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EFFECT OF ADDING YEAST CULTURE OR SODIUM BICARBONATE TO LACTATING FRIESIAN COWS DIET CONTAINING FODDER BEET ROOT SILAGE ON THEIR REPRODUCTIVE PERFORMANCE

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SUMMARY

Twenty one lactating Friesian cows were used to study the effect of adding yeast culture or sodium bicarbonate to a ration containing fodder beet root silage (FBRS) on reproductive performance. The interval from parturition to complete uterine involution (PPUI), first ovulation (PPOI), first detected estrus (PPEI), first service (PPSI) as well as number of services per conception (NS/C) and days open (DO) were determined.

Three days after calving, cows were assigned randomly into three equal groups (n=7). Cows of the first group (G1, control) fed ration contained FBRS represented 30% of the required TDN, concentrate mixture 70% of the require TDN and wheat straw. Ration offered to the second (G2) and third (G3) groups were similar to G1 except that it was supplemented with 15 gm/day/head yeast culture and 150 gm/day/head sodium bicarbonate for G2 and G3, respectively.

Results indicated that supplementing ration with yeast culture (G2) improved ($P<0.05$) PPUI, PPOI, DO, NS/C and CR% as compared to the other groups, however, there were no effect on PPEI and PPSI among the studies groups. Treatment with sodium bicarbonate (G3) improved PPUI and PPOI as compared to untreated cows (G1).

Keywards: yeast, sodium bicarbonate, dairy cows, reproductive performance

INTRODUCTION

Inavailabity of high quality green fodder during summer is one of the managerial obstacles that face herdsmen. This is in addition to the negative effect of summer conditions on feed intake and milk production of lactating cows. So, silage could contribute to minimize this problem.

Fodder beet root silage (FBRS) could be considered as a potential feed source in dairy cattle feeding (Schwarz *et al.*, 1992). Offering FBRS during summer may keep the energy intake as required. But high production of lactic acid during FBRS processing have to be considered due to its negative effect on rumen function and other physiology disturbances.

To keep rumen function and pH within the normal range, many trails were conducted through adding yeast culture and sodium bicarbonate as buffers (West *et al.*, 1982, Biosclair *et al.*(1986) Nisbert and Martin, 1991, Cole *et al.*, 1992, El-Ashry *et al.*, 1996 and Ibrahim *et al.*, 2000). Such types of buffers were reported to improve physiological function and production traits of treated lactating cows. Under such treatments rare data are available concerning its effect on reproductive traits of treated animals.

In the light of the previous facts, the present work was planned to investigate the effect of adding buffers on diets containing FBRS on post-partum reproductive performance of Friesian lactating cows.

MATERIALS AND METHODS

The present work was carried out at Sakha Experimental Station, Animal Production Research Institute, Ministry of Agriculture. The experiment was started three days after calving at July 1998 and was extended for five months post-partum.

Cow's management:-

A total of twenty-one purebred multiparous Friesian. Cows were assigned randomly into three equal groups (n=7). Cows in the experimental groups were similar in parity, age, body weight at calving and preceding milk yield (Table 1).

Table 1. Average of parity, age (month), body weight at calving (kg) and preceding milk yield (kg) in different groups of the experimental animals

Groups	Parity	Age	Body weight	Milk yield
G1	2.3 ± 0.4	54.1 ± 5.3	450 ± 11.2	2987 ± 124.3
G2	1.4 ± 0.4	55.0 ± 5.4	430 ± 12.3	2942 ± 113.0
G3	2.3 ± 0.4	53.7 ± 5.3	441 ± 13.3	3004 ± 110.8
Overall means	2.3 ± 0.4	54.3 ± 3.1	445 ± 7.1	2977 ± 67.4

All cows were kept under semi shaded open yard, clean water for drinking was made available all the time. Dams were allowed to nurse their calves four days post-partum before being machine milked, twice daily at 700 and 1600 hr.

