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PERFORMANCE OF FATTENING BUFFALO CALVES FED DIFFERENT LEVELS OF FAT FOR TWO DIFFERENT PERIODS

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SUMMARY

Two completely random feeding trials were conducted on buffalo calves. In the first 24 animals of 275 kg initial weight and lasted for 126 days were used, while in the second 12 animals of 350 kg and lasted 77 days. The animals in each trial were divided into three similar groups and allocated on the following treatments: control ration (T1) consisted of concentrate mixture and rice straw, while T2 and T3 consisted of the control's concentrate substituted partially by 5% and 7.5% fat (palm oil), respectively, plus rice straw. Results indicated superior values of most nutrients digestibilities as well as feeding values (TDN, SV and DCP), with T2 compared to T1 and T3. Slight increases in daily gain and significant improvements in feed utilization and economical efficiency were found as increasing fat replacement in the rations in the two experiments. Dressing percentage was closely similar among treatments in both experiments. Boneless meat percentage slightly increased in the first experiment and slightly decreased in the second one in T2 and T3 than T1. Data of chemical composition of eye muscle (Longissimus dorsi), heart, liver and kidney as well as the data of visceral and non-visceral offals were determined.

Keywords: Buffaloe calves, growth, Fattening, dietary fat, replacement

INTRODUCTION

Under the prevailing conditions of most developing countries, there is great competition between human and livestock in grains consumption as the main source of energy in diets. However, numerous worldwide researches on fat usage have been done in animal feeding as a partial replacement of grains, but few researches were conducted under the local conditions (El-Bedawy, 1989a, Abdel-Hafiz et al., 1992 and Shahin, 1993). Positive response to rations supplemented by fat regarding milk and beef production has been reported by many workers (Palmquist and Jenkins, 1980, Haaland et al., 1981, Bendary, 1987, Murphy et al., 1987 and Zinn, 1989). Furthermore, to alleviate the acute negative effect of excess starch feeding during early lactation or finishing fattening feedlot, partial replacement of grain by fat is a must (Palmquist and Jenkins, 1980).

This study adimed to investigate the performance and carcass quality of buffalo calves fattened on rations contained different levels of palm oil for different periods.

MATERIALS AND METHODS

Two completely random feeding trials were conducted at Mehallet Mousa Research Station, Kafr El-Sheikh Governorate, belonging to the Animal Production Research Institute. In the 1st trial 24 animals of 275 kg initial live body weight (LBW) and in the 2nd one, 12 animals of 350 kg LBW were used. The animals within each trial were divided into three similar groups and allocated on the following dietary treatments, control ration (T1) consisted of concentrate mixture and rice straw, T2 and T3 used the control's concentrate mixture replaced by 5.0% and 7.5%(W/W) palm oil, respectively, in addition to rice straw. Palm oil (melted) was added to concentrate just before offering it to animals. Homogeneous state of the mixture of palm oil and concentrate was secured along the experiments. The calves were individually fed according to NRC, 1984 for beef and fattening. Feeding values of ingredients used in terms of starch value (SV), total digestible nutrients (TDN) and digestible crude protein (DCP) were

calculated according to Egyptian Ministry of Agriculture data(1968). Rice straw was offered daily at 8.0 a.m. and 12 noon and concentrates at 9.0 a.m. and 4.0 p.m. Fresh water was available 3 times daily and feeding allowances were adjusted every fortnight according to LBW changes.

Three digestibility trials were carried out on animals of the feeding trial (three for each ration) during the middle of the first experimental period to determine the digestion coefficients and feeding values of the used rations. and data were used later in the comparison. During the period of digestibility trial, the calves were managed in the same manner of feeding experiments. Faecal grab samples of about 200 gm were taken from the rectum twice daily for 7-day collection period. Acid Insoluble Ash (AIA) was used as a natural marker as described by (Van Keulen and Young, 1977). Representative samples of feeds and feces were taken for nutritive analysis according to A.O.A.C. (1980).

Fattening period lasted for 126 and 77 days in the 1st and 2nd experiments, respectively. Slaughter test was carried out on two animals from each group after a fasting period of 16 hours. Slaughtered animals were skinned after complete bleeding, then dressed out and weights of hot carcass, boneless meat, offals, organs and gut (full and empty) were recorded. Dressing percentage was calculated as % of hot carcass weights to the fasting LBW. Representative samples of eye muscle (Longissimus dorsi) at the 9th, 10th and 11th ribs, heart, kidney and liver were prepared and kept for chemical analysis according to A.O.A.C. (1980).

