ينيم كود اتم والأفريوسكلس ، بينما نمت ٥ أجناس على العليقة المركزة وهي : الايزوتريكا بروستوما ، والايزوتريكا انتستينالز ، دبلود ينيم ، دبلود ينيم كود اتم والأنتود ينيم سمبلكس.

لوحظ أن هناك زيادة معنويه في عدد كل من الدبلود ينيم ، الدبلود ينيم كود اتم ، والانتود ينيم سمبلكس على العليقة المركزة . بينما كانت الزيادة على العليقة الخضراء تتمثل في زيادة عدد الايزو تريكا بروستوما والايزوتريكا انتستينالز .

وتمثل تأثير الزمن بعد ٦ ساعات في زيادة جنس الايزوتريكا والانتود ينيم كود يتم على العليقه الخضراء ، والانتود ينيم سمبلكس على العليقه المركزة . بينما بعد ٢٢ ساعه من التغذية زاد الدبلود ينيم على كل من التغذيه زاد الدبلود ينيم على كل من العليقه الخضراء والمركزة .

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DIETERY EFFECT UPON THE CONCENTRATION OF RUMEN PROTOZOA IN GOAT

(With 6 Tables and 3 Figures)

By
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(Received at 7/7/1985)

SUMMARY

Three rumen fistulated Baladi Goats were used in two experiments to investigate the effect of diet and time of feeding upon the concentration of rumen ciliate protozoa. These animals were fed Barseem as green fodder and Sorghum, Bran and Wheat straw as concentrates, each for 30 days as a period of adaptation before spampling.

Animals were fed once per day. Samples were collected twice daily at 6 and 22 hours after feeding.

The total protozoal number at 6 hours post feeding was 1604.459 x 10 /ml on concentrates and 474.148 x 10 /ml on green fodder. At 22 hours post feeding, it was 1080.667 x 10 /ml on oncentrates and 590/03 on green fodder.

On green fodder, eight species were recorded (Isotricha prostoma, Isotricha intestinalis, Dasytricha ruminatum, Entodinium simplex, Entodinium caudatum, Diplodinium, Diplodinium caudatum and Ophryoscolex). While on concentrate ration, five species were present (Isotricha prostoma, Isotricha intestinalis, Diplodinium, Diplodinium caudatumand Entodinium simplex).

On dry concentrate ration, there was significant increase in Diplodinium, Diplodinium caudatum and Entodinium simplex number per cubic millileter rumen content. On green fodder, Isotricha prostom and Isotricha intestinalis number was incresed per millileter.

At 6 hours after feeding, Isotricha species and Entodinium caudatum increased on green fodder and Entodinium simplex on concentrates. At 22 hours post feeding, Diplodinium species were increased in green and dry ration.

INTRODUCTION

Literature on goat digestion are very scanty, speciallly in the significance of different types of rumen protozoa in relation to the composition of diet, health and productivity of animals.

The aim of this work is to study the picture of rumen microfauna in goats fed on Barssem which is the main ration during winter season and grain and roughage which constitute the main ration during summer season in Egypt.

MATERIALS and METHODS

Four adult fistulated female Egyption Balady goats from Assiut Governate were used.

These animals were fed Egyptian clover (Barseem) as a green fodder for 30 days as a period of adaption before sampling.

In another experiment, animals were fed Wheat straw, Bran and grain Sorghum as dry ration up to one month.

Animals were fed once per day. Samples from rumen contents were collected twice daily at 6 and 22 hours after feeding.

Fixed films were stained with Heidenhain's long iron haematoxylin method of DAVIS and BELDING (1942).

For counting protozoa, modified Mac Master slide was used according to the method of (HARMEYER, 1963).

RESULTS and DISCUSSION

Response of the protozoal species number to diet changes are charactristic with the species.

