EFFECT OF COTTONSEED CAKE (GOSSYPOL) ON THE REPRODUCTIVE PERFORMANCE OF NILI-RAVI BUFFALOES

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ABSTRACT

Effect of free gossypol present in the cottonseed cakes was investigated using 12, Nili-Ravi dairy buffaloes randomly assigned to two equal groups i.e., A and B. Buffaloes in group A were fed control ration and buffaloes in group B were fed cottonseed cake ration containing 5.88g free gossypol. Non-significant differences were found between control and treated buffaloes in respect of occurrence of postpartum oestrus, length of oestrous cycle, duration of oestrus, intensity of oestrus and occurrence of ovulation. However, buffaloes fed cottonseed cake showed significantly ($P<0.01$) lower conception rate than that of control buffaloes (50 vs 83 %).

INTRODUCTION

The increasing production of cottonseeds in Pakistan since last many decades is the main source for cheaper availability of protein ingredient of animal rations (Ahmad, 1993). Cottonseed cakes contain highly metabolizable protein (Cusack and Perry, 1995). Cottonseed cakes contain a toxic material "Gossypol" that remain in it from 0.21 to 0.36 percent (Ala-ud-Din, 1995). Gossypol was confirmed male antifertility agent (National Coordinating group on Male Fertility, 1978) and has also been reported to have antifertility effect in females as well. Gossypol is reported to cause interrupted oestrous cycle in rats (Gu and Anderson, 1985), also inhibited embryo implantation in rats (Lin *et al.*, 1985) and delayed embryo development in cattle (Zirkle *et al.*, 1988). Gossypol has been shown to exert its effects on luteal, granulosa and adrenocortical cells (Gu *et al.*, 1991; Ohmura *et al.*, 1993). One of the main problems for improvement of buffalo production in Pakistan remains its low reproductive efficiency (Ayre-Smith, 1993). The present study was designed to examine possible effect of gossypol on some of the reproductive functions in Nili-Ravi buffaloes.

MATERIALS AND METHODS

Twelve Nili-Ravi buffaloes calved during the months of July and August, with clinically normal reproductive tract and on similar level of milk yield (approximately 8.00 to 9.00 liters/day/buffalo) were maintained under the naturally prevailing climatic conditions. Six buffaloes were randomly assigned to each group of control and treatment. Buffaloes in group A were fed control ration and buffaloes in group B were fed cottonseed cake ration @ 3.5kg/day (Table 1). In addition, good quality green fodder was offered *ad libitum*.

Table 1: Composition of rations fed to experimental buffaloes

Ingredients	Ration A (%)	Ration B (%)
Maize oil cakes	60	-
Cottonseed cakes*	-	60
Wheat Bran	30	30
Molasses	8	8
Di-Calcium phosphate	1	1
Common salt	1	1
Approximate free gossypol content/kg ration	0.00	1.68 g

* = Cottonseed cakes contained free gossypol = 2.8 g/kg (Ala-ud-Din, 1995).

Each buffalo of treated group consumed cottonseed cake ration @ 3.5kg/day which contained 5.88g free gossypol. Buffaloes were closely monitored for first noticeable postpartum oestrus and at least three oestrous cycles were observed in each buffalo to determine the length of the oestrus periods and oestrous cycles. For determination of ovulation, the ovaries of each experimental buffalo were palpated at 2 hourly intervals during each oestrus period upto the occurrence of ovulation (Hussain, 1992). Oestruses were detected by

their behavioural signs using a teaser bull and confirmed by rectal palpation of genital organs. The buffaloes were inseminated after observing at least three complete oestrous cycles, using liquid semen collected. After 90 days of artificial insemination buffaloes were examined per rectum for pregnancy. The data collected were computed to analysis of variance using general linear model procedure (Steel and Torrie, 1980) in Minitab Statistical Software Computer Package (Anonymous, 1991).