Economical efficiency was expressed as ratio betwen the price of output (live weight gain) and input (feed consumed). The price of rations ingredients were 420, 30 and 1200 LE/ton for concentrate mixture, rice straw and palm oil, respectively. 6 LE was considered the price of one kg of LBW.

Data were statistically analysed according to Steel and Torrie (1980). Duncan's multiple range test was applied to test significance among means.

RESULTS AND DISCUSSION

Chemical composition and digestibility.

Results of chemical composition of the experimental rations are presented in Table (1) and indicated that all animals in the two experiments were fed isonitrogenous rations, while crude fiber(CF) and ash contents in the 2nd & 3rd rations increased by decreasing amounts of concentrate mixture as the result of fat addation.

Table 1. Chemical composition of feed ingredients and the calculated composition of experimental rations

Item	DM	Composition of DM, %				
		CP	EE	CF	NFE	ASH
Concentrate Mixture*	89.30	14.94	3.30	10.97	61.35	9.44
Rice Straw	91.41	3.22	0.61	34.13	45.15	16.89
Experimental rations (Calculated)						
T_1	89.78	11.81	2.82	15.96	58.91	10.50
T_2	89.93	11.53	5.67	17.69	53.50	11.61
T_3	89.93	11.25	8.20	18.30	50.49	11.76

* Composed of undecorticated cottonseed Cake 42%, wheat bran 26%, yellow corn 20%, rice bran 6%, molasses 3%, limestone 2% and salt 1%.

Digestibility coefficients of dietary nutrients and the nutritive values of experimental rations are presented in Table (2). Digestibilities of organic matter (OM) and nitrogen free extract (NFE) were not

crude protein (CP) and ether extract (EE) were significantly increased in supplemented fat rations compared with the control. The higher apparent digestibility of EE (85.34-83.99 vs 75.06%) in T2 and T3 is mainly due to the smaller effect of endogenous lipid excretion on apparent fat digestibility because of the increased crude fat consumption and supplementation with highly digestible fat. Similar results were found by (Dijkstra,1969, Honing et al.,1981 and Palmquist, 1991).

Table 2. Dry matter content, digestion coefficients and nutritive values of the experimental rations

Item	Treatments T_1	T_2	T_3
Dry matter, %	89.7	889.93	89.93
Digestibilities, %			
OM	59.3	263.13	58.88
CP	52.23C	67.08A	61.21B
EE	75.06B	85.34A	83.99A
CF	55.64A	52.78A	40.44C
NFE	58.72	58.96	57.08
Feeding Values (DM), %			
TDN	53.49	59.22	58.18
SV	44.81	47.70	45.20
DCP	6.24C	7.74A	6.88B

ABC: Means with different superscripts in the same row are significantly different ($p<0.01$).

Digestibility of crude fiber (CF) did not significantly decrease by addition of 5% fat, while, the 7.5% - fat ration caused a significant depression ($P<0.01$). CF results are in agreement with those of Dijkstra (1969) who found a depression of CF digestibility at higher levels of fat supplementation, but at the low levels, CF digestibility hardely changed or even increased (Honing et al., 1981). In relation to this point, Honing et al. (1981) and Abdel-Hafiz (1992) reported that low roughage-high concentrate ration reduced the negative effect of fat on CF digestibility.

Regarding feeding values of experimental rations, no significant differences were observed among treatments with respect TDN and SV, otherwise DCP significantly increased by the two levels of fat substitution ($P<0.01$). Generally, results of digestion trials are in consistentence with most of the available published data (Haaland et al., 1981, Smith et al., 1981, Moore et al., 1986 and Bendary, 1987), which indicated reduction in utilization of diet when the inclusion fat exceeds 5%.

Growth and fattening performance.

Data presented in Table (3) showed no significant differences in daily gain among treatments in both experiments. These results are similar to those of El-Bedawy (1989) who reported that the inclusion of different levels of fat in rations of sheep and goats did not affect daily gain. Using steers, Haaland et al. (1981) revealed that gain corresponding to 5% supplemental fat was superior ($P<0.05$) to that of 10% fat-ration. On contrast to the present study, Zinn (1989) showed linear increases in daily gain ($P<0.01$) as increasing level of fat in the diet of steers (0, 4, and 8% fat).

