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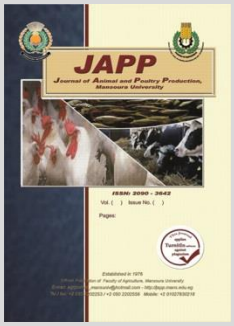
Productive and Reproductive Performances of Primi-parous Friesian Cows Treated with Yeast Culture

Wafa, W. M.[1*]; Mona A. Farag[2] and M. A. El-Kishk[1]

[1] Cattle Breeding Research Department, Animal Production Research Institute, Agricultural Research, Dokki, Giza, Egypt.
[2] Animal Nutrition Research Department, Animal Production Research Institute, Agricultural Research Center, Dokki, Giza, Egypt.



ABSTRACT

This study was conducted to evaluate the effect of dietary supplementation of dairy cows with yeast culture (YC) on productivity and reproduction of primi-parous cows. Animals in the 1st group were fed the control ration (G1), while those in G2 and G3 were fed control ration with 20 and 40 g/h/d yeast culture (n=5 in each) during experimental period of 90 days prepartum and 90 days postpartum. Results show that CF digestion pre- and post-partum, body weight (30 and 90-d postpartum), body condition score (one-d prepartum and 90-d postpartum), daily actual and 4% FCM milk yield, milk fat, total solids and solids not fat contents were higher (P<0.05) in G2 and G3 than in G1, being the highest in G3. Uterine involution was earlier (P<0.05) by 7.6 d and calf performance parameters was better in G3 than in G1. Postpartum 1st estrus interval, days open, P4 at estrus, service period and number of services/conception reduced (P<0.05) in G3 with best conception rate. Serum immunoglobulins (IgG, IgM and IgA) at 0 and 24 h post-calving, RBCs and WBCs counts, hemoglobin, hematocrit, and serum biochemicals in cows and their calves in G3 were the highest (P<0.05), whilst ALT and AST activities were the lowest in cows and calves in G3. The current study may conclude that dietary supplementation pre- and post-partum with yeast culture (40 g/h/day) can enhance productive and reproductive performances of primi-parous cows, and immune response, healthy status of cows and their offspring.

Keywords: Primi-parous cows, calves, immunoglobulins, reproduction, hematology, blood biochemicals

INTRODUCTION

The probiotics are widely used as feed additives in ruminant ration, live yeast can explored as substitute of antibiotic additives that improves gut media condition, promote animal performance and improve reproductive activity with limits excretion of pollutants (Frizzo *et al*., 2011). There is prevalent confidence in livestock producer that yeast and its products had beneficial effect on animal productive and reproductive performance by increased feed intake with maintain ruminant health (Rifat *et al*., 2016). There is old hypothesis interpreted the action of yeast and yeast culture. Yeast cells can grow in the rumen for short time and it act in collaboration with rumen micro-organisms to increase the digestion of fiber and nutrients production, subsequently the ruminal bacteria growth rate will raise and lactic acid utilization increased that led to increase animal dry matter intake as affected by ruminal liquor pH reduction (Thrune *et al*., 2009). In this line, Montes *et al*. (2016) proposed another possibility, yeast grow in rumen utilized little amounts of oxygen that stimulate ruminal bacteria growth especially the cellulolytic bacteria.

Most of dairy heifers in first calving (24 month) are not yet physically mature because the impaired of its metabolic state. In this stage, heifers require more nutrients for their own body growth and developing their calves (Coffey *et al*., 2006). After calving, dairy cows start the early lactation period with insufficient energy balance because the inability of adequate nutrients consumption (Drackley, 1999). The interval from about three weeks prepartum to the beginning of lactation and continued to three weeks postpartum is critical time (Goff and Horst, 1997). Dairy heifers in this period exposed to several changes in metabolic and physiological statuses as affected by calving and milk synthesis (Grummer, 1995; Drackley, 1999). When the nutritional level in this period did not meet heifer requirements, many health problems will be confirm, like dystocia, retained placenta, metritiss, ketosis, milk fever and prolonged or non-estrus cycle (Goff and Horst, 1997).