On green (Barseem) fodder, eight species were present (Isotricha prostoma, Isotricha intestinalis, Dasytricha ruminatum, Entodinium simplex, Entodinium caudatum, Diplodinium, Diplodinium caudatum and Ophryoscolex). On dry concentrate ration, five species were only present (Isotricha prostoma, Isotricha intestinalis, Diplodinium, Diplodinium caudatum and Entodinium; Tables 1, 2, 3; Fig. 1).

Most of these species were described by HARMEYER (1963), AZOUZ (1977) and ATTIA, EL HAMAMSY and ASHMAWY (1980) in goats.

On dry concentrate ration, three species disappeared (Dasytricha ruminatum, Entodinium caudatum and Ophryoscolex) as lignification of carbohydrate fraction of roughage reduced the rate of digestion and protozoal survival which causes absence of certain morphological types of protozoa other than entodinium (KANE and LAWLOR, 1968).

Dasytricha disappered on dry conentrate ration, as it dependes for its energy on sugars in forages and hey (HUNGATE,1966; NAKAMURA and KANEGASAKI,1969; KURRIHARA; TAHECHI and CHIBATA, 1977). Also its mouth is too small to be able to swallow any starch grains from concentrates (SUGDEN and OXFORD, 1952).

Ophryoscolex disappeared on dry concentrate ration, as it ingests chlorophil from green plants like clover which stimulutes its development (TRIER, 1926 and MAH, 1964).

Entodinium caudatum was present only on green fodder because it depends for its nutrition and nitrogenous requirement on Gram positive diplococci (GUTIERREZ and DAVIES, 1959), which increased on green fodder (NASSAR, ALI, MAHMOUD and HASSAN, 1985).

DIET AND RUMEN PROTOZOAL CONCENTRATION

On dry ration, there was significant increase in Diplodinium, Diplodinium caudatum and Entodinium simplex number per milliliter rumen content, while Isotricha species significantly decreased (Tables, 2, 3; Fig. 1).

Doplodinium species increased on dry concentrate ration because Wheat straw contains over 50% of its solid content crude fibers. Diplodinium species ingest and digest cellulose in addition to strach as it contain cellulose enzymes (HUNGATE, 1942 and ZWVINE, 1961).

On concentrates, pH decresed and acid tolerating bacteria as streptococcus bovis increased (HUNGATE, DOUGHERTY, BRYANT and CELLO, 1952; MANN, MASSON and OXFORD, 1954 and MANN, 1970). Entodinium and Diplodinium species multiplied enough to keep streptococcus in check (HUNGATE, 1959). The presence of wheat straw; as roughage with concentrate ration; containing 12.9% lignin causes rumen defaunation for most protozoal species except Entodinium. As stored starch within Entodiniun provided it with food for longer period than was the case for other species (HUNGATE, 1966).

Isotricha species decreased on concentrates due to decrease of soluble carbohydrates.

On green fodder, Isotricha species significantly increased (Tale 1, 3; Fig. 1). As barseem is rich in soluble carbohydrates and Isotricha species convert it to smooth out the fermentation process (HELD, OXFORD and SUGDEN, 1953; GATIERREZ, 1955 and LEVINE, 1961).

The qulitative effect of diet on the differnt protozoal species was measured by the percent of different species to the total protozoal number. From Table 3, it is clear that green fodder increases significantly Isoticha species, while dry concentrate ration increases significantly Entodinium simplex. While Doplodinium species share with the same percents on dry and green fodder.

Isotricha species increased significantly on green fodder as it fulfills its requirement for energy from soluble carbohyates in barseem and protein from cellulolytic micro-organisms which significantly increased on barseem specially rod forms (HUNGATE, 1950, NASSAR et al., 1985).

While on concentrates, Entodinium simplex was significantly increased, as it fulfills its energy requirement from starch in concentrate diet and protein from streptococcus which increased on concentrates (HUNGATE et al., 1952 and MANN, 1970).

The total protozoal number at 22 hours after feeding on concentrates was twice as those on green fodder. While at 6 hours after feeding, it was four time as those on green fodder (Tables 1, 2, 3).

