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Effect of fish meal supplementation on economy of feeding crossbred Jersey calves

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The aim of the present study was to assess the effect of fish meal (FM) supplementation on performance of crossbred jersey calves. Crossbred Jersey calves (15) of either sex of 2–3 months of age were selected, divided into three groups of 5 each randomly. Calves were fed on three different types of calf starter rations namely T_0 (maize- 37, wheat bran- 27, groundnut- 33, FM - 0, mineral mixture- 2, common salt-1 parts)), T_1 (maize- 45, wheat bran-17, groundnut- 27, FM- 8, mineral mixture- 2, common salt-1 parts) and T_2 (maize- 42, wheat bran-30, groundnut- 0, FM- 25, mineral mixture- 2, common salt-1 parts). The calves were fed on the experimental calf starter rations twice daily *ad lib*. Calves were allowed to graze in the grazing land twice daily – 2 h in the morning (10 am to 12 pm) and 2 h in the evening (2 to 4 pm) to meet forage requirement. The experiment was conducted for three months. The data on daily feed intake and fortnightly body weight gain was recorded. The proximate composition was estimated as per the AOAC (1990). The data were analyzed as per the methods of Snedecor and Cochran (1989).

The crude protein and NFE content (%) of experimental diets varied from 19.42 to 20.43 and 55.95 to 57.90 respectively (Table 1). The average dry matter intake (kg/d) was 1.05, 1.06 and 0.97 respectively in T_0, T_1 and T_2 calves which was not significantly different (Table 2). The average body weight gain (g/day) was 356.00, 381.11 and 394.67 respectively in T_0, T_1 and T_2 groups (Table 2). The average body weight gain (g/day) was significantly higher ($P<0.05$) in calves supplemented with FM.

Table 1. Proximate composition (% DM) of experimental diets

Parameters	Diet (% FM)		
	0% FM(T_0)	8% FM(T_1)	25% FM(T_2)
OM	93.72	93.32	92.51
CP	19.42	20.43	19.46
EE	5.67	4.59	5.24
CF	12.68	10.40	11.24
NFE	55.95	57.90	56.58
Ash	6.28	6.68	7.48

OM, organic matter; CP, crude protein; EE, ether extract; CF, crude fibre; NFE, nitrogen free extractives; FM, fish meal.

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Zerbini and Polan (1985) observed improved average daily gains when FM was used as a source of RUP (rumen undegradable protein) in diets of Holstein bull calves. Dawson *et al*. (1991) fed grass silage to young Friesian steers and reported significantly increased growth rates in steers whose diet was supplemented with FM compared to the steers receiving only grass silage. Gaya *et al*. (1979) also reported significantly ($P<0.01$) increased daily live weight gain (500 g) with supplementation of FM @ 450 g/day in a basal diet of sugarcane tops and molasses in comparison to diet without fish meal (208 g). Veira *et al*. (1994) fed available silage on an *ad libitum* basis either alone or supplemented with 100, 225, 350, or 500 g of FM or 600 g of SBM/d and observed that increasing levels of FM resulted in a linear increase in live weight gain ($P <.001$) and gain: feed ratio ($P <.001$).

The total dry matter intake (kg) was 94.29, 95.76 and 87.63 respectively in T_0, T_1 and T_2 groups (Table 3). Total dry matter intake (kg) was significantly ($P<0.05$) lower in higher FM supplemented groups than lower and un-supplemented groups (Table 3). However, Veira *et al*. (1994) and Sahoo *et al*. (2005) reported that inclusion of fish meal in the calf starter had no effect on feed intake. The reduction in dry matter intake in higher FM supplemented group might be due to the presence of high undegraded digestible protein (UDP), which also reduces ammonia production in the rumen. The feed conversion efficiency was higher in higher fish meal supplemented group (2.46 ± 0.09) than lower (2.73 ± 0.06) as well as un-supplemented (2.93 ± 0.05) group (Table 3). Davenport *et al*. (1990b) reported that addition of FM to the diets of beef calves increased feed efficiency as compared to control diets that were supplemented with SBM only. The