Cows were fed individually according to NRC allowances, 1988. Ration composed of concentrate feed mixture, wheat straw and fodder beet root silage (FBRS), which represented 30% of the total energy requirements of the rations of the three groups. Cows of the first group (G1, control) was fed the previous ration. Ration of the second group (G2) was similar to G1 but supplemented with 15 gm/day/head yeast culture (soccharomyces servisia.5*109c.f.u.sc.strain 1026/mg, according to Yousef *et al.*,1996), while of the third group (G3) was supplemented with 150 gm/day/head sodium bicarbonate (as recommended by Orrego *et al.*,1993). Yeast culture or sodium bicarbonate were added to FBRS just before feeding.

Cows were fed concentrate mixture twice a day at 0800 and 1500 hr, silage was offered at 1100 while wheat straw was offered at 1700 hr.

Reproductive management

Cows were checked two times daily at 7,00 and 17,00 hr by vesectomized bull to define cows on heat. The bull was left to run with the cows for a period of 30 minutes at each check round. Standing behavior was considered the main sign of heat. Cows that displayed estrus after 50 days post-partum were artificially inseminated. Pregnancy was diagnosed by rectal palpation 60 days after last insemination. The reproductive tract was palpated weekly to determine the time of uterine involution. The interval from parturition to complete uterine involution (PPUI), first ovulation (PPOI), first detected estrus (PPEI), first service (PPSI) as well as number of services per conception (NS/C), service period (SP) and days open (DO) were determined.

Blood samples

Blood samples were regularly collected at 3 to 4 day intervals to determine concentration of progesterone for monitoring ovarian activity. Samples (about 5ml) were collected via the jugular vein in tubes treated with heparin as an anticoagulant. Within about half an hour, samples were centrifuged for 15 minutes at (1000 g.) for plasma separation. Plasma samples were stored at –20°C till the assay time.

Hormonal assay

Direct Radioimmunoassay technique was performed for assessment of plasma progesterone concentration. Ready antibody coated tube kits (Diagnostic produre Corporation, Los Angeles, California, USA) were used according to the procedure outlined by the manufacturer.

Crossreaction of progesterone antibody (at 50% displacement) was 100% with progesterone and it was 13.8%, 7.7% and 1.81% with 5α- Pregnanedione, 5β- Pregnanedione and Corticosterone, while it was less than 1% with each of the other steroids. The sensitivity value of the assay was 0.03 ng/ml plasma. The standard curve ranged between 0.0 and 60.0 ng/ml. Inter-assay coefficients of variation were found to be 8.9 and 9.8, respectively.

Statistical analysis

Factorial analysis was done to compare among the experimental groups applying SAS linear program (1990).

RESULTS

The overall mean of PPUI in the three studied groups was within the average reported previously on Friesian in Egypt (28.8 – 37.8 days) by El-Keraby and Aboul-Ela (1982), Kadoom (1991) and Swiefy (1997). However, it was shorter ($P<0.05$) in G2 and G3 (fed rations supplemented with buffers) as compared to untreated cows (G1) by about six and five days, respectively (Table 2).

Similar trend was also observed concerning PPOI where G2 and G3 resumed their ovarian activity post-partum earlier than G1 (Table 2). The interesting point to be noted is that under summer condition in Egypt, all cows displayed their first ovulation within two months post-partum. Moreover, the obtained PPEIs and PPSIs of the three studied groups were similar (Table 2).

It is worth to note that cows of G2 (fed yeast culture) required less ($P<0.05$) services to get pregnant as compared to G1 and G3 which resulted in shorter ($P<0.05$) SP and DO (Table 2), relative to the other two groups.

During the first ovulation, incidence of quiet ovulation was higher in G3 (28.6%) than the other two studied groups (14.3 for each group). However, nearly similar average of quiet ovulation cases/cow was observed during the experimental period in the three studied groups (about 0.1 cases/cow for each group).

Figure 1 shows that no abnormal ovarian function was detected. Cows in the three studied groups have regular progesterone pattern and ovarian cycle. The average of the three first ovarian cycles were 22.4 ± 0.5, 22.0 ± 0.6 and 21.3 ± 0.6 days for G1, G2 and G3, respectively.