The rapid decrease in total protozoal number 6 hours after taking green fodder was due to high dilution rate of barseem. As it's moisture content forms 85.15%. At higher rate of dilution,the protozoal number,retention and recycling within rumen was decreased (HARSISONet al. 1979). Also due to adhesion of protozoa to fiber particles and as nutrient deminished protozoa would detach themselves again (WELLER and PILGRIM, 1974 and BUCHOP and CLARK, 1976).

The increased total protozoal number on dry concentrate ration 6 hours after feeding (Table 3) was due to lower dilution with concentrates (TOOPS, KAY, GOODALL, WHITELAW and REID,1968). Also concentrate diet causes flourishing of acid producing bacteria, the protozoa fed on these bacteria in order to check progressive decrease in pH of rumen (SLYTER, 1976 and ABE and IRIKI, 1978).

Diplodinium and Diplodinium caudatum number per ml rumen content and Diplodinium candutum percent significantly increased 22 hours after feeding green fodder. While on dry concentrate ration, both Diplodinium and Diplodinium caudatum number and percent significantly increased. The increased number of Diplodinium species at 22 hours post feeding green fodder was due to increased number of mono- and diplococci which represent the protein source for their species (GUTIERREZ and DAVIS, 1959 and NASSAR et al. 1985). As source for carbohydrate, they utilized cellulose mainly (HUNGATE, 1942 & 1943), which represent the main rumen content at 22 hours both on green and dry ration.

The number and percent of isotricha prostoma and intestinalis increased 6 hours after feeding green fodder, due to presence of soluble carbohydrates in barseem, which represent the main source of energy for Isotricha (LEVINE, 1961).

The number and percent of Entodinium simplex on dry contentrate ration significantly increased at 6 hours after feeding, as concentrates contain large amount of starch. On green fodder, their number and percent significantly increased at 22 hours, as Entodinium simplex is mainly starch ingester (KOFOID, MaC LENNAN, 1930, LEVINE, 1961). At 22 hours on green fodder, most of the Isotricha cells bursts and grains of stored starch within it are released (SUGDEN and OXFORD, 1952) and Utilized by Entodinium simplex. It's protein requirement is obtained from diplococci, which increased at 22 hours on green fodder (NASSAR, et al. 1982).

Entodinium caudatum was increased at 6 hours on green fodder, as it depeneds on soluble carbohydrates present in barseem.

Desytricha increased at 22 hours on green fodder due to incresed number of small Gram positive rods and small cocci which represent it's main source for protein (NASSAR et al., 1985).

Ophryoscolex significantly incrased both in number and percent at 22 hours on green fodder, due to their predation charachter; as it can engulf Entodinium simplex which increased at 22 hours (Table 3). Also due to freeing of chlorophil from barseem, which was ingested by ophyoscolex and stimulates its division (TRIER, 1926 and MAH, 1964).

From above, it is clear that type of food influences not onyl the quantity but also the quality of protozoa in the rumen content of goat. This act as a mediator for volatile fatty acids, amino acids and sugars to the metabolic pool of the ruminant, which effects on health and productivity of the animal.

So study of protozoal picture on different food stuffs will help us to obtain more efficient ration and better control for metabolic disorders in ruminant.

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Table (1)

Total and individual protozoal count (X 10^3 ml of rumen fluid) in rumen of goat fed on green (Barseem) diet.

