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COMPARATIVE IMPACT OF FORMULATED HERBAL NUTRACEUTICALS ON PERFORMANCE OF CROSSBRED CALVES

RAM NIWAS, D. P. SINGH*, V. K. PASWAN, ABED M. ALBIAL AND S. KUMAR
Department of Animal Husbandry and Dairying, Institute of Agricultural Sciences,
Banaras Hindu University, Varanasi - 221 005, INDIA
e-mail:devipdsinghbhu@gmail.com

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***Corresponding author**

ABSTRACT
Present study was designed with the aim to see the influence of formulated and marketed herbal (*Herbstone*) nutraceuticals on growth performance, dry matter intake (DMI) and digestibility coefficient of crossbred calves. For this purpose twenty seven crossbred calves weighing about 58 to 65 kg were selected and divided randomly into three similar groups (3 animals in each) for three different trials (Rainy, Winter and Summer season) and each trial was conducted for a period of 60 days excluding pre experimental period. To meet out the nutritional requirement as per NRC (1989) recommendation; all the calves were fed on seasonally available chopped roughages and concentrate mixture. Group T_2 and T_3 were supplemented with 2.0% of concentrate ration with formulated and marketed nutraceuticals respectively while group T_1 (control) was fed without any nutraceuticals. During each trial body length, height, weight, girth circumferences, DMI and digestibility coefficient were measured at 0, 30 and 60 days of interval. As a result of the administration of the two different nutraceuticals given to calves; had showed significantly ($P<0.05$) higher body weight gain, length, girth circumferences, DMI and digestibility coefficient than control group but body height had not shown any significant difference amongst treatments and periods. DM digestibility was significantly lower ($p<0.05$) in control group.

INTRODUCTION

Recently developing countries have suffered with sharp decline of food grains production; not sufficient for human and livestock feeding as well. In present scenario there is a need to search certain alternate energy sources. To solve the said problem of animal nutrition and livestock production there has been an increasing interest in exploiting the formulated herbal nutraceuticals. Their primary effects are to improve the growth performance, feed efficiency and secondary benefit to reduce the incidence of various kinds of diseases. While on the other hand they suppress the microbial population releasing methane gas. As such attempts are being made to use of herbal nutraceuticals could be widely accepted as feed additives (Line-Eric *et al*., 1998; Aboul *et al*., 2000). Neelam *et al*. (2006) found the significant effect of two herbal feed additives (*Eclipta alba* and *Kutaki picorrhiza*) individually or in combination, on the nutrient utilization and growth of buffalo calves. Likewise El-Ashry *et al*. (2006), Khir and Ibrahim (2007), Aiad *et al*. (2008), Pankaj *et al*. (2008) and Sirohi *et al*. (2012) found the beneficial effects of essential oils and saponins from medicinal plants as feed additives on rumen fermentation, nutrient utilization and growth rate of calves. Thus Addition of herbal growth promoter and liver tonic products significantly improved liver function, feed assimilation and digestibility of ration ultimately leading to gain in body weight as compared to untreated control group (Ahmed *et al*., 2009; Hadiya *et al*., 2009; Sarker *et al*., 2010). On the basis of above views the present herbal formulation was made with Pudina (*Mentha piperita* Linn), Ajwain (*Trachyspermum ammi* (Linn) Sprague), Harada (*Terminalia chebula*), Kalmegh (*Andrographis paniculata*), *Amla* (*Phyllanthus emblica*), Chirayita (*Swertia chirata* Buch Ham), Dry Zinger (*Zingiber officinale*), Black Salt and marketed herbal nutraceuticals (*Herbstone*) and used as feed additives for getting the responses on growth performance, dry matter intake and digestibility coefficient of crossbred calves.

MATERIALS AND METHODS

This study was carried out in the Department of Animal Husbandry and Dairying, institute of Agricultural Sciences, Banaras Hindu University, Varanasi - 221005 (U.P.) India, to evaluate the effect of supplementation diets (as per NRC, 1989 recommendation) with self compounded herbal and marketed herbal drugs (*Herbstone*) on growth performance, feed intake and digestibility of crossbred calves. In this study twenty seven crossbred calves with an average of live body weight 58 to 65Kg and 4 to 6 months of age were used. The experimental calves were divided randomly into three groups (3 each) in each season. The Table 1 shows the composition of marketed herbal nutraceutical; while in case of formulated herbal nutraceutical, slight modification *i.e.* Baheda, Hara Kasis, Khana Soda and Comman Salts were replaced by Pudina, Kalmegh and Dry Zinger with the view to see the effect of aforementioned herbs on microbial population of the rumen and digestibility of nutrients etc. Calves of the T_1 group (control) were reared on normal feed (NRC, 1989) while the ration of T_2