The nutrition level of dairy cow had significant effect on blood biochemical, hematological and immunoglobulins profiles (Bayram *et al*., 2016; Dunn *et al*., 2017). Yeast culture is the major microbial additive in ruminant ration, it can improve cattle ruminal function and subsequently increases milk production with normal reproductive and immune status (Nocek *et al*., 2011). Yeast has positive effects on animal blood hematology, which was reflected in general health status improvement (Agazzi *et al*., 2014). Also, several investigations found that, immunity of dairy cows was improved in terms of increasing the blood protein and its fractions, and decreasing AST and ALT activity in blood cows treated with yeast (Fröhdeová *et al*., 2014, Tóthová *et al*., 2014; Wafa, 2017). The present study aimed to evaluate the productive and reproductive performance, and blood constitutes of heifers at first reproductive season as affected by feeding on ration containing different levels of yeast culture

MATERIALS AND METHODS

This study was carried out at El-Gemmizah Experimental Station, belonging to Animal Production

* **Corresponding author.**
E-mail address: drwailfatoh1973@hotmail.com
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Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt.

Animals and feeding system:

Fifteen Friesian heifers at late 1st pregnancy (primi-parous cows) with average body weight of 407 kg and 30 month of age were used in the present study.

Throughout the experimental period, animals in all groups were fed basal ration according to NRC (1988) requirements. This ration contained 55% concentrate feed mixture (CFM),, 20% corn silage (CS), 15% rice straw (RS) and 10% berseem hay (BH: 2nd cut). The CFM composed of 34% corn grain, 20% uncorticated cotton seed cake, 20% wheat bran, 20% rice polish, 3% molasses, 2% limestone and 1% salt. The chemical analysis of different feedstuffs of experimental basal ration on dry matter basis was present in Table (1). Heifers housed in open sheds. Free fresh water was available all day time.

Table 1. Chemical analysis of different feedstuffs and the basal ration (on DM basis, %) used for feeding all groups.

Feedstuffs	DM	Chemical analysis (%) on DM basis					
		OM	CP	CF	EE	NFE	ASH
CFM	86.91	91.51	16.78	11.14	2.23	61.36	8.49
CS	35.11	88.35	8.85	19.56	2.42	57.52	11.65
RS	90.81	79.46	3.01	38.12	1.52	36.81	20.54
BH	88.67	88.24	12.34	28.91	2.26	44.73	11.76
Basal ration	77.31	88.74	12.68	18.65	2.17	55.24	11.26

The experimental groups:

The experimental primi-parous cows (n=15) were divided in randomized design to three groups (n = 5 animals in each). Animals in the 1st group were fed the basal ration without supplementation (control group; G1), while those in the 2nd and 3rd groups were fed the basal ration supplemented with 20 and 40 g/h/d yeast culture (YC).

The experimental period lasted from 90 days prepartum till 90 days postpartum. The used yeast culture (Thepax 100R, Dox-A1 Italia SpA, Sulbiate, Italy) is in-activate strains of *Saccharomyces cerevisiae* that contained $1x10^{10}$ colony forming unit g^{-1} concentration.

Digestibility trails:

Two digestibility coefficients were determined using three animals from each group, after 30 days of YC treatment period and at 30 days postpartum to determine the nutrients digestibility coefficients and nutritive values of rations. Samples of fresh feces were taken from each animal at three successive days at 7 a.m. and 5 p.m., weighed, dried for 24 hours at 60°C in oven and ground. About 10% of grounded samples preserved in plastic bottles for analysis using acid insoluble ash (AIA) method according to VanKeulen and Young (1977). A representative samples of CFM, corn silage, berseem hay, rice straw and feces were analyzed to determined DM, CP, EE, CF and ash then the nitrogen free extract (NFE) was calculated as described by A.O.A.C. (1995).

Experimental procedures:

Animals were individually weight at 90 days prepartum and at calving. However, body condition score (BCS, 1-5) was determined to each animal using Edmonson *et al*. (1989) method. Average daily feed intake was individually recorded and expressed as DM, TDN and DCP.

Milk production in terms of daily actual and 4% fat corrected milk (FCM), milk composition, and somatic cell count (SCC) were determined using MILKOSCOPE (Julle C8 Automatic, Slovak Republic).

Reproductive performance:

Reproductive performance of primi-parous cows including calve birth weight, weight and time to drop of placenta, uterine involution, postpartum 1st estrus interval, service period, number of services per conception, days open, conception rate, and blood progesterone level at estrus were determined. Uterine involution was measured by rectal examination for all cows twice weekly from 7 day postpartum until two equal successive examination, as the interval from calving to sameness of uterine horns. Service period was determined as the interval from 1st service up to the fertile service (conception). Days open interval was considered as the interval from calving to conception, while conception rate was calculated according to the following: (Number of pregnant/number of serviced cows) x100.