Type of protozoa	Morning										
	Animal No. 1			Animal No. 2			Animal No. 3			Mean	S.E.
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Diplodinium	11.999	14.933	21.334	10.667	6.000	11.33	28.000	25.999	35.334	18.400	± 3.252
D.caudatum	74.668	69.998	66.668	38.668	23.332	25.333	46.000	49.331	42.667	48.518	± 6.219
I.prostoma	11.333	14.666	13.333	22.000	24.667	22.666	21.334	17.334	18.000	18.370	± 1.536
I.intestinalis	10.667	2.667	0	6.667	4.000	6.667	9.335	7.999	14.000	5.778	± 1.486
Entodinium	444.667	434.667	428.000	459.335	452.667	461.33	490.000	500.000	647.334	479.77	±22.370
E.caudatum	7.333	6.00	6.667	8.667	7.999	11.333	17.334	11.999	13.334	10.074	± 1.239
Dasytricha ruminatum	8.667	6.667	8.667	6.000	4.666	5.332	11.333	9.335	10.667	7.926	± 0.789
Ophryoscolex	0	1.332	0.667	1.332	0	1.332	2.000	1.332	3.333	1.259	± 0.341
Total	559.334	550.930	545.336	553.336	523.331	545.329	625.336	623.329	784.669	590.103	± 27.000
				Afternoon							
Diplodinium	4.667	6.667	6.000	8.000	9.333	6.000	16.666	19.333	14.000	10.074	± 1.761 **
D.caudatum	36.000	32.667	31.333	17.333	28.667	16.667	14.667	10.667	13.333	22.370	± 3.222 **
I.prostoma	98.667	114.667	103.333	0.667	33.333	95.333	137.333	151.333	117.333	99.111	±13.145 **
I.intestinalis	4.000	9.333	6.667	10.000	10.667	12.000	19.333	27.333	14.667	12.667	± 2.349 *
Entodinium	282.000	256.667	316.667	216.333	264.667	300.000	370.667	300.000	434.000	309.556	±19.490 **
E.caudatum	11.333	12.000	20.667	9.333	10.667	10.000	24.000	19.333	20.667	15.333	± 1.905 *
Dasytricha ruminatum	2.667	5.333	3.333	4.000	5.333	2.667	8.667	7.333	4.667	4.889	± 0.684 *
Ophryoscolex	0.666	0	0	0	0	0	0	0	0.666	0.148	± 0.977 **
Total	440.000	437.334	488.000	350.666	362.667	442.667	591.332	532.332	619.333	474.148	±31.165 *

* (P/_ 0.05) , ** (P / 0.01)

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Table (2)

Total and individual protozoal count (X 10^3 ml of rumen fluid in rumen of goat fed on concentrates (Wheatbran and grain sorghums) diet.

Type of protozoa	Morning									Mean	S.E.
	Animal No. 1			Animal No. 2			Animal No. 3				
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	∓	
Diplodinium	38.668	35.334	37.332	20.000	28.000	24.667	28.667	24.000	31.334	29.778	± 2.139
D.cadatum	64.667	141.998	74.000	138.667	118.000	73.332	85.334	67.334	83.999	94.148	±10.171
I.prostoma	10.667	9.335	11.999	7.333	9.335	8.000	6.000	7.333	6.667	8.519	± 0.655
I.intestinalis	0	2.000	1.333	3.333	1.333	2.000	4.000	2.667	4.000	2.296	± 0.420
Entodinium	724.000	796.666	785.333	11104.667	1116.000	1085.332	972.666	971.334	957.334	945.926	±48.928
Total	838.002	985.333	909.997	1274.000	1272.668	1193.331	1096.667	1072.668	1083.334	±1080.667	±50.602
				Afternoon							
Diplodinium	15.332	16.668	19.332	29.333	40.000	28.667	10.663	14.000	5.332	19.925	± 3.601 *
D.cadatum	100.657	135.335	105.332	54.000	61.333	46.667	62.667	67.334	64.667	77.556	± 9.795
I.prostoma	13.334	14.000	13.334	6.000	9.335	7.999	10.667	7.669	10.667	10.371	± 0.930
I.intestinalis	2.000	1.332	0.667	0	2.000	0.667	2.667	2.667	4.000	1.778	±0.445
Entodinium	1742.000	1961.330	1770.667	1203.332	1559.332	1084.133	1460.668	1370.000	1262.000	1494.829	±97.917 **
Total	1873.33	2128.665	1909.332	1292.665	1712.000	1168.133	1547.332	1462.000	1346.666	1604.459	±107.316 **

* : (P /__ 0.05) ** : (P /__ 0.01) Morning : 22 h. after feeding Afternoon : 6 h. after feeding.

