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PHYSIOLOGICAL RESPONSES OF SHEEP TO DIET SUPPLEMENTATION WITH YEAST CULTURE

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ABSTRACT

The effect of dietary yeast culture (YC) supplementation during pre-mating and gestation periods on some physiological responses was studied in 48 Suffolk crossbred ewes aged 3-4 years and weighed 58.54 ± 1.34 kg. The animals were divided into 3 comparable groups. The 1st group was fed a basal ration composed of 60% concentrate feed mixture (CFM) plus 40 % clover and rice straw. The 2nd and 3rd groups fed the same basal ration which supplemented daily with 2.5 or 5.0 g YC added to a part of the ground CFM, respectively. Results showed that YC supplementation improved significantly (P<0.05) reproductive ability, prolificacy, lambs born/ewes joined, lambs weaned/ewes lambed, kg of lambs born or weaned/ewes joined or /ewes lambed and insignificantly affected conception rate, fertility, fecundity and twinning frequency compared to those of control ewes. It also resulted in higher (P<0.05) serum albumin, glucose, urea concentration and AST activity but it decreased cholesterol concentration (P<0.05) than control ewes. Serum albumin and urea did not significantly differ among gestation periods. However, total protein, globulin, glucose and cholesterol concentrations progressively increased (P<0.05) with the advancement of pregnancy especially up to the 15th week of gestation followed by a decrease up to lambing. The A/G ratio showed an opposite trend (P<0.05), meanwhile creatinine concentration and activity of AST and ALT were fluctuated. Rectal and skin temperatures, pulse rate and respiration rate were lower (P<0.05) in YC supplemented ewes than those in control ones. It can be concluded that yeast culture supplementation could be safely added to ewes ration at 5.0 g /d/head during pre-mating and gestation periods in order to improve the reproductive performance, blood components and thermo-cardio-respiratory responses without any adverse effects on liver and kidney functions.

Key words: Yeast culture, sheep, reproductive traits, blood parameters, thermo-respiratory cardio- responses.

ITRODUCTION

The lack of sufficient feeds to meet the nutritional