Effect of *Eucalyptus* leaves supplementation on beef calf performance

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Abstract.

Forty four calves with an average initial body weight 149 kg in complete random design were used in fattening trial. The aim was to study the effect of *Eucalyptus* leaves supplementation to diet on calves performance. The animals were divided into 2 similar groups of 22 animals each. The experimental period was divided into two stages, the first extended for 143 days and the second extended for 79 days. Animals of each group were fed total mixed ration containing concentrate feed mixture contained 14% CP during the first period and 10.57 % CP during the second period. The *Eucalyptus* leaves(22 g / h / d) were added to ration of group G2. Feed intake DM, TDN and DCP per kg $^{0.75}$ were higher ($P<0.05$) for G1 than that of G2 during all experimental periods. The animals of G2 presented higher nutrients digestibility ($P\leq0.05$) than G1. Also G2 had higher serum total protein and albumin concentrations than G1. Animals of G2 showed higher ($P<0.05$) mean daily gain than those of G1 during the second stage as well as the overall period. Feed conversion g or kg /kg gain of DM, TDN and DCP, were better ($P<0.05$) than G1 during the second stage and the over all period.

Using *Eucalyptus glopulus* leaves as feed additives by the recommended dose enhance digestion and improve ADG and feed conversion.*Key words: medicinal plants, calves, feed conversion*.

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INTRODUCTION

Using medicinal herbs and plants (MH&P) with humans has been known since the old civilizations. Old drugs industry depended upon the raw material of MH&P and their extracts, which proved safe always. Inversely many synthesized chemicals caused many hazards to animals, plants and human. The world Health organization (WHO) encourages using MH&P to minimize or substitute the use of chemicals through the global trend to go back to nature. ***(Allam et al 1999).***

Herbal medicine is a growing area of alternative medicine nowadays. Many of the active ingredients in manufactured drugs are derived originally from plant compounds and have a wide range of use. It is believed that plant compounds are more natural, less toxic, and safer than chemical preparations. The use of natural products is becoming more popular, since drugs of synthetic origin may have either side effect and or a negative impact on the environment and parasite resistance to poisonous chemicals that can develop after repeated applications ***Magi and Sahk (2003).***

MATERIALS AND METHODS

The present study was carried out in Amber feed lot station located in El-Noubaria El-Behera Governorate, and lab of animal nutrition, Animal production Department, Faculty of Agriculture, Ain Shams University.

Experimental animals:

Forty four male crossbred calves with initial body weigh of 149 kg were used in this study for 222 days. The animals were divided into 2 similar groups of 22 animals each,

according to their weight, each group was assigned randomly to one of the two dietary treatments, control (G1) or treatment (G2).

Experimental diet:

The experimental period was divided into two stages, the first stage extended from the start (average body weight 149 kg) till animals reached 290 kg, 143 day), the second stage (finishing period) extended for 79 days. Animals of each group were fed total mixed ration containing 60% concentrate feed mixture (CFM1 during the first period and CFM2 during the second period) plus 32% corn silage and 8% bean straw. CFM1 composed of 52.5 % yellow corn, 11.5 % Soybean meal, 15 % rice bran, 12 % wheat bran, 5 % poultry litter, 4 % mineral salts and lime stone, while, CFM2 composed of 65 % yellow corn, 4 % Soybean meal, 16 % rice bran, 9 % wheat bran, 2 % poultry litter, 4 % mineral salts and lime stone. The animals of group G2 received a dose (22 g /h/d) of *Eucalyptus globulus*. Leaves (EG). Table (1) illustrate the chemical composition of the ingredients used in the experimental diets.

Table 1: The chemical composition % of ration ingredients.