Table (3)

Mean ciliate protozoal counts (X 10^3 ml of ruman fluid) and morphological grouping count in rumen of goat fed on green (Barseem) and concentrates (wheat bran and grain sorghum) diet.

Diet	Time of sampling / mean	Diplodinium	Diplodinium caudatum	Isotricha prostoma	Isotricha inestinalis	Entodinium	Entodinium caudatum	Dasytricha	Ophyascalex	Total protozoal number
Green	Early in morning	18.400 ±3.252	48.518 ±6.210	18.370 ±1.536	5.778 ±1.486	479.778 ±22.370	10.074 ±1.239	7.926 ±0.789	1.259 ±0.341	590.103 ±27.000
	Afternoon	10.074 ±1.761	22.370 ±3.222	99.111 ±13.145	12.667 ±2.349	309.556 ±19.490	15.333 ±1.905	4.889 ±0.684	0.148 ±0.997	474.148 ±31.165
	Mean	14.237 ±2.060	35.444 ±4.650	58.741 ±11.729	9.223 ±1.587	394.667 ±25.180	12.704 ±1.275	6.407 ±0.627	0.0703 ±0.219	532.126 ±24.466
Concentrates	Early in morning	29.778 ±2.139	94.148 ±10.171	8.519 ±0.655	2.296 ±0.420	945.926 ±48.928	- -	- -	- -	1080.667 ±50.602
	Afternoon	19.925 ±3.601	77.556 ±9.795	10.371 ±0.930	1.778 ±0.445	1494.829 ±97.917	- -	- -	- -	1604.459 ±107
	Mean	24.852 ±2.358	85.852 ± 7.144	9.445 ±0.596	2.037 ±0.303	1220.377 ±85.968	- -	- -	- -	1342.563 ±85.768

(P / 0.05)
(P/ 0.01)

Early morning : 22 h. after feeding
Afternoon : 6 h. after feeding.

Table (4)

Individual protozoal species concentration % in rumen content of goat fod green (Barseem) diet.

Type of protozoa	At morning									
	Animal No. 1			Animal No. 2			Animal No. 3			
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	Mran
Diplodinium	2.2	2.7	3.9	1.9	1.1	2.1	4.5	4.2	4.5	3.0
D.caudatum	13.4	12.7	12.2	7.0	4.5	4.6	7.3	7.9	5.4	8.3
I.prostoma	2.0	2.7	2.4	4.0	4.7	4.2	3.4	2.8	2.3	3.2
I.intestinalis	0.1	0.5	0	1.2	0.8	1.2	1.5	1.3	1.8	1.0
Entodinium	79.5	78.9	78.5	83.0	86.5	84.6	78.4	80.2	82.5	81.3
Ento-Caudatum	1.3	1.1	1.2	1.6	1.5	2.1	2.8	1.9	1.7	1.7
Dasytricha rumin	1.5	1.2	1.6	1.1	0.9	1.0	1.8	1.5	1.4	1.3
Ophryoscolex	0	0.2	0.1	0.2	0	0.2	0.3	0.2	0.4	0.2
				At afternoon						
Diplodinium	1.1	1.5	1.2	2.3	2.6	1.4	2.8	3.6	2.3	2.1
D.caudatum	8.2	7.5	6.4	4.9	7.9	3.8	2.5	2.0	2.2	5.0
I.prostoma	22.4	26.2	21.2	11.6	9.2	21.5	23.2	28.3	18.9	20.3
I.intestinalis	0.9	2.1	1.4	2.9	2.9	2.7	3.3	5.1	2.4	2.6
Entodinium	64.1	58.7	64.9	74.5	73.0	67.8	62.7	56.0	70.1	65.8
Ento-Caudatum	2.6	2.7	4.2	2.7	2.9	2.3	4.1	3.6	3.3	3.2
Dasytricha rumin	0.6	1.2	0.7	1.1	1.5	0.6	1.5	1.4	0.8	1.0
Ophryoscolex	0.2	0	0	0	0	0	0	0	0.1	0.03

Table (5)

Individual porotozoal species concentration % in rumen content of goat fed concentrates (Wheat bran and grain Sorghum) diet.

