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Weight, Body Condition and Calving Interval in Holstein Cows in Transition, Supplemented with Vegetable Oil

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Abstract: To evaluate the body weight and Body Condition Score (BCS) and reproductive performance, 45 multiparous Holstein cows of 3.6±1.6 years of age, 2.2±1.2 calving, of 610.6±46.7 kg prepartum weight and of 3.5±0.37 BCS were used, allotted in: T1 (n = 15) where cows were supplemented orally with 500 mL day^{-1} of vegetable oil and T2 (n = 15) with 250 mL day^{-1}, 15 days before calving and up to 30 days after calving and T3 (n = 15) control. The pp weightamong treatments was similar ($p>0.05$) in the periods evaluated, except at 60 d pp in T3. BCS was the same ($p>0.05$) among groups per periods; except in T3 at 15 d pp. Most weight loss and BCS happened until 45 days pp. The average P_4 at 15 dpp, in all three treatments were <1 ng mL^{-1}, then 1.2, 1.6 and 2.0 ng mL^{-1} were recorded at 30, 45 and 60 dpp, respectively. Ovarian activity was not different among treatments ($p> 0.05$). 46% of cows presented levels >1 ng mL^{-1} of P_4 15 d pp, at 30 d pp 57.7 and 69% at 45 and 60 d pp. The interval calving-first oestrus was different ($p<0.05$) in T3, 36.2±5 d vs 64.5±38 and 50.4±23.9 d for T1 and T2, respectively. Calving interval for T3 was different ($p<0.05$) from T1 and T2, 343.2±25.4 vs 385±71 and 393±60 d pp. Although, there was no difference in weight and BCS per treatment, a good calving interval was achieved; the energy supplementation can be done from 15-45 days postpartum in dairy cows.

Key words: Bovine, transition period, ovarian reactivation, open days, weight

INTRODUCTION

In dairy cows, an important stage for health and productivity is the transition period by changes occurring at metabolic and nutritional level (Huang *et al*., 2014; Sanchez, 2014). During this time feed intake declines which leads to an imbalance among nutritional requirements and consumed nutrients; whereupon the animal mobilizes body fat reserves for maintenance and milk production and this is reflected in an accelerated loss of body condition postpartum (pp). In recent years, the increase in milk production per cow has obliged to change the management of herds and animals have also had physiological changes which has a negative impact on fertility (Badinga *et al*., 2013). One of the practices to minimize the mobilization of adipose tissue during the transition period and increase reproductive efficiency is the supplementation with different fats (vegetable oils, marine oils, modified animal fats, etc.). The type of fat affects the absorption of nutrients, production, feed palatability and milk composition. The most important factor in these supplements is the degree of saturation; unsaturated fats have inhibitory effects on rumen microflora and fiber digestion. Vegetable oils contain more unsaturated fat and therefore are less satisfactory as dietary supplements than animal fat (Staples and Cullens, 2005). Nevertheless, Martinez (2012) reported better fertility at first service in cows fed polyunsaturated fats vs control animals and also the calving-conception interval was 68 vs. 123.5 days for the supplemented and control groups, respectively. The aim of this study was to evaluate the effect of supplementation with vegetable oil during the transition period in dairy cows on the postpartum reproductive performance and body weight.

MATERIALS AND METHODS

The research was conducted at the dairy farm of the Faculty of Veterinary Medicine, University Juárez of Durango, located at km 11.5 of the Durango-Mezquital road, Mexico; on the North Latitude 24°10'00'', West Longitude 104°40'00'' and 1890 MASL. The climate is BS1 (w)(e) dry temperate with rains in summer and cold in winter. The average annual temperature is 17°C and during summer it ranges from 37-39°C with regular rains in June, July and August with an average precipitation of

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450 mm^3, relative humidity of 60.8% in summer (INIFAP, CEVAG, 2013). Total 45 multiparous Holstein cows of 3.6±1.6 years of age, 2.2±1.2 calving, 610.6±46.7 kg of prepartum weight and Body Condition (BCS) of 3.5±0.37 were used, they were allotted randomly into three treatments: T1 (n = 15) cows were orally supplemented with 500 mL day^{-1} of vegetable oil and T2 (n = 15) with 250 mL day^{-1} and T3 (n = 15) control group. The rest of the diet was not controlled and cows received a mixture of minerals (12% Ca and 12% P), season forage, corn silage and concentrate feed with 18% PC (2 kg/cow/day). The vegetable oil composition is saturated fatty acids 1.12 gL^{-1}, monounsaturated 7.59 gL^{-1}, polyunsaturated 4.75 gL^{-1}. The cows were fed the supplement from 13.7±4.1d prepartum, up to 30 days pp in the three groups. Weight, body condition score 15 days prepartum, parturition, 15, 30, 45 and 60 days pp were recorded. Blood samples were taken at 15, 30, 45 and 60 days pp for determination of progesterone by ELISA. Competitive immunoassay of solid phase of chemiluminescence (Immulite Progesterone Kit, LKPW1/Siemens 06603261). Cows with progesterone levels = 1 ng mL^{-1} were considered active in a cyclical and ovarian way. Data were analyzed by ANOVA and the difference among means was established with a Duncan test (SAS, See 9).

RESULTS AND DISCUSSION

Differences in age and number of parities (Table 1) were found per treatment. Although, the start of supplementation was based on the date of the last service of cows, supplementation started at 12±4.2, 11.8±3.6 and 16.8±1.8 d prepartum in T1, T2 and T3, respectively. Weight pp among treatments was similar ($p>0.05$) in the periodsevaluated, except at 60 d pp in T3. BCS was also equal ($p>0.05$) among groups by periods; except in T3 at 15 d pp (Table 2). The weight performance and body condition pp of cows, regardless of treatment is shown in Fig. 1, the steepest loss occurred during the first 45 days. Then, both BCS as the weightstart to recover. It is observed that the weight loss is steeper than BCS.