	DM	On DM basis					TDN% *	DCP% *
item		Ash	OM	CF	CP	EE	NFE		
Corn silage	25	13.61	86.39	8.4	29.14	1.14	47.71	21.5	2.6
bean straw	93.61	11.31	88.69	34.96	5.48	0.65	47.60	44.7	2.1
CFM1	91.55	8.5	91.5	11.2	14.0	2.51	63.79	72.94	10.02
CFM2	91.59	14.12	85.88	9.53	10.57	2.81	68.27	73.60	7.86

* According to ***Abou Raya (1967)***

Digestibility trials

Two digestibility trials were performed before the end of the experimental stages. Six animals in each treatment were used in each trial . A grab sample method was applied at which acid insoluble ash (AIA) was used as an internal marker according to **(*Van Keulen and Young 1977*)** for determining the nutrients digestibility.

Blood samples

The blood samples were taken after two hours after morning feeding from 6 animal of each groups. The blood serum was obtained and transferred into a clean dried glass vials and then stored in deep freezer at -20º C for subsequent specific chemical analysis.

Analytical methods

The proximate analysis of different feedstuffs were analyzed according to the ***A.O.A.C. (1995)***

Statistical Analysis*:*

The data were analyzed according to statistical analysis system ***(SAS) User s Guide, (1995).*** Separation among means was carried out by using **Duncan** multiple range tests, **(1955).** The statistical model was $Y = \mu + T + E$, Where T = effect of treatments, E = is experimental error

RESULTS AND DISCUSSION

Feed intake

Data in table (2) indicated that animal groups (G1 and G2) were fed the same total mixed ration by the same quantity through the different stages of the experimental period. Also it is obvious that the feed intake (DM, TDN and DCP) per kg $^{0.75}$ tended to be higher ($P<0.06$) for the control group G1 than that of the treated group G2 during the first

and the second stages as well as through the over all period. This may be attributed to the fact that animals of the two groups were fed the same quantity however the mean body weight of G2 were higher than that of G1. One of the important observation was that treatment group consumed their ration in longer time compared to the control group .

Table 2: Mean values of daily feed intake during the experimental stages.

Item	Stage 1		Stage 2		Overall period	
	G 1	G2	G 1	G2	G 1	G2
DMI kg/h/ d	8.03	8.03	13.30	13.30	9.89	9.89
C* DMI kg/h/ d	4.85	4.85	8.00	8.00	5.95	5.95
R** DMI kg/h/ d	3.18	3.18	5.30	5.30	3.94	3.94
DM/ kg $^{0.75}$ g	130.4 ^{a} ±1.7	125.8 ^{b}±1.7	158.3 ^{a} ±2.2	150.5 ^{b} ±2.2	140.1 ^{a} ±1.7	134.6 ^{b} ±1.7
TDNI kg/ h/d	6.22	6.22	9.30	9.30	7.31	7.31
C TDNI kg/h/ d	3.93	3.93	6.48	6.48	4.83	4.83
R TDNI kg/ h/d	2.29	2.29	2.82	2.82	2.48	2.48
TDNI/ kg $^{0.75}$ g	101.2^{a}±1.3	97.6 ^{b} ±1.3	112.3 ^{a} ±1.6	106.9 ^{b} ±1.6	105.1 ^{a} ±1.3	100.9 ^{b} ±1.3
DCP g/ h/d	773	773	1055	1055	872	872
C g/ h/d	540	540	890	890	663	663
R g/ h/d	233	233	165	165	209	209
DCPI/ kg $^{0.75}$ g	12.6 ^{a} ±0.16	12.1 ^{b}±0.16	12.9 ^{a} ±0.18	12.3 ^{b} ±0.18	12.7 ^{a} ±0.16	12.2 ^{b} ±0.16

a and b : Means of treatments within the same row with different superscript letters are differ significantly ($p < 0.05$).
* C: concentrate ** R: roughage

Nutrient digestibility .

