

EFFECT OF SUPERPHOSPHATE AS PHOSPHORUS SUPPLEMENT ON DRY MATTER INTAKE AND WEIGHT GAIN OF SAHIWAL CALVES

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Faisalabad-38040, Pakistan**ABSTRACT**

Sixteen calves aged 9-12 months were divided into 4 equal groups and given four treatments viz. C = control, SJ = supplementation with supernatant juice to provide phosphorus as per NRC recommendations, SP = supplementation with superphosphate powder to provide phosphorus as per NRC recommendations and AP = supplementation with supernatant to provide phosphorus 20% above the NRC recommendations. The calves were fed mixture of berseem (70%), wheat straw (20%) and molasses (10%) on dry matter basis. Results indicated a significant effect of phosphorus supplementation ($P < 0.05$) on daily dry matter intake which was higher in AP, followed by SJ and minimum dry matter intake was found in SP group. Maximum daily weight gain was recorded in SJ group, followed by AP and SP. The minimum weight gain was found in control calves. However, statistical analysis of data indicated non-significant effect of phosphorus supplementation on daily weight gain.

Key words: Sahiwal calves, super juice, dry matter intake, weight gain, superphosphate.

INTRODUCTION

In Pakistan, dairy animals have short productive life mainly due to late maturity and poor growth rate during calthood. Phosphorus is intimately associated with normal functions of all animal tissues by virtue of its role in the process of energy metabolism. Little (1970) found a significant linear response in the voluntary feed intake in calves supplemented with phosphorus. This increase in feed intake was beneficial to increase the production by increasing growth rate of calves. Overall production was also increased due to decreased age at maturity.

Berseem (*Trifolium alexandrinum*), the most common winter and spring fodder in our country, is notoriously low in phosphorus contents (0.14%) and abundant in calcium (1.44%). Owing to a wide Ca:P ratio, animals fed predominantly on berseem, unless supplemented with some rich source of phosphorus, may suffer from phosphorus deficiency syndromes (Ranjhan, 1993). Concentrates, grains, bone flour, phosphoric acid, sodium and calcium phosphate may be used as sources of phosphorus but they are expensive and increase the cost of feeding particularly in calves. The value of above compounds in providing phosphorus depends in part upon the biological availability of the phosphorus (McMeniman, 1973).

Superphosphate or 'super juice' prepared by dissolving superphosphate fertilizer in water appears the cheap source of phosphorus for livestock feeding in Pakistan. Moreover, the use of super juice is a fairly popular dairy management practice in Australia (Radostits *et al.*, 2000). Therefore, evaluation of single super phosphate as phosphorus supplement in terms of its effect on dry matter intake and weight gain of Sahiwal calves fed on berseem has been described in the present paper.

MATERIALS AND METHODS

In this study, 16 Sahiwal calves aged 9-12 months were divided into four equal groups on the basis of their body weights. All the calves were maintained under similar housing and management conditions and had free access to drinking water.

Single superphosphate fertilizer (National Fertilizer Corporation, Pakistan) was used as the source of phosphorus supplementation. One kg of superphosphate was dissolved in 5 liters of water. Solution was stirred vigorously and allowed to settle for 12 hours. The gypsum along with fluorine was settled down. Supernatant (super juice) was skimmed off and was used as a source of phosphorus supplement (Radostits *et al.*, 2000). Analysis of the juice revealed that it had 3% phosphorus and 0.05% fluorine.

The calves were fed mixture of berseem (70%), wheat straw (20%) and molasses (10%) on dry matter basis. Each group of the calves was randomly assigned to one of the following four treatments:

C= control (mixture of chaffed berseem, wheat straw and molasses)

SJ = supplemented with super juice of single superphosphate to provide phosphorus as per NRC (2001) recommendations.

SP = supplemented with single superphosphate powder to provide phosphorus as per NRC (2001) recommendations.

AP = supplemented with super juice of single superphosphate to provide phosphorus 20% above NRC (2001) recommendations. The calculated amount of SJ, SP and AP was hand mixed thoroughly in the rations, offered at morning time, as during adjustment period it was observed that orts of this time feeding were minimum.

The data on daily feed intake and weight gain were collected during a study period of 60 days. The ration was fed *ad libitum*, twice daily and theorts collected next morning. Feed intake was recorded on the basis of dry matter intake. Feed samples were analyzed weekly for the phosphorus before making adjustment in phosphorus supplementation. All the calves were weighed individually at fortnightly intervals.

The data thus collected were statistically analyzed using Randomized Complete Block Design (Steel and Torrie, 1984). Least significant difference (LSD) was used for comparison of means of treatments.

RESULTS AND DISCUSSION

Dry matter intake

Dry matter Intake (DMI) in calves increased due to phosphorus supplementation. The highest increase in DMI occurred in AP group (29.79%), followed by SJ (26.45%) and SP (20.64%). However, a minimum increase in DMI (17.14%) was found in control group. Statistical analysis indicated that DMI was significantly increased due to phosphorus supplementation with super juice as compared to supplemented with powder form. However, non-significant difference was found between SJ and AP groups (Table 1). The possible reason for low DMI in the SP was bad flavor of fertilizer. However, an increasing trend in DMI was found in all calves at the end of trial.

Table: 1 Effect of phosphorus supplementation on daily dry matter intake (DMI) and weight gain in Sahiwal calves

Treatments	% increase in DMI intake (kg)	Mean DMI (kg, ±SE)	% increase in weight (kg)	Mean weight gain (kg, ±SE)
SJ	26.45	4.196 ± 0.431 ^{ab}	14.36	0.229 ± 0.0125 ^a
SP	20.64	3.694 ± 0.359 ^c	10.21	0.162 ± 0.0172 ^a
AP	29.79	4.366 ± 0.524 ^a	12.63	0.200 ± 0.0192 ^a
C	17.14	3.948 ± 0.622 ^{bc}	9.67	0.108 ± 0.0661 ^a

The results of the present study are in line with those of Valk and Sebek (1999), who pointed out that phosphorus supplementation, increased DMI in dairy animals. Weiss and Wyatt (2004) reported that when the dietary phosphorus was increased from 0.34 to 0.45% of dry matter in diet of cows, DMI increased from 12.4 to 30.5 kg/day. However, some studies (Knowlton and Herbein, 2002; Wu *et al.*, 2003) indicated no effect on DMI with phosphorus supplementation. The probable reason of DMI difference between this and the previous studies could be the type of feed offered to the experimental animals along with the breed and growth stage of the experimental animals.

Weight gain

The weight of calves increased due to phosphorus supplementation. Maximum increase in daily weight was in SJ (0.229 ± 0.0125 kg/day), followed by AP (0.200 ± 0.0192 kg/day), SP (0.162 ± 0.0172 kg/day) and C (0.108 ± 0.0661 kg /day). Statistical analysis indicated that daily weight gain was non-significantly affected by phosphorus supplementation (Table 1). The possible reason for this might be short duration of the present study.

These results are in line with those of Knowlton and Herbein (2002), who pointed out no effect on weight gain with phosphorus supplementation. However, some previous studies (Valk and Sebek, 1999; Karn, 2001) indicated a significant effect of phosphorus supplementation on weight gain.

Based on the findings of the present study it was concluded that phosphorus supplementation with single super phosphate fertilizer in the form of super juice had no beneficial effects in terms of daily weight gain in Sahiwal calves.

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