Blood sampling:

Blood samples were collected from the jugular vein puncture at the end of experimental period. Each blood sample was divided to two portions the first one (without anticoagulant) for biochemical parameters analysis (total protein, albumin, globulin, total lipids, total cholesterol, glucose, and creatinine) and enzymes activity of aspartate (AST) and alanine (ALT) transaminases and the second portion with anticoagulant (EDTA) used for determination of the hematological parameters in the whole blood. The first portion of blood samples was allowed to colt at room temperature, then it centrifuged for 20 min at 3000 rpm then blood serum was separated and stored until analysis at -20°C. The second portion of blood samples were used to count red and white blood cells (RBCs and WBCs) using heamocytometer, while hemoglobin concentration (Hb), and packed cell volume (PCV) were determined directly by Mission® Plus kit (REF C132-3031, USA) according to Henry (2001).

Assay of immunoglobulins:

Concentrations of different types of immunoglobulins, including IgG, IgA, and IgM were measured in blood serum collected from each cow and its calf at 0 and 24 h of calving. Immunoglobulin concentrations were assayed by quantitative ELISA (Bovine IgG, IgM, and IgA ELISA Quantitative kit, Bethyl laboratories, UK) as described by Killingsworth and Savory (1972).

Concentration of blood biochemicals and hormones:

In blood serum collected monthly from 90d pre-partum till 90d postpartum, concentrations of total proteins (Henry, 1964), albumin (Doumas *et al*., 1971), total lipids (Zollner and Kirsch, 1962), cholesterol (Richmond, 1973), glucose (Trinder, 1969) and creatinine (Bartles *et al*., 1972) was determined. Also, the activity of AST and ALT in blood serum was identified as descripted by Reitman and Frankel (1957). However, the globulin concentration was calculated by subtraction albumin from the total protein concentration.

The concentrations of progesterone (P_4) at estrus were assayed in blood serum by radioimmunoassay (RIA) commercial kits (Coat-A-Count®-TKT31) using Automatic Mini-Gamma Counter (LKB-1275; Saunders, 1995).

Statistical analysis:

Data were analyzed using one-way ANOVA analysis within IBM SPSS statistical program (version 20) to evaluate the effect of yeast culture treatment pre- or post-partum. The results were expressed as means ± SE. The significant differences among means were tested using Duncan's

multiple range test according to Duncan (1955), when the F-value reveals significant differences at $P < 0.05$.

RESULTS AND DISCUSSION

Effect of yeast culture treatment of prim-parous cows on:

Digestibility and nutritive values:

Data in Table 2 showed significant differences ($P<0.05$) only in CF digestibility pre- and post-partum period. Digestibility coefficient of CF pre- and post-partum was significantly ($P<0.05$) higher in treatment groups (G2 and G3) than in G1 (control), but animals in G3 showed insignificantly higher CF digestion than those in G2. On the other hand, digestibility coefficients of DM, OM, CP, EE, and NFE as well as nutritive values were higher in treatment groups than in control, but the difference was not significant. The observed improvement in CF digestion pre- and post-partum may be due to the role of yeast culture in improving the ruminal function that allow microflora (ruminal microorganisms) to enhance the nutrient degradation. In this concern, Thrune *et al.* (2009) reported the possibility of growing the yeast cells under the ruminal condition for short time, leading to increasing the digestion of fiber and other nutrients in collaboration with ruminal microflora. This will raise growth of ruminal bacteria and increase lactic acid utilization.

Table 2. Nutrient digestibility coefficients and nutritive values (%) determined by cows at pre- and post-partum periods.

Group	Nutrient digestibility (%)						Nutritive values (%)	
	DM	OM	CP	CF	EE	NFE	TDN	DCP
				Prepartum				
G1	64.5±1.45	65.5±2.33	66.5±2.56	51.6±1.27^{b}	68.0±1.76	73.4±1.93	61.93	8.43
G2	65.8±2.88	66.8±1.42	68.0±2.11	54.4±1.58^{a}	69.1±2.56	73.9±2.56	62.97	8.62
G3	66.8±1.32	67.6±2.24	68.3±0.17	55.1±1.33^{a}	69.7±2.36	74.8±1.1	63.66	8.66
				Postpartum				
G1	65.2±0.81	66.5±1.67	67.2±2.26	52.5±1.11^{b}	70.8±2.46	73.7±2.02	62.67	8.52
G2	67.5±2.11	67.9±2.07	68.0±1.09	54.8±1.98^{a}	71.2±2.43	74.1±1.56	63.27	8.63
G3	68.0±1.32	68.4±1.97	68.7±0.79	56.2±1.07^{a}	71.7±1.02	74.9±1.41	64.03	8.71

a and b: Values with different superscripts within the same column are significantly different at P< 0.05.