RESULTS AND DISCUSSION

Non-significant differences were found between control and treated buffaloes in respect of their first observable post-partum oestrus interval (81.2 vs 85.0 days), length of oestrous cycle (24.7 vs 23.1 days), duration of oestrus (20.3 vs 22.1 hours) and ovulation after end of oestrus (10.6 vs 10.5 hours). Whereas, conception rate (83.3 vs 50.0 %) differed significantly ($P<0.01$) between control and treated buffaloes (Table 2).

Table 2: Mean values (±SEM) for length of oestrous cycle, duration of oestrus and ovulation after end of oestrus and conception rate in the experimental buffaloes.

Parameters	Oestrus No.	Groups: Control	Groups: Cottonseed cakes
Post-partum oestrous interval (days)		81.2±11.7a	85.0±10.7a
Length of oestrous cycle (days)			
	1	25.5±2.5	25.8±3.9
	2	25.7±1.8	22.2±0.7
	3	22.8±0.9	21.0±0.2
	Mean	24.7±1.1a	23.1±1.3a
Duration of oestrus (hours)			
	1	20.3±2.0	21.7±2.0
	2	18.0±0.9	20.3±1.8
	3	22.7±1.3	24.3±1.6
	Mean	20.3±0.9a	22.1±1.1a
Ovulation after end of oestrus (hours)			
	1	10.0±0.3	11.2±1.1
	2	11.2±0.3	10.7±0.6
	3	10.7±0.6	9.7±0.5
	Mean	10.6±0.2a	10.5±0.5a
Conception rate	%	83.3a	50.0b

The present findings are partially in agreement with those reported by previous workers (Zhu *et al.*, 1984; Gu and Anderson, 1985; Wu *et al.*, 1985; Yang and Wu, 1987) who reported anti-steroidogenic effects on ovaries, delayed oestrus in laboratory animals and a local cytotoxic effect on human uterus. It is speculated that the amount of gossypol present in the ration fed to Nili-Ravi buffaloes remained unable to disturb the ovarian function or much of the amount of gossypol fed to the experimental buffaloes was detoxified in the rumen, as ruminants had the ability to detoxify high intake of free gossypol (Lindsey *et al.*, 1980).

The effects of gossypol as reported in the female rats (Gu and Anderson, 1985; Lin *et al.*, 1985), may not be expected in buffaloes as such. The results showed that 5.88g gossypol consumed by each treated buffalo in the ration had not affected their postpartum ovarian activity and subsequent oestrous cycles. This was further supported by the resumption of cyclic ovarian activity and normal length of oestrous cycle throughout the study.

Conception rate in control buffaloes (83.33 %) was significantly ($P<0.05$) higher than buffaloes fed cottonseed cakes (50.0 %). The average conception rates reported by Saji (1985), Shah (1985), Ali *et al.* (1985), Ahmad *et al.* (1990), and Chohan *et al.* (1992) were 33 to 60 %. Relatively higher conception rate found in present study might be attributed to efficient detection of oestrus and artificial insemination of buffaloes at appropriate time of oestrous. However, the pregnancy rate in buffaloes fed cottonseed cakes in ration is in agreement with the reports of Lagerloff and Tone (1985) and Yang and Wu (1987) who reported decreased pregnancy rate in female rats after feeding gossypol either before breeding or during gestation. Bender *et al.* (1988) reported unfavorable change in the endometrial environment of female rats for the embryonic and fetal development after feeding gossypol. Mushtaq (1995) also reported detrimental effects on embryo development, both *in vivo* implantation of embryo and *in vitro* studies.

The postpartum oestrus interval (81.2 vs 85.0 days) found in experimental buffaloes might be attributed to the season as the present study started from July/August towards winter. Ahmed *et al.* (1981) also reported that buffaloes calving in summer and autumn resume cyclic activity earlier than those calving in winter or spring.

It may be concluded that cottonseed cakes comprising 60 percent of the total ration fed to Nili-Ravi buffaloes did not affect the postpartum ovarian activity, oestrous cycle length, duration of oestrus and ovulation. However, 60 % of cottonseed cakes in the

ration of dairy buffaloes may reduce their conceptions than those buffaloes not being fed cottonseed cakes in the ration.

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