Table 1: Composition of marketed herbal nutraceutical *(Herbstone)*

S.No.	Name of Herbs	Ratio used(in percentage)
1	Chirayita (*Swertia chirata* Buch Ham)	10
2	Anola	10
3	Harad Wadi	10
4	Baheda	10
5	Ajwain (*Trachys permum ammi*)	05
6	Black salt	15
7	Hara Kasis	02
8	Khana Soda	03
9	Comman Salt	05
10	Base	30
	Total	100

and T_3 groups were mixed with formulated and marketed herbal nutraceuticals @ 2% of Concentrate ration respectively. All the animals were housed under similar management conditions in well ventilated, clean and dry pucca shed having individual feeding arrangements. The calves were let loose in the paddock during morning hours for short duration for exercise as well as to facilitate proper washing, cleaning and drying of the shed. In paddock calves had free access to fresh, clean drinking water. Strict hygienic and sanitary conditions were maintained in the shed throughout the experimental period. Proper and timely health care was extended to sick animals. The animals of various experimental groups were fed standard farm ration comprising green fodder (Bajara, Maize and Berseem etc. depending on seasonal availability) and wheat busha as the dry roughage along with a balanced concentrate mixture and mineral to meet the requisite nutritional requirements. During the entire period possible scientific care was exercised to maintain hygienic conditions and to avoid infectious viz diarrhea, pneumonia etc. in the experimental animals and these animals were dewormed using 20 to 30 mL piperazine before initiating the experiments. During each trial at 0, 30 and 60 days interval the body length, height, weight gain, girth circumference, dry matter intake (DMI) and digestibility coefficient (DC) were measured.

In digestibility experiments attempts were made to find out the digestibility coefficient of the food as a whole or some constituents of the food. The usual calculation of the digestion coefficient (DC) by following equation (Smith and Reid, 1955):

DMI (kg/head/day) = DM in feed offered – DM in feed residue

$$DC\ of\ DM = \frac{\text{DM intake (Kg) - DM in faeces (Kg)}}{\text{Dm intake (Kg)}} \times 100$$

Statistical Analyses

The data were statistically analyzed using GLM procedure of SAS (1992). Duncan's test (1955) was applied in experiment whenever to test differences.

RESULTS AND DISCUSSION

Growth Performance

During each trial the body height, length and girth circumference in cm, while body weight and dry matter intakes (DMI) in kg and digestibility coefficient in percent were

Table 2: Physical parameters, dry matter intake and digestibility coefficients in different groups of crossbred calves at different interval