Regarding ovarian activity, P_4 levels during the first 15 d pp, in the three groups were <1ng mL^{-1}, then 1.4, 1.6 and 2.0ng mL^{-1} at 30, 45 and 60 d pp were recorded, respectively. In general, 42.3% of the cows presented serum levels <1 mL^{-1} at 30 d pp, at 45 and 60 d pp, 69% of the cows had ovarian activity. The first postpartum oestrus was lower in T3 (Table 3) and also, this group was different from T1 and T2 in calving interval ($p<0.05$).

Animals from T1 lost less weight but cows from T2 performed better in terms of weight gain during early lactation (Staples and Cullen, 2005; Martinez, 2012). The

Table 1: Weight and body condition score of Holstein cows supplemented with vegetableoil in the transition period prepartum-calving

Tital	Groups	Mean±SD	Minimum	Maximum
Age	1	$3.0±1.1_a$	1.9	5.2
	2	$3.3±1.2_a$	2.0	5.0
	3	$4.7±2.1_b$	2.0	9.0
Num. of calving	1	$1.7±.79_a$	1.0	3.0
	2	$1.6±.71_a$	1.0	3.0
	3	$3.4±1.4_b$	1.0	6.0
*Prepartum weight	1	$608.7±45.8_a$	520.0	676.0
	2	$607.8±44.2_a$	519.0	668.0
	3	$621.0±55.3_a$	490.0	696.0
*BC	1	$3.6±.33_a$	3.0	4.0
	2	$3.4±.44_a$	2.5	4.0
	3	$3.5±.32_a$	3.0	4.0
**Weight at calving	1	$572.0±47.0_a$	475.0	640.0
	2	$568.2±41.2_a$	485.0	628.0
	3	$576.6 ± 51.5_a$	450.0	645.0

*Weight and BC 15 days before calving; **Weight immediately 12 h after calving. Different letters in column mean $p<0.05$

Table 2: Weight and body condition score of Holstein cows supplemented with vegetable oil in the postpartum transition period

Weight (d)	15	30	45	60
Treatments				
1	$528±50^a$	$519±51^a$	$527±52^a$	$518±60^a$
2	$537±71^a$	$535±75^a$	$540±64^a$	$550±64^a$
3	$564±52^a$	$573±52^a$	$527±143^a$	$573±42^b$
Body condition score				
1	$2.8±.45^a$	$2.6±.50^a$	$2.5±.53^a$	$2.6±.55^a$
2	$2.5±.39^a$	$2.6±.47^a$	$2.6±.50^a$	$2.5±.45^a$
3	$3.1±.40^b$	$2.9±.47^a$	$2.7±.42^a$	$2.8±.49^a$

Different letters in column mean $p<0.05$

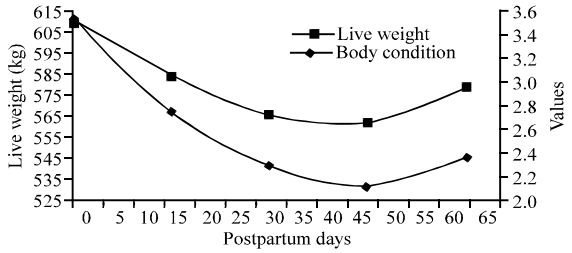

Fig.1: Body weight and body condition postpartum in Holstein cows supplemented with vegetable oil in the transition period (postpartum)

transition period is critical for health, production and reproductive performance of dairy cows; most metabolic disorders occur at this time. The regulation and coordination of the metabolism of adipose tissue, liver, intestine and mammary gland are key components of adaptation for lactation and subsequent reproductive performance. The inclusion of additional sources of fat in the diet may have benefits in the metabolism of animals because the fatty acids are a source of energy and also play an important role in the physiology and metabolism of animals; whose detrimental effects can be minimized if the diet contains large amounts of forage or fiber

Table 3: Postpartum reproductive performance of Holstein cows, supplemented with vegetable oil in the transition period

Variables	T1	T2	T3	Total
1st oestruspp (d)	64.5±38.0$_a$	50.4±23.9$_a$	36.23±5.0$_b$	51.0±30.0
Open days (d)	114.7±101$_a$	107±61.7$_a$	72±51.1$_a$	99.1±75.8
Services/conception	2.0±1.5$_a$	1.9±1.0$_a$	1.9±.95$_a$	1.9±.95.0
Calvinginterval	385.5±71.0$_a$	393.6±60.0$_a$	343.2±25.4$_b$	375±59.5

Different letters in row means p<0.05

(Badinga *et al*., 2013). Forage quality in the transition period is a key factor for normal functioning of the rumen which also contributes to the dry matter intake that provides more energy and nitrogen as well as high amounts of substrate for microbial protein synthesis in the rumen. What is important in any management practiceresults in the impact of the productive cycle of animals, in this case the most important parameter (open days) is considered good in the three groups, although the animals from T3 presented the lowest interval.

CONCLUSION

According to the results obtained with regard to the reproductive performance oil supplementation as the source of fat did not have a positive effect in the control group.Although, due to the performance observed, the addition of an energy source can be performed from day 15 up to 45 d pp, time where the greatest loss of body weight and condition is observed and at the same time, the ovarian activity has been resumed; aspects determining the open days in these animals.

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