Table 2. Effect of fish meal supplementation on fortnightly dry matter intake (kg/day) and live weight gain (g/day)

Fortnightly	Diet (% FM)			SEm	Diet (% FM)			SEm
	0% FM(T_0)	8% FM(T_1)	25% FM(T_2)		0% FM(T_0)	8% FM(T_1)	25% FM(T_2)	
	DMI kg/d				B.wt. gain, g/d			
I	0.80±0.01	0.80±0.02	0.76±0.03		281.33±2.49	298.67±14.18	301.33±1.33	
II	0.87±0.01	0.87±0.02	0.82±0.03		290.67±4.98	329.33±7.76	361.33±11.02	
III	0.95±0.01	0.96±0.02	0.88±0.02		340.00±5.95	366.67±27.68	376.00±10.44	
IV	1.13±0.01	1.12±0.05	0.96±0.02		386.67±10.73	408.00±23.19	432.00±18.15	
V	1.21±0.02	1.26±0.04	1.14±0.02		409.33±9.55	424.00±18.78	433.33±15.03	
VI	1.33±0.02	1.38±0.04	1.28±0.04		428.00±7.11	460.00±13.14	464.00±28.44	
Average	1.05±0.08	1.06±0.09	0.97±0.08	0.07^{NS}	356.00^{a}±4.10	381.11^{b}±5.75	394.67^{b}±5.08	10.76*

NS, nonsignificant; * P<0.05, ^{a,b,c}different superscripts in a column differs significantly; FM, Fish meal; SEm, standard errors of mean.

Table 3. Effect of fish meal supplementation on feed conversion efficiency and economy of feeding

Parameters	Diet (% FM)			SEm
	0% FM(T_0)	8% FM(T_1)	25% FM(T_2)	
Total DMI (kg)	94.29^{b}±0.87	95.76^{b}±0.52	87.63^{a}±1.62	2.36*
As such basis (kg)	104.76±0.97	106.39±0.57	97.36±1.80	—
Total gain in body weight(kg)	32.04^{a}±0.37	34.30^{b}±0.52	35.52^{b}±0.46	0.50*
FCE	2.93^{a}± 0.04	2.73^{b}± 0.09	2.46^{c}± 0.04	0.04**
Total expenditure (Rs)	1119.84±10.33	1137.30±6.12	1040.75±19.25	—
Economy(Rs/kg gain)	34.96^{c}±0.31	33.19^{b}±0.56	29.33^{a}±0.75	0.31**

* P<0.05; **P<0.01; ^{a,b,c}different superscripts in a column differs significantly; FM, fish meal; FCE, feed conversion efficiency; SEm, standard errors of mean.

higher body weight gain might be due to better digestion, absorption and assimilation of nutrients and the better amino acid profile of the FM.

The cost of production per kg live weight (Rs) was 34.96, 33.19 and 29.33 respectively, in T_0, T_1 and T_2 groups (Table 3). The lower cost of production per kg live weight was due to significantly better body weight gain and lower TDMI in fish meal supplemented group. The cost of production of per kg live weight lowered by 16.10% in higher (T_2) and 11.63% in lower (T_1) FM supplemented group in comparison to un-supplemented group.

SUMMARY

Crossbred Jersey calves (15), 2–3 month-old, were randomly divided into 3 groups of 5 each and fed on 3 different types of calf starter rations containing 0 (T_0), 8 (T_1) and 25% (T_2) of fish meal to assess growth performance and economy of feeding. The calves were fed calf starter rations twice daily *ad lib.* and allowed 4h grazing in the morning (10 AM to 12 PM) and in the evening (2 to 4 PM). The average dry matter intake (kg/d) was not significantly different. However, the total dry matter intake (kg) was significantly lower in higher FM supplemented group (T_2) than the other groups. The average live weight gain (g/day) was significantly higher in calves supplemented with FM. The feed conversion efficiency was higher in 25% (T_2) fish meal supplemented group than T_0 and T_1 groups. The cost of production per kg live weight (Rs) was significantly lower in fish meal supplemented groups. It is concluded that cost of feeding can be reduced by supplementation of fish meal in calf starter ration.

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