Concerning feed consumption (Table 3), it appears that DM intake tended to decrease as fat in rations increased, while non significant effect on intake of SV, TDN and DCP was found over the two experiments. However, improvement in feed efficiency responded significantly ($P<0.05$) to fat addition was found. These results are in

agreement with those of Aliev (1980) and Zinn (1989). Inclusion of fat in ruminant rations encourages microbial protein production. (Tamminga et al., 1983, Murphy et al., 1987 and Zinn, 1988), and decreases energy loss as methan (Aliev, 1980).

Economical efficiency in both fattening periods, was higher ($P<0.05$) in tested rations than in control (Table 3). Considerable decrease in the cost of kg gain as a result to fat addition with no valuable differences between T2 and T3 over both trials could be also noticed.

Comparatively, daily gain, feed conversion and profitability were markedly better in the 1st trial (calves of 275 kg initial LBW.) than in the 2nd one (calves of 350 kg initial LBW.) (Table 3). Such results matched with the fact of higher growth rate and feed conversion in early than in late stage of growing-fattening period.

Carcass quality and slaughter data.

Carcass characteristics are presented in Table (4). In both trails differences in dressing percentage between treatments were not pronounced, (range from 49.7 to 52.2%). Concerning boneless meat percentage, slight increase was observed in substituted fat groups in the 1st trial, and a slight decrease in the 2nd one. These results are in harmony with those of Haaland et al., 1981, who found lower percentage of retail yield of steers fed diets containing protected tallow at 5 and 10% levels.

Chemical composition of eye muscle, heart, kidney and liver are presented in Table (5). As a general trend an increase in DM and EE and a decrease in CP contents in eye muscle, heart, kidney and liver could be noticed in groups T2 and T3. On the other hand, ash content was almost not affected by treatments with respect to eye muscle and the other organs mentioned. These results

Table 3. Performance of buffalo calves Fed rations supplemented by different levels of fat for different periods

Item	First trial			Second trail		
	T_1	T_2	T_3	T_1	T_2	T_3
No. of animal	8.0	8.0	8.0	4.0	4.0	4.0
Duration of expt. (day)	126.0	126.0	126.0	77.0	77.0	77.0
intial LBW,Kg	277.5	275.6	273.4	357.8	351.3	350.5
Final LBW, Kg	358.3	392.9	391.6	418.3	418.8	416.0
Total gain, Kg	107.8	117.3	118.2	61.5	67.5	65.5
Daily gain, gm	856.0	931.0	938.0	799.0	877.0	850.0
Feed intake, Kg/head/ day						
Concentrate mixture	7.6	6.80	6.40	9.90	9.00	8.40
Rice straw	3.1	3.20	3.30	4.10	4.00	4.00
Total (as fed)	10.7	10.00	9.70	14.00	13.00	12.40
Total (DM)	9.61	8.99	8.72	12.57	11.69	11.15
TDN	5.14	5.33	5.08	6.72	6.92	6.49
SV	4.30	4.29	3.94	5.63	5.58	5.04
DCP	0.60	0.70	0.60	0.78	0.905	0.768
Feed efficiency, Kg/kg gain						
DM	11.23^a	9.66^b	9.30^b	15.73^a	13.33^b	13.12^b
TDN	6.00^a	5.73^a	5.41^b	8.40^a	7.89^b	7.63^b
SV	5.03^a	4.61^b	4.20^c	7.03^a	6.36^b	5.93^c
DCP	0.700	0.748	0.640	0.981	1.032	0.902
Economical efficiency	1.56^a	1.74^b	1.78^b	1.12^a	1.24^b	1.23^b
Feed cost/kg gain (piaster)	383.70	345.60	337.00	536.00	484.60	486.50

* Concentrate mixture contains 00, 5.0 and 7.5% palm oil in the 1st, 2nd and 3rd treatment, respectively in both trails. ** Calculated using data in Table 2.

a,b,c: Means in the same row bearing different superscripts differ significantly ($p < 0.05$)

are in agreement with those recorded by McCartor et al. (1979), Haaland et al. (1981), and Zinn (1989) who found significant increase in fat of empty body, kidney, pelvic, heart and eye muscle.

In conclusion the concentrate portion of the ration could be replaced partially with 5% palm oil, without adverse effect on the productive performance of fattening calves.