Type of protozoa	At morning									
	Animal No. 1			Animal No. 2			Animal No. 3			Meam
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	
Diplodinium	4.6	3.6	4.1	1.6	2.2	2.2	2.6	2.2	2.9	2.9
D.caudatum	7.7	14.4	8.1	10.9	9.3	6.1	7.8	6.3	7.8	8.7
I.prostoma	1.3	0.9	1.3	0.6	0.7	0.7	0.5	0.7	0.6	0.8
I.intestilalis	0	0.2	0.1	0.3	0.1	0.2	0.4	0.2	0.4	0.2
Entodinium	86.4	80.9	86.3	76.8	87.7	90.9	88.7	90.6	88.4	86.3
Ento-Caudatum										
Dasytricha rumin										
Ophryoscolex										
	At afternoon									
Diplodinium	0.8	0.8	1.0	2.3	2.3	2.5	0.7	1.0	0.4	1.3
D.caudatum	5.4	6.4	5.5	4.2	3.6	4.0	4.1	4.6	4.8	4.7
I.prostoma	0.7	0.7	0.7	0.5	0.5	0.7	0.7	0.5	0.8	0.6
I.intestilalis	0.1	0.1	0.3	0	0.1	0.1	0.2	0.2	0.3	0.1
Entodinium	93.0	92.1	92.7	93.1	93.4	92.8	94.4	93.7	93.7	93.2
Ento-Caudatum										
Dasytricha rumin										
Ophryoscolex										

DIET AND RUMEN PROTOZOAL CONCENTRATION

Table (6)

Mean individual protozoal species concentration % in rumen content of goat fod green (Barseem) and concentrate (Wheatbran and grain sorghum) ration.

Diet	Time of sampling / mean	Diplodinium	Diplodinium	Isotricha caudatum	Isotricha prestoma	Entodinium Intestinalis	Entodinium	Onsytricha caudatum	Ophryoscolex ruminatum
Green	Early morning	3 ±0.43	8.3* ±1.18	3.2 ±0.32	1.0 ±0.21	81.3** ±0.98	1.7 ±0.18	1.3 ±0.44	0.2** ±0.04
	Afternoon	2.1 ±0.28	5.0 ±0.84	20.3** ±2.09	2.6** ±0.4	65.8 ±2.07	3.2** ±0.23	1.0 ±0.13	0.03 ±0.02
	Mean	2.6 ±0.27	6.7 ±0.8	11.7** ±2.32	1.8** ±0.3	73.6 ±2.2	2.4 ±0.2	1.2 ±0.9	0.1 ±0.03
Concentrates	Early norning	2.9** ±0.33	8.7** ±0.86	0.8 ±0.1	0.2 ±0.05	86.3 ±1.54			
	Afternoon	1.3 ±0.27	4.7 ±0.3	0.6 ±0.04	0.1 ±0.03	93.2 ±0.23**			
	Mean	2.1 ±0.28	6.7 ±0.65	0.7 ±0.06	0.2 ±0.03	89.8 ±1.13**			

Morning : 22 h. after feeding. Afternoon : 6 h. ater fedding. * : (P /__ 0.05) ** , ** : (P /__ 0.01).