Body weight, body condition score, and feed intake:

Results in Table 3 showed insignificant differences in live body weight from 90-d prepartum up to one-d postpartum. However, from 30 to 90-d postpartum, body weight was significantly ($P<0.05$) higher in treatment groups than in control, being significantly ($P<0.05$) the highest in G3.

Table 3. Live body weight, body condition score and feed intake of cows in experimental groups at pre- and post-partum periods.

Item	G1	G2	G3
	Live body weight (kg):		
90-d prepartum	407.3±22.15	406.8±26.25	408.9±27.36
One-d prepartum	468.2±22.85	473.3±28.15	478.6±25.31
At calving	406.4±21.75	406.0±21.23	408.9±23.90
30-d postpartum	391.0±18.95^{c}	394.7±21.20^{b}	399.9±22.34^{a}
90-d postpartum	402.3±19.28^{c}	416.0±18.20^{b}	433.7±18.12^{a}
	Body condition score:		
90-d prepartum	2.48±0.03	2.46±0.06	2.47±0.02
One-d prepartum	2.66±0.05^{b}	2.75±0.04^{a}	2.83±0.08^{a}
30 d post-calving	1.75±0.02	1.85±0.04	1.96±0.07
90 d post-calving	2.05±0.03^{b}	2.49±0.05^{a}	2.61±0.03^{a}
	Feed intake (kg/h/d) during prepartum period:		
DM	11.53	11.53	11.53
TDN	7.14	7.26	7.34
DCP	0.972	0.994	0.998
	Feed intake (kg/h/d) during postpartum period:		
DM	12.66	12.66	12.66
TDN	7.93	8.01	8.11
DCP	1.08	1.09	1.11

a, b and c: Values with different superscripts within the same row are significantly different at P< 0.05.

In addition, BCS of treatment groups (G2 and G3) showed significantly ($P<0.05$) increased as compared to those in G1 only one-d prepartum and 90-d postpartum. In this respect, Mostafa *et al.* (2014) found that feeding dairy cows on diets with YC supplementation had insignificant effect on LBW of cows at pre-partum period and calving.

Data in Table 3 indicated slight differences in feed intake as TDN and DCP at pre- and post-partum periods, being the highest in G3, followed by G2, and the lowest in G1. This trend is in accordance with Ayad *et al.* (2013), who reported clear improvement in ration digestibility of dairy cows associated with yeast culture treatment.

Milk yield and composition:

Results presented in Table 4 showed significant ($P<0.05$) effect for YC treatment on daily milk yield as actual or 4% FMC, being significantly ($P<0.05$) the highest in G3, moderate in G2, while the lowest in G1. Daily actual milk yield was higher by about 7.1 and 12.4% in G2 and G3 compared to G1, Also, daily 4% FCM was higher in G2 (9.6%) and in G3 (17.7%) than in G1. On the other hand, contents of protein, lactose, and SCC were not affected by YC treatment.

Data in Table 4 showed that YC treatment in G3 significantly ($P<0.05$) improved milk fat and total solids contents compared with other groups (G1 and G2).

Table 4. Milk production and constituents of cows in different treatment groups.

Item	G1	G2	G3
Daily milk yield (kg)	11.14±0.33^{c}	11.93±0.45^{b}	12.52±0.36^{a}
4% FCM yield (kg)	9.64±0.40^{c}	10.57±0.52^{b}	11.35±0.43^{a}
Fat (%)	3.10±0.13^{b}	3.19±0.13^{b}	3.38±0.45^{a}
Protein (%)	2.38±0.05	2.52±0.13	2.41±0.06
Lactose (%)	4.35±0.04	4.42±0.05	4.40±0.03
Total solids (%)	10.67±0.17^{b}	10.95±0.22^{b}	11.02±0.14^{a}
Solids not fat (%)	7.57±0.05^{b}	7.76±0.12^{a}	7.63±0.06^{a}
SCC (x10^{6})	117.0±14.9	98.0±14.0	86.8±16.8

a, b and c: Values with different superscripts within the same row are significantly different at (P< 0.05).