Significantly higher values ($P \leq 0.05$) of different nutrient digestibility coefficients were recorded for G2 than G1 (Table 3). this may be attributed to the EG supplement which have digestibility stimulating effect, may be attributed to the effect of the essential oils of the *Eucalyptus* leaves. The same trend was observed by ***Aboul-Fotouh et al (1999)*** when used EG leaves as feed additive to sheep diet. Also **El-Bordeny *et al* (2005)** reported that adding EG leaves to buffalo calves rations improved nutrients digestibility. ***Aboul-Fotouh et al (1999)*** and **El-Bordeny (2006)** found that adding *Eucalyptus* leaves had stimulating effect on *In Vitro* dry matter disappearance (IVDMD) and *In Vitro* organic matter disappearance (IVOMD) of the tested *In Vitro* formulated diets.

Table 3: Effect of eucalyptus leaves supplements on nutrients digestibility and feeding values .

Exper. stage	I		II		SE
Item	G1	G2	G1	G2	
DM	62.55 ^{b}	66.65 ^{a}	65.32 ^{b}	68.89 ^{a}	2.1
OM	60.82 ^{b}	64.5 ^{a}	62.33 ^{b}	67.59 ^{a}	2.35
CP	63.54 ^{b}	64.98 ^{a}	65.42 ^{b}	67.56 ^{a}	2.3
CF	56.66 ^{b}	59.52 ^{a}	55.45 ^{b}	59.02 ^{a}	2.2
EE	80.24 ^{b}	83.62 ^{a}	80.6 ^{b}	84.22 ^{a}	2.6
NFE	70.12 ^{b}	73.54 ^{a}	71.34 ^{b}	75.76 ^{a}	3.1
TDN	59.70 ^{b}	62.43 ^{a}	60.56 ^{b}	64.13 ^{a}	1.9

a and b: Means of treatments within the same row with different superscript letters are differ significantly ($p < 0.05$).

Blood parameters

Data in Table (4) show an increase (P≤0.05) in serum total proteins and albumin in G2 than G1. This may be due to increasing protein digestibility by G2 than G1 (Table 3). Insignificant effect(P>0.05) was observed in globulin concentration. On the contrary G1 showed significantly higher urea concentration than G1.

Table 4: Effect of Eucalyptus leaves supplements on some blood serum parameters.

Item	G1	G2
Total protein (g /dl)	$6.60^{b} \pm 0.18$	$6.75^{a} \pm 0.18$
Albumin (g /dl)	$2.80^{b} \pm 0.24$	$3.08^{a} \pm 0.24$
Globulin (g /dl)	3.80 ± 0.17	3.67 ± 0.19
Urea (mg /dl)	$59.97^{a} \pm 3.14$	$36.27^{b} \pm 3.51$

a and b: Means of treatments within the same row with different superscript letters are differ significantly ($p < 0.05$).

Average daily gain

Data in table (5) indicated that no significant differences in initial body weight between the two animal groups, also it is clear that treatment group (G2) showed insignificant higher (P>0.05) mean daily gain than that of the control group (G1) during the first experimental stage. However G2 showed significant higher (P<0.05) mean daily gain than that of G1 during the second stage as well as during the overall experimental period. This may be attributed to that adding Eucalyptus leaves to animals rations lead to increase nutrients digestibility **(El-Bordeny *et al.* 2005** on buffalo calves **and Aboul-Fotouh et al., 2000** on sheep) and improved animal general health and viability (**El-Bordeny et al., 2005**). This led to increase the nutrients absorbed from gastrointestinal canal which can be reflected on increase average daily gain.

Table 5: Effect of Eucalyptus leaves supplements on Body weights changes.

Exper. stages	Stage 1		Stage 2		Overall period	
Groups	G 1	G2	G 1	G2	G 1	G2
initial weight	149.31	149.54	290.68	296.68	149.31	149.54
final weight	290.68	296.68	352.00	377.00	352.00	377.00
days	143.00	143.00	79.00	79.00	222.00	222.00
ADG	0.990±0.3	1.050±0.3	$0.790^{b} \pm 0.1$	$0.990^{a} \pm 0.1$	$0.910^{b} \pm 0.03$	$1.030^{a} \pm 0.03$

a and b: Means of treatments within the same row with different superscript letters are differ significantly ($p < 0.05$).

Table 6: Effect of Eucalyptus leaves supplements on Feed conversion .