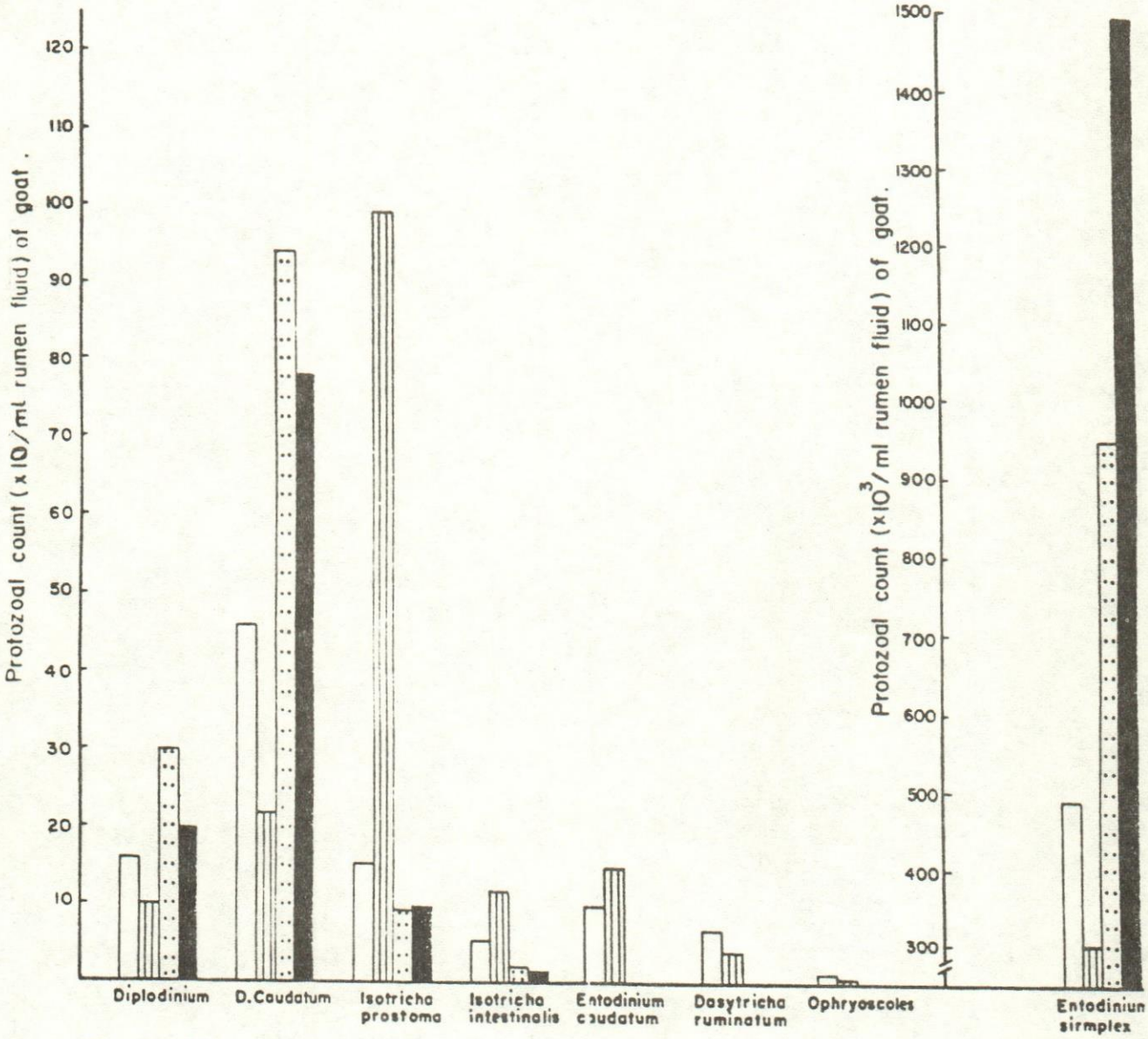

Fig. (I) Mean ciliate protozoal count (X 10 /ml rumen fluid) in goat fed on green and concentrate diet