The obtained results of milk yield and composition indicated positive effects of the dietary inclusion of YC at a level of 40 g/h/d on milk production as compared to YC at a level of 20 g/h/d or unsupplemented diet. The improved in milk yield by YC is in agreement with results of Abdel-Khalek *et al.* (2002) and Ghorab (2007). Meanwhile, some studies indicated no significant differences in milk production of dairy cattle treated with YC (Bonadaki *et al.*, 2004). The presented increase in content of fat percentage was similar to that obtained by Abdel-Khalek (2003), and contrasted that reported by Biricik and Yavuz (2001), who indicated no significant effect for YC treatment on milk fat percentage. The obtained increase in TS percentage in milk of primi-parous Friesian cows treated with

YC is in accordance with the results of Abd El-Ghani (2004). While, Biricik and Yavuz (2001) indicated that YC had no effect on the percentage of TS in dairy cow milk. The significant effect of YC on the content of milk SNF was in agreement with Alshaikh *et al.* (2002) results, while, Ghorab (2007) did not find any significant effect for YC treatment on milk SNF. As indicated by Schingoethe *et al.* (2004), YC treatment did not affected in primi-parous cow milk SCC, while the slight improved in YC treatment groups was in accordance with the findings of Shaver and Garrett (1997). Some studies indicated that YC supplementation throughout the first stage of lactation significantly decreased SCC (Zaworski *et al.*, 2014). The observed confliction in the results of YC on milk production may be related to type, level, and strain of YC as well as feeding system, managerial factors and type of lactating animals.

Reproductive performance:

Data in Table 5 showed that among calving characteristics, only uterine involution duration was significantly (P<0.05) earlier by 7.6 d in G3 than in G1, but did not differ significantly in G2 than in G1 or G3, However, weight and time spend to drop of placenta were not affected significantly by YC treatment. Also, YC treatment in G3 significantly (P<0.05) improved calf performance parameters, in term of increasing birth and weaning weights, and total and average daily gain of calves.

Table 5. Calving characteristics, calf performance and reproductive traits of cows in expeimental groups.

Item	G1	G2	G3
Calving characteristics:			
Placental weight (kg)	4.10±0.42	4.70±0.57	4.20±0.27
Fetal membrane drop (h)	4.00±0.79	3.50±0.18	4.00±1.58
Uterine involution (d)	35.60±1.20^{a}	32.80±2.24^{ab}	28.0±1.50^{b}
Calf performance:			
Birth weight (kg)	32.6±1.90^{b}	34.60±2.40^{b}	41.40±2.60^{a}
Weaning weight (kg)	78.0±10.40^{b}	81.40±4.70^{ab}	94.20±11.80^{a}
Total gain (kg)	45.40±2.50^{b}	46.80±3.40^{b}	52.80±2.70^{a}
Average daily gain (kg)	0.43±0.10^{b}	0.45±0.06^{b}	0.50±0.08^{a}
Reproductive traits:			
Postpartum 1st estrus interval (d)	69.8±5.20^{a}	69.60±3.39^{a}	51.20±2.98^{b}
Service period length (d)	30.80±8.1^{a}	4.40±0.08^{b}	0.0±0.0^{c}
Number of service per conception	1.80±0.08^{a}	1.20±0.05^{b}	1.0±0.0^{c}
Days opend	100.60±16.20^{a}	74.00±12.9^{ab}	51.20±2.98^{b}
Conception rate at 90-d postpartum	40% (2/5)	80% (4/5)	100% (5/5)
Progesterone at estrus (ng/ml)	0.52±0.04^{a}	0.45±0.05^{a}	0.30±0.03^{b}

a and b: Values with different superscripts within the same row are significantly different at P< 0.05.

Concerning the reproductive traits studied, results in Table 5 showed significant (P<0.05) effect of YC on all reproductive traits. Postpartum 1st estrus interval, days open and P4 level at estrus significantly (P<0.05) reduced by YC at a level of 40 g/h/d, while service period length and number of services per conception were significantly (P<0.05) decreased by both YC levels, being the lowest for YC at 40 g/h/d. In addition, cows in YC treated groups recorded high conception rate compared to those in control one.