Progesterone concentration during the period from parturition to the first ovarian cycle was less than 0.5 ng/ml in all cases. During the first ovarian cycle it was less than the subsequent one, after that it decreased during the third cycle in the three studied groups. However, the important not is that the average of progesterone concentration during the first and second ovarian cycles was higher in G2 (4.3 ± 0.3 and 5.0 ± 0.4 ng/ml, respectively) than G1 (4.0 ± 0.4 and 4.6 ± 0.4 ng/ml, respectively) and G3 (3.6 ± 0.3 and 4.4 ± 0.4 ng/ml, respectively).

Table2. Means (±SE) and range of post-partum uterine involution (PPUI), estrous intervals (PPEI), ovulation intervals (PPOI), service intervals (PPSI), days open (DO), number of services per conception (NS/C) and service period (SP) for the three experimental groups

Item		G1	G2	G3	Overall mean
PPUI	X ± SE	33.4 ± 2.02^{a}	26.8 ± 1.5^{b}	28.3 ± 2.4^{b}	30.2 ± 1.30
	Range	27 – 44	22 - 33	22 - 37	22 – 44
PPOI	X ± SE	41.4 ± 3.5^{a}	33.4 ± 2.1^{ab}	32.4 ± 2.3^{b}	35.8 ± 1.7
	Range	30 – 55	26 – 42	26 – 43	26 - 55
PPEI	X ± SE	43.5 ± 3.2^{a}	43.5 ± 3.2^{a}	36.0 ± 4.3^{a}	37.8 ± 4.1
	Range	31 – 54	31 – 54	25 – 59	25 - 52
PPSI	X ± SE	59.4 ± 2.6^{a}	58.3 ± 2.6^{a}	56.6 ± 2.7^{a}	57.7 ± 1.5
	Range	51 – 69	50 – 71	47 – 67	47 - 71
NS/C	X ± SE	3.2 ± 0.4^{a}	2.0 ± 0.3^{b}	3.0 ± 0.3^{a}	2.7 ± 0.2
	Range	2 – 4	1 - 3	2 – 4	1 - 4
SP	X ± SE	48.6 ± 7.4^{a}	26.8 ± 4.1^{b}	44.4 ± 6.4^{ab}	39.9 ± 3.8
	Range	24 – 56	22 - 43	23 – 63	22 - 65
DO	X ± SE	109.8 ± 5.1^{a}	80.7 ± 5.1^{b}	99.6 ± 3.7^{a}	95.7 ± 3.9
	Range	62 - 119	62 - 95	90 – 110	62 - 119

(a,b) means within each raw or column with different superscripts are significantly different at 5% level.

DISCUSSION

The role of yeast culture in addition to its buffering effect acts as prebiotics. Since, it improves feed digestibility and utilization (Ibrahim, *et al.*, 2000). Moreover, it increases blood glucose, decreases cholesterol concentration and improved total VFA (El-Gaafarawy *et al.*, 2000).

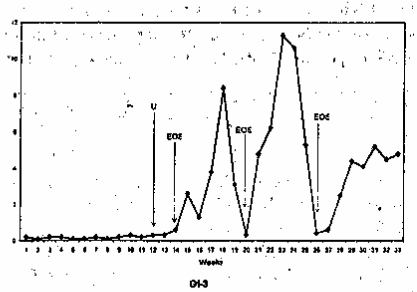
Improving feed digestibility means an increase of energy intake, which was reported to have positive correlation with body condition and reproduction of bovine (Peters and Ball, 1995).

Reduction of the total VFA (as energy source) in untreated cows, causes negative energy balance, which may suppress LH-RH secretion and LH pulses necessary for follicular growth (Schillo, 1992), or/and may modify the follicular hypophysial axis to reduce the responsiveness to estradiol in early post-partum, resulting in alteration of the first ovulation (Perters and Riley, 1982).

Increasing glucose level may improve the reproductive efficiency through coordinating the biological activity of gonadotropine hormones (Hafez, 1993a), furthermore, cyclic metabolic variation in uterine tissue consists of availability of glucose (Hafez, 1993b). Increase blood plasma glucose causes increase in plasma insulin like growth factors 1 (IGF1). This may be a possible hormonal mechanism by which nutritional effects might be recognized centrally. Furthermore, IGF1 has an effect on the rate of increase in the bioactivity of LH and to augment FSH-stimulated induction of LH receptors and subsequent progesterone synthesis (Peters and Ball, 1995).