Table 4. Carcass characteristics of buffalo calves fed rations contained different levels of fat

Item	First trial			Second trail		
	T_1	T_2	T_3	T_1	T_2	T_3
Slaughter wt.,kg	380.0	396.0	410.0	448.5	447.5	430.0
Empty wt.,kg	340.0	341.0	364.8	403.5	387.8	357.5
Hot carcass wt., kg	187.5	187.8	198.5	224.0	223.5	211.5
Dressing, %	51.6	49.7	50.7	52.2	51.8	51.3
Boneless meat, %	74.5	78.6	77.6	79.8	78.4	75.2

Table 5. Chemical composion of longissimus dorsi muscle, heart, kidneys and liver of buffalo calves fed different levels of fat

Treatment	First Trail				Second Trail			
	DM%	On Dry Matter Basis (%)			DM	On Dry Matter Basis (%)		
		CP	EE	Ash		CP	EE	Ash
Longissimus Dorsi Muscle								
T_1	20.58	79.46	6.95	5.00	23.46	82.67	5.02	4.96
T_2	25.57	74.21	10.35	5.63	24.12	81.15	4.80	4.96
T_3	26.74	70.05	18.26	4.02	23.93	82.21	5.36	5.28
Heart								
T_1	20.18	66.42	12.26	4.89	19.19	72.99	7.73	5.86
T_2	20.49	57.13	25.09	4.09	21.01	69.38	12.41	5.46
T_3	24.72	53.11	28.11	4.02	21.25	69.50	15.14	5.20
Kidneys								
T_1	19.07	46.68	38.89	4.09	22.25	59.31	28.20	3.95
T_2	26.71	48.32	40.95	3.99	23.51	52.95	33.96	4.46
T_3	28.25	46.85	43.63	3.65	24.24	55.48	34.13	4.55
Liver								
T_1	25.89	57.67	8.51	4.98	30.59	65.75	8.64	5.56
T_2	30.50	55.52	10.90	4.93	29.88	62.77	9.12	5.70
T_3	30.53	57.73	11.43	4.88	29.64	66.56	9.63	4.98

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أداء عجول التسمين الجاموسى المغذاه على علائق مضاف اليها مستويا مختلفة من الدهون خلال فترتين مختلفتين

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اجريت هذه الدراسة لمعرفة تأثير العلائق المضاف اليها نسب مختلفة من احد الزيوت النباتية (زيت النخيل) على اداء العجول وصفات الذبيحة. اجريت تجربتين ، الاولى استعمل فيها ٢٤ عجل ذات وزن ابتدائى ٢٧٥ كجم واستمرت حتى ١٢٦ يوم. والتجربة الثانية استعمل فيها ١٢ عجل يزن فى المتوسط ٣٥٠ كجم للراس ، ٧٧ يوم فترة تجريبية والمعاملات الغذائية كانت موحدة فى التجربيتين كما يلى: عليقة الكنترول مكونة من علف مصنع + قش ارز اما العليقة المختبرة الاولى والثانية كانت مكونة من العلف المركز السابق بعد اضافة زيت النخيل ليصل نسبة الدهن الى ٥ ، ٧,٥ ٪ على التوالى مع استعمال قش الارز ايضا.

وكانت اهم النتائج المتحصل عليها كما يلى :

١- بالنسبة لمعظم معاملات الهضم والقيم الغذائية (مركبات مهضومة كلية - معادل النشا- البروتين المهضوم) كانت العلقية المحتوية ٥٪ دهن هى المتفوقة كذلك معامل هضم الالياف لم يتأثر فى تلك العلقية ولكنه انخفض معنويا مع اضافة ٧,٥٪دهن.

٢- تلاحظ زيادة غير معنوية فى الوزن المكتسب اليومى ولكن الكفاءة الغذائية والاقتصادية تحسنت معنويا بإضافة الدهن ٥، ٧,٥٪ خلال التجربتين.

٣- نسبة التصافى متشابهة بين المعاملات خلال التجربتين ولا يوجد فروق جوهرية.

٤- نسبة التشافى زادت خلال التجربة الاولى وانخفضت خلال الثانية بإضافة الدهن الى العلائق ولكن تلك الزيادة والانخفاض لم تكن معنوية.

٥ - من خلال التحليل الكيماوى للعضلة العينية وجد ان هناك زيادة ملموسة فى نسبة الدهن وانخفاض محسوس فى نسبة البروتين نتيجة لإضافة الدهن خاصة فى التجربة الاولى.