These results may indicate beneficial impacts of dietary YC supplementation (40 g/h/d) during prepartum period on prompting the uterine involution, increasing growth performance of born calves and improving reproductive performance during early postpartum period.

It is clear that, transition period in dairy cattle is a critical time because the increase in nutritional request and occurrence of metabolic diseases which stresses the immune system (Goff and Horst, 1997). The ovarian activity may affected by postpartum negative energy balance in dairy cows that may by decreasing LH concentration and subsequently delayed luteal activity resumption (Opsomer *et al.*, 2000). Dietary supplementation of YC during the transition period for dairy cows exposed to nutritional problems may be a tool for solving the decreased reproductive performance (Ferguson, 2001). This impact was reported by many authors, who found that treatment animals with YC improve the reproductive performance significantly then increased conception rate (Abu El-Ella and Kommonna, 2013) with better immune response (Young, 2012).

Immune response of cows and calves:

Data in Table 6 revealed significant (P< 0.05) increase in serum immunoglobulins (IgG, IgM and IgA) concentrations in cows of G3 at 0 and 24 h of calving as compared to controls (G1). Also, serum immunoglobulins levels in calves were significantly (P< 0.05) higher in G3 than in G1 and G2 either at 0 or 24 h of calving (Fig. 1). These results are in agreement with previous investigations reporting that mannan-oligosaccharides supplementation increased animal immunoglobulin concentration (O'Quinn *et al.*, 2001; Franklin *et al.*, 2002). Results indicated a reduction in immunoglobulins concentration in cow serum after calving in all groups, which may be attributed to immunoglobulins transportation from blood to mammary glands to produce the colostrum (Heriazon *et al.*, 2011) that increase its concentration in calves blood serum (Table 6). The present results of cow immune response was in accordance with Sanchez *et al.* (2014), who indicated that, YC can improve immune status. Generally, YC had clear role in immune system stimulation and health improvement (Kalmus *et al.*, 2009).

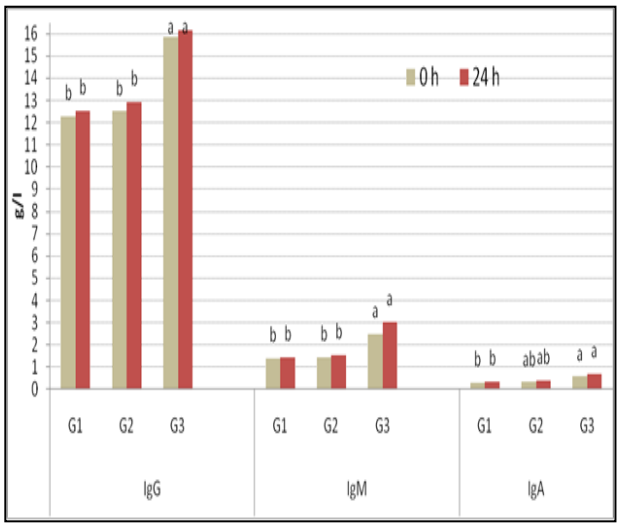

Fig. 1. Blood immunoglobulins concentrations of calves in experimental groups.

Table 6. Blood immunoglobulins concentrations of cows in experimental groups.

Ig level	G1		G2		G3	
(g/l)	0 h	24 h	0 h	24 h	0 h	24 h
IgG	18.67±1.37^{b}	18.37±1.23^{b}	19.20±1.91^{b}	18.72±1.57^{b}	22.10±1.65^{a}	21.40±1.64^{a}
IgM	4.16±0.91^{b}	3.90±0.46^{b}	4.89±1.05^{ab}	4.50±0.64^{ab}	5.44±0.35^{a}	5.10±0.51^{a}
IgA	0.340±0.11^{b}	0.331±0.12^{b}	0.363±0.12^{b}	0.372±0.11^{b}	0.832±0.12^{a}	0.846±0.13^{a}

a and b: Values with different superscripts within the same row for each time are significantly different at P< 0.05.