In addition, the decreasing level of plasma cholesterol may be attributed to the increasing demand of cholesterol in the biosynthesis of the steroid hormones towards the sexual maturity since about 25% of daily formed cholesterol are used in the synthesis of steroid hormones (Sommer 1969).

Finally, the present results indicated that adding buffers to the Friesian cattle feed contained FBRS improved most of the studied reproductive traits (PPUI, PPOI, NS/C, SP and DO). However, adding yeast culture to the ration resulted in significantly better reproductive performances as compared to the other two studied groups.



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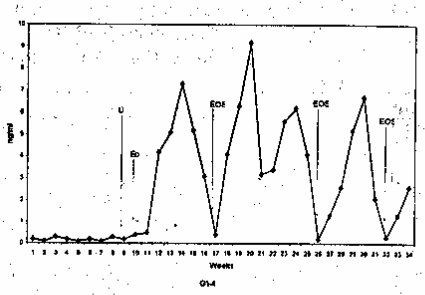

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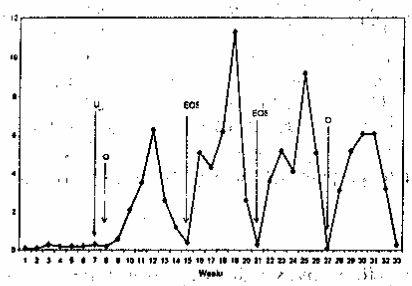

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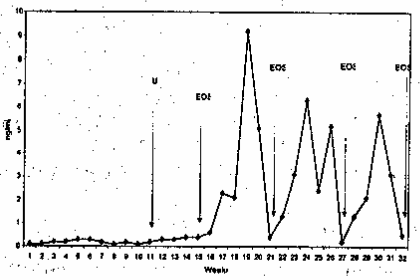

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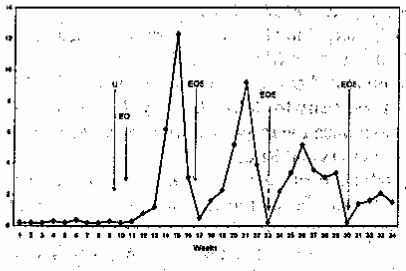

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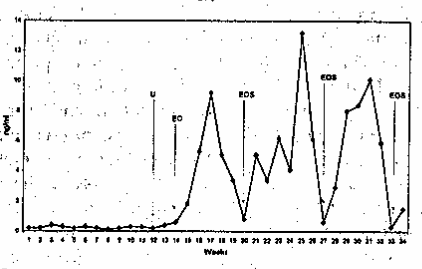