Group	Parameters	1st Trial (Rainy season)			2nd Trial (Winter Season)			3rd Trial (Summer Season)		
		0 Days	30 Days	60 Days	0 Days	30 Days	60 Days	0 Days	30 Days	60 Days
Control Group (T_1)	Body height (cm)	$82.33^{a} \pm 1.20$	$83.49^{a} \pm 1.09$	$85.13^{a} \pm 1.05$	$83.76^{a} \pm 1.28$	$85.03^{a} \pm 1.01$	$86.89^{a} \pm 0.89$	$79.28^{a} \pm 0.89$	$80.16^{a} \pm 0.88$	$81.17^{a} \pm 0.86$
	Body length (cm)	$72.67^{abc} \pm 3.92$	$73.59^{abc} \pm 3.94$	$74.87^{ab} \pm 3.98$	$76.42^{a} \pm 6.70$	$76.93^{a} \pm 6.72$	$77.55^{a} \pm 6.73$	$79.20^{a} \pm 0.89$	$79.92^{a} \pm 0.91$	$80.71^{a} \pm 0.91$
	Hearth girth (cm)	$108.01^{d} \pm 1.15$	$111.07^{c} \pm 1.21$	$115.56^{b} \pm 1.19$	$109.60^{cde} \pm 1.10$	$111.49^{bc} \pm 1.06$	$114.65^{a} \pm 1.30$	$106.20^{ef} \pm 1.30$	$107.95^{cde} \pm 1.32$	$111.27^{ab} \pm 1.32$
	Body weight (kg)	$60.70^{e} \pm 1.75$	$66.93^{cd} \pm 1.84$	$75.07^{b} \pm 1.78$	$62.33^{f} \pm 1.47$	$67.09^{ef} \pm 1.46$	$72.40^{cde} \pm 1.61$	$59.20^{ef} \pm 1.61$	$64.70^{bcd} \pm 1.74$	$69.14^{abc} \pm 2.40$
	DM Intake (kg)	$1.01^{e} \pm 0.02$	$1.30^{d} \pm 0.005$	$1.60^{c} \pm 0.02$	$1.06^{f} \pm 0.06$	$1.34^{cd} \pm 0.06$	$1.80^{b} \pm 0.04$	$1.06^{d} \pm 0.04$	$1.39^{c} \pm 0.04$	$1.80^{b} \pm 0.07$
	Digestibility (%)	$42.17^{de} \pm 1.51$	$43.30^{cde} \pm 1.20$	$41.92^{de} \pm 0.31$	$44.17^{de} \pm 1.51$	$45.30^{cde} \pm 1.20$	$43.92^{de} \pm 0.31$	$40.27^{de} \pm 1.53$	$41.31^{cde} \pm 1.20$	$39.92^{de} \pm 0.31$
Self Compounded Herbal drug (T_2)	Body height (cm)	$83.34^{a} \pm 2.85$	$84.61^{a} \pm 2.88$	$86.26^{a} \pm 2.84$	$86.02^{a} \pm 4.73$	$87.26^{a} \pm 4.75$	$88.82^{a} \pm 4.75$	$81.22^{a} \pm 4.75$	$82.33^{a} \pm 4.74$	$83.71^{a} \pm 4.73$
	Body length (cm)	$74.56^{ab} \pm 1.64$	$75.24^{ab} \pm 1.73$	$76.77^{a} \pm 1.72$	$78.44^{a} \pm 4.88$	$79.24^{a} \pm 4.90$	$80.21^{a} \pm 4.91$	$69.13^{b} \pm 1.78$	$69.77^{b} \pm 1.96$	$70.65^{b} \pm 2.10$
	Hearth girth (cm)	$108.00^{d} \pm 0.57$	$111.57^{c} \pm 0.62$	$118.17^{a} \pm 0.58$	$109.09^{de} \pm 1.34$	$111.33^{bcd} \pm 1.46$	$115.27^{a} \pm 1.94$	$106.98^{def} \pm 1.94$	$109.47^{bcd} \pm 1.93$	$113.86^{a} \pm 1.91$
	Body weight (kg)	$62.01^{de} \pm 1.74$	$70.07^{bc} \pm 2.38$	$82.01^{a} \pm 2.62$	$69.30^{e} \pm 2.78$	$78.80^{bc} \pm 4.40$	$88.40^{a} \pm 1.76$	$57.08^{f} \pm 4.37$	$63.10^{de} \pm 4.36$	$69.58^{ab} \pm 4.03$
	DM Intake (kg)	$1.01^{e} \pm 0.02$	$1.35^{d} \pm 0.01$	$1.89^{a} \pm 0.02$	$1.44^{c} \pm 0.02$	$1.88^{b} \pm 0.02$	$2.55^{a} \pm 0.02$	$1.05^{d} \pm 0.02$	$1.54^{c} \pm 0.02$	$2.51^{a} \pm 0.02$
	Digestibility (%)	$41.39^{e} \pm 0.68$	$45.85^{bc} \pm 0.89$	$59.22^{a} \pm 1.49$	$43.39^{e} \pm 0.68$	$47.85^{bc} \pm 0.89$	$61.22^{a} \pm 1.49$	$39.39^{e} \pm 0.68$	$43.85^{bc} \pm 0.89$	$57.22^{a} \pm 1.49$
Marketed herbal drug (T_3)	Body height (cm)	$83.33^{a} \pm 2.60$	$84.42^{a} \pm 2.54$	$85.95^{a} \pm 2.47$	$84.25^{a} \pm 2.47$	$85.42^{a} \pm 2.44$	$86.98^{a} \pm 2.36$	$79.35^{a} \pm 2.38$	$80.39^{a} \pm 2.39$	$81.49^{a} \pm 2.40$
	Body length (cm)	$67.67^{c} \pm 0.87$	$68.42^{bc} \pm 0.62$	$69.86^{bc} \pm 0.62$	$68.13^{a} \pm 0.60$	$69.19^{a} \pm 0.70$	$70.12^{a} \pm 0.86$	$79.34^{a} \pm 2.36$	$80.01^{a} \pm 2.26$	$80.71^{a} \pm 2.06$
	Hearth girth (cm)	$105.0^{e} \pm 0.57$	$108.32^{d} \pm 0.46$	$114.33^{b} \pm 0.32$	$106.76^{f} \pm 0.11$	$108.62^{ef} \pm 0.23$	$112.99^{ab} \pm 0.03$	$104.59^{f} \pm 0.04$	$106.53^{ef} \pm 0.05$	$110.12^{bc} \pm 0.09$
	Body weight (kg)	$61.35^{de} \pm 2.04$	$68.98^{c} \pm 2.01$	$82.60^{a} \pm 4.20$	$70.18^{de} \pm 4.27$	$76.08^{bcd} \pm 4.24$	$82.19^{b} \pm 4.28$	$58.76^{ef} \pm 4.01$	$64.46^{cd} \pm 4.05$	$72.18^{a} \pm 2.66$
	DM Intake (kg)	$1.01^{e} \pm 0.02$	$1.31^{d} \pm 0.008$	$1.72^{b} \pm 0.01$	$1.26^{cd} \pm 0.01$	$1.59^{bc} \pm 0.02$	$1.80^{b} \pm 0.29$	$0.95^{a} \pm 0.07$	$1.34^{c} \pm 0.09$	$1.91^{b} \pm 0.14$
	Digestibility (%)	$42.56^{de} \pm 1.03$	$45.17^{bcd} \pm 0.12$	$46.71^{b} \pm 0.36$	$44.56^{de} \pm 1.07$	$47.17^{bcd} \pm 0.12$	$48.71^{b} \pm 0.36$	$40.56^{de} \pm 1.03$	$43.17^{bcd} \pm 0.12$	$44.56^{b} \pm 0.35$