Hematological parameters:

Results of Table 7 showed significantly (P<0.05) the highest values of count of RBCs and WBCs, hemoglobin concentration and PCV percentage of cows and their calves in G3 as compared to other groups. The trend of change in all hematological parameters was the same in cows and their calves. The significant increase in WBC of cows treated with YC was in matching with Burton and Erskine (2003), who indicated that at parturition, cows had experience neutrophilia. It is of interest to note that, all values of determined hematological parameters were within the normal range of healthy animals (Heinrichs *et al*., 2003). Generally, Radkowska and Herbut (2014) stated that hematological parameters are affected by cow nutrition. Therefore, YC treatment had significant effect on these parameters (Ghazanfar *et al*., 2015). The observed improvement in hematological parameters of dams and their calves is in association with clear improvement in the immunity status.

Table 7. Some blood hematological of cows and their calves in experimental groups.

Item	Animals	G1	G2	G3
RBC	Dams	7.50±0.10^{b}	7.72±0.12^{b}	8.10±0.10^{a}
($x10^6/mm^3$)	Calves	6.76±0.38^{b}	7.10±0.37^{b}	9.13±0.32^{a}
WBC	Dams	7.68±0.12^{b}	8.13±0.10^{a}	8.27±0.12^{a}
($x10^3/mm^3$)	Calves	9.17±0.90^{b}	9.79±1.01^{a}	10.29±0.78^{a}
Hb (g/dl)	Dams	10.11±0.27^{b}	10.46±0.26^{b}	11.17±0.28^{a}
	Calves	10.27±0.58^{b}	10.54±0.50^{b}	12.33±0.49^{a}
PCV (%)	Dams	32.43±0.32^{b}	34.90±0.39^{a}	35.48±0.32^{a}
	Calves	31.60±1.72^{b}	31.40±1.21^{b}	36.30±1.11^{a}

a and b: Values with different superscripts within the same row are significantly different at P< 0.05.

Blood biochemical concentrations:

Cows treated with YC and their calves in G3 had significantly (P<0.05) the highest serum concentrations of total proteins, albumin, total lipids, total cholesterol and glucose. However, creatinine concentration was the lowest insignificantly in treated cows and significantly (P<0.05) in calves of G3 compared with G2 and G1 (Table 8). The activity of ALT and AST enzymes was the lowest in cows and calves treated with YC in G3. As affected by YC treatment, the present results are in accordance with those reported by Burdick Sanchez *et al*. (2014), who indicated marked alterations in blood energy metabolites as affected by YC then it improve immune status. The increase in total lipids concentration in blood serum of primi-parous cows and their calves in G3 was attributed with improve digestibility of nutrients that increased the availability of digestible components in suckled milk for calves (Strusinka *et al*., 1998). In addition, increasing glucose level in cows and their calves of G3 may be attributed with gluconeogenesis improvement then lactose absorption increase (De Valdez *et al*., 1997). The present results concerning reducing the activity of serum AST and ALT of cows and their calves in G3 is in agreement with Hammon and Blum (1998), who reported a relationship between AST and ALT activity in calf blood and the suckled milk quality. Generally, the positive effects of YC treatment on improvement of blood biochemicals are in agreement with Ghoneem and Mahmoud (2014) and Fröhdeová *et al*. (2014).

Table 8. Some blood biochemicals concentrations of cows and their calves blood in experimental groups.

Item	Animals	G1	G2	G3
Total protein	Dams	7.38±0.14^{c}	7.61±0.06^{b}	8.10±0.07^{a}
(g/dl)	Calves	6.48±0.28^{b}	7.13±0.32^{b}	8.29±0.26^{a}
Albumin	Dams	3.70±0.06^{c}	4.06±0.05^{b}	4.47±0.07^{a}
(g/dl)	Calves	3.86±0.16^{b}	4.27±0.21^{b}	5.01±0.17^{a}
Globulin	Dams	3.67±0.15	3.55±0.05	3.63±0.02
(g/dl)	Calves	2.62±0.19^{b}	2.85±0.24^{ab}	3.29±0.26^{a}
Total lipids	Dams	552.4±27.5^{c}	679.1±26.0^{b}	787.4±27.4^{a}
(mg/dl)	Calves	586.9±7.27^{c}	610.98±5.96^{b}	644.04±8.11^{a}
Total cholesterol	Dams	144.1±10.0^{c}	193.6±13.8^{b}	233.3±15.0^{a}
(mg/dl)	Calves	98.67±3.86^{c}	112.45±3.76^{b}	128.45±3.51^{a}
Glucose	Dams	42.90±1.75^{c}	49.86±1.79^{b}	54.84±1.32^{a}
(mg/dl)	Calves	73.50±2.66^{b}	80.67±3.14^{b}	100.97±2.90^{a}
Creatinine	Dams	1.19±0.04	1.12±0.06	1.10±0.02
(mg/dl)	Calves	1.59±0.09^{a}	1.36±0.10^{ab}	1.16±0.08^{b}
AST	Dams	26.67±1.50^{a}	23.24±1.81^{a}	16.48±1.10^{b}
(IU/l)	Calves	36.24±1.10^{a}	32.30±0.98^{b}	28.40±0.79^{c}
ALT	Dams	2.19±0.22^{a}	2.00±0.19^{a}	1.88±0.18^{b}
(IU/l)	Calves	4.61±0.36^{a}	2.61±0.29^{b}	2.06±0.31^{b}