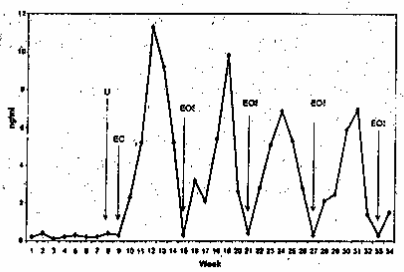

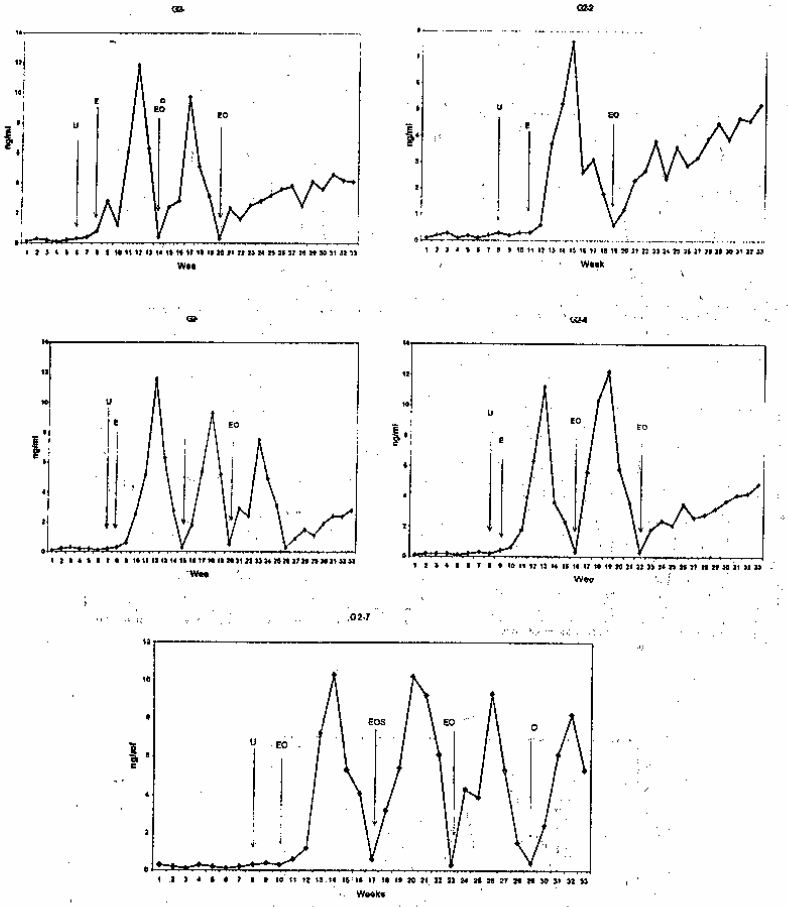
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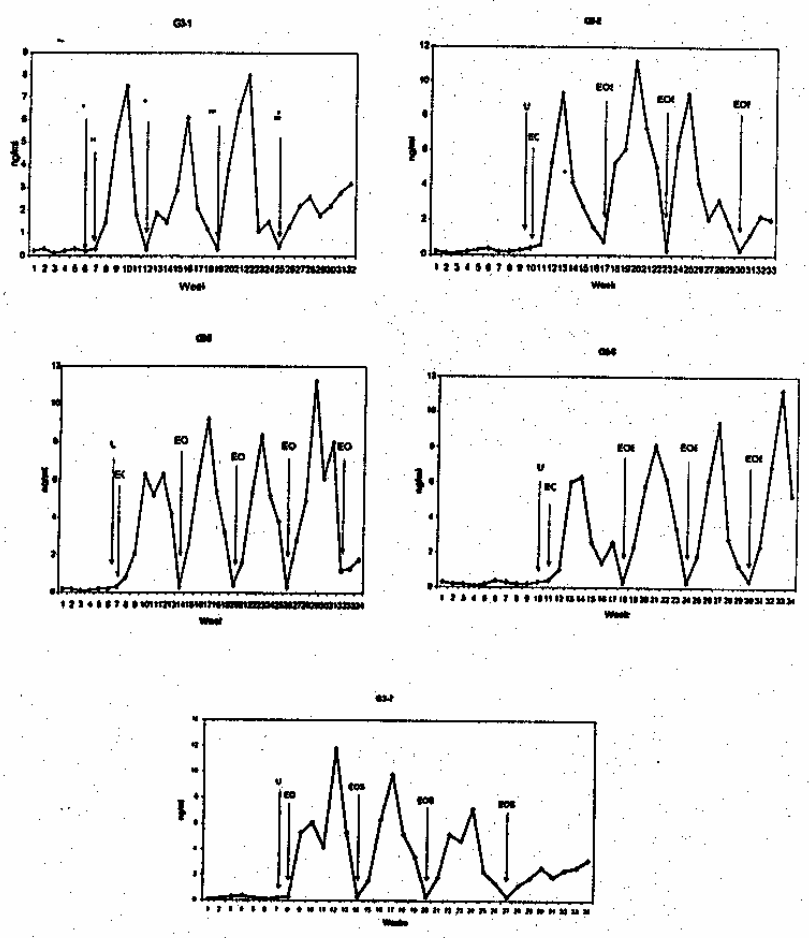

Figure 1. Progesterone profile during the post-partum period in different groups of the experimental animals.

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