Means with different superscript in a row differ significantly ($p < 0.05$).

Table 3: Composition of self formulated nutraceuticals

S. No.	Name of Herbs	Ratio used (%)
1	Pudina (*Mentha piperita* Linn)	15
2	Ajwain (*Trachyspermum ammi*)	15
3	Harada (*Terminalia chebula*)	10
4	Kalmegh (*Andrographis paniculata*)	10
5	Amla (*Phyllanthus emblica*)	10
6	Chirayita (*Swertia chirata* Buch Ham)	15
7	Dry Zinger (*Zingiber officinale*)	15
8	Black Salt	10
	Total	100

measured at 0, 30 and 60 days of interval. The body height was found best in T_2 followed by T_3 and lowest in T_1 (Control) groups in all three (rainy, winter and summer) seasons; showed non significant difference between formulated (T_2), marketed nutraceuticals (T_3) groups than T_1 (Control) groups at different (0, 30 and 60) days of interval. Further the body height was found maximum in winter season followed by rainy and lowest in summer seasons increased simultansiously at different days of interval in all three seasons. In case of girth significant difference ($P < 0.05$) was observed between T_2 and T_3 while T_1 and T_2 groups have not shown any significant difference. Further towards the end of trials the body length has not shown any significant difference between T_1 and T_3 but significant ($P < 0.05$) difference in T_1 and T_2 as well as T_2 and T_3 groups in all three seasons. The data pertaining to the body weight gain of the crossbred calves revealed that T_3 group showed maximum followed by T_2 and lowest in T_1 (Control) groups; showed non significant difference amongst various groups with the advancement of the age in all three seasons (Table 2). Likewise the dry matter intake (DMI) was found highest in T_2 followed by T_3 and lowest in T_1 groups. These results are in agreement with the findings of Neelam *et al*. (2006), Pankaj *et al*. (2008) and Sarker *et al*. (2010). Thus the significant ($P < 0.05$) increase was observed in respect of heart girth and DMI in T_2 and T_3 fed with formulated and marketed herbal nutraceuticals respectively containing some herbs stimulated appetite and digestion process of the crossbred calves which might have improved heart girth and DMI as well and it collaborates with the findings of Aboul-Fotouh *et al*. (2000), Ahmed *et al*. (2009) and Hadiya *et al*. (2009).

Digestibility

Data in Table 2 indicates that the diet supplemented with formulated herbal nutraceutical (T_2) fed to the crossbred calves significantly ($P < 0.05$) tended to improve the digestibility coefficients of DM showed the highest values followed by marketed herbal nutraceutical (T_3) and lowest in control (T_1) groups and showed significant ($P < 0.05$) difference between treatments and with the advancement of age in all three different trials. These drugs might have stimulated the activity of cellulolytic microorganisms that increased the digestibility coefficients in the treated groups. These results are in agreement with those found by El-Ashry *et al*. (2006), Aiad *et al*. (2008), Khir and Ibrahim (2007) and Sirohi *et al*. (2012).

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