a, b and c: Values with different superscripts within the same row are significantly different at P< 0.05.

CONCLUSION

The current study may conclude that dietary supplementation of primi-parous cows pre- and post-partum with yeast culture at a level of 40 g/h/day can enhance digestibility and nutritive values of feeds, body weight, body condition score, milk yield and composition, reproductive performance of cows, and immune response that improve health status of cows and their offspring.

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الأداء الإنتاجي والتناسلي لأبقار الموسم الأول المعاملة ببيئة الخميرة

وائل محمد وفا[1]*، منى السيد فرج[2] و محمد عبدالحكيم الكشك[1]

[1] قسم بحوث تربية الأبقار – معهد بحوث الانتاج الحيواني – مركز البحوث الزراعية – الدقي – الجيزة – مصر

[2] قسم بحوث تغذية الحيوان – معهد بحوث الانتاج الحيواني – مركز البحوث الزراعية – الدقي – الجيزة – مصر

أجريت هذه الدراسة بهدف تقييم تأثير إضافة الخميرة لعليقة الأبقار في الموسم الأول على الأداء الإنتاجي والتناسلي حيث تم تغذية الأبقار في المجموعة الأولى (G1) على عليقة الكنترول بينما غذيت أبقار المجاميع الثانية (G2) والثالثة (G3) على عليقة الكنترول مع 20 و 40 جم خميرة يوميا (5 حيوانات في كل مجموعة) خلال فترة التجربة من 90 يوم قبل الولادة حتى 90 يوم بعد الولادة وأظهرت النتائج زيادة معنوية (عند مستوى معنوية < 0.05) في هضم الألياف الخام , وزن الجسم (30 و 90 يوم بعد الولادة) , حالة الجسم (قبل الولادة بيوم و بعد الولادة بـ 90 يوم) , إنتاج اللبن الفعلي والمعدل نسبة الدهن به إلى 4٪ , مكونات اللبن من الدهن والجوامد الكلية والجوامد اللادهنية في المجاميع الثانية (G2) والثالثة (G3) عن المجموعة الأولى (G1) وكانت الأعلى في المجموعة الثالثة (G3). عاد الرحم لوضعة الطبيعي مبكرا بشكل معنوي (عند مستوى معنوية < 0.05) بحوالي 7.6 يوم وكان أداء العجول أفضل في المجموعة الثالثة (G3) عن المجموعة الأولى (G1). قلت الفترة من الولادة حتى الشياع الأول , الفترة المفتوحة وفترة التلقيح وقل عدد التلقيحات اللازمة لحدوث الحمل معنويا وإنخفض مستوى هرمون البروجيسترون عند الشياع (عند مستوى معنوية < 0.05) في المجموعة الثالثة (G3) مع أفضل معدل لحدوث الحمل. كان محتوى السيرم من الجلوبيولينات المناعية عند الولادة وبعد 24 ساعة , عدد كريات الدم الحمراء , عدد كريات الدم البيضاء , الهيموجلوبين , الهيماتوكريت والمكونات البيوكيميائية أعلى في أبقار مواليد المجموعة الثالثة (G3) بينما كان أقل نشاط إنزيمي لكل من ALT و AST في أبقار مواليد المجموعة الثالثة (G3). يمكن أن يستخلص من الدراسة الحالية أن إضافة بيئة الخميرة إلى علائق أبقار الموسم الأول قبل وبعد الولادة بمستوى 40 جم للرأس يوميا يمكن أن يحسن الأداء الانتاجي والتناسلي للأبقار والاستجابة المناعية والتي يمكن أن تحسن من الحالة الصحية للأبقار ومواليدها.