Experimental Stages	Stage 1		Stage 2		Overall period	
Groups	G 1	G2	G 1	G2	G 1	G2
DMI kg/ kg gain	8.12±0.28	7.64±0.28	$16.90^{a} \pm 1.4$	$13.49^{b} \pm 1.7$	$10.82^{a} \pm 0.4$	$9.62^{b} \pm 0.4$
C* DMI kg/ kg gain	4.90±0.2	4.61±0.2	$10.17^{a} \pm 0.8$	$8.11^{b} \pm 0.8$	$6.52^{a} \pm 0.2$	$5.79^{b} \pm 0.2$
R** DMI kg/ kg gain	3.22±0.11	3.03±0.11	$6.74^{a} \pm 0.55$	$5.38^{b} \pm 0.55$	4.30±0.16	$3.83^{b} \pm 0.16$
TDNI kg/ d	6.29±0.21	5.92±0.21	$11.82^{a} \pm 0.9$	$9.43^{b} \pm 0.9$	$8.00^{a} \pm 0.3$	$7.11^{b} \pm 0.3$
C TDNI kg/ kg gain	3.97±0.13	3.74±0.13	$8.24^{a} \pm 0.67$	$6.58^{b} \pm 0.67$	$5.28^{a} \pm 0.20$	$4.70^{b} \pm 0.2$
R TDNI kg/ kg gain	2.32±0.08	2.18±0.08	$3.58^{a} \pm 0.28$	$2.86^{b} \pm 0.28$	$2.72^{a} \pm 0.10$	$2.42^{b} \pm 0.10$
DCP g/ kg gain	782±26	735±26	$1341^{a} \pm 110$	$1070^{b} \pm 110$	$955^{a} \pm 36$	$849^{b} \pm 36$
C DCP g/ kg gain	546±18	513±18	$1132^{a} \pm 92$	$903^{b} \pm 92$	$726^{a} \pm 27$	$645^{b} \pm 27$
R DCP g/ kg gain	236±8	222±8	$209^{a} \pm 18$	$167^{b} \pm 18$	$229^{a} \pm 9$	$204^{b} \pm 9$

a and b: Means of treatments within the same row with different superscript letters are differ significantly ($p < 0.05$).

* C: concentrate ** R: roughage

Feed conversion

It is clear from data of Table (6) that feed conversion g or kg/ kg gain (DM, TDN and DCP and its fractions) were slightly better for the treatment group (G2) than that in control group (G1) during the first stage. On the other hand, feed conversion g or kg/ kg gain were significantly ($P<0.05$) better for G2 than that of G1 for the second stage as well as through the whole experimental period. This may be due to that group G2 showed higher mean daily gain than group G1 (Table 5). Similar trend was observed by **Aboul-Fotouh *et al.*, (1999 and 2000)** when studied the effect of inclusion leaves of EG as feed additives to sheep and lactating buffalo diets. They observed that inclusion of EG to sheep diets resulted significantly better ($P \leq 0.05$) feed conversion compared to the control. Also, feeding EG supplemented diets to lactating buffalo showed the better feed conversion compared to the control, where the differences were significant ($P \leq 0.01$) as kg DMI/kg FCM ، kg SVI / kg FCM, TDNI, DE Mcal/kg and g DCPI/ kg FCM . Also **El- Bordeny et al., (2005)** observed that adding eucalyptus leaves to ration of buffalo calves improved the feed conversion.

Data in Table (7) clearly showed that the treated group (G2) had significantly higher ($P \leq 0.01$) fasting body weight, carcass weight and dressing percentage than that in control group (G1).

Table (7): Effect of Eucalyptus leaves supplements on dressing percentage.

	G1	G2
Fast body weight	368.6	397
Carcass weight	219.65	239.47
Dressing percentage	$59.59^{b} \pm 0.2$	$60.32^{a} \pm 0.2$

a and b: Means of treatments within the same row with different superscript letters are differ significantly ($p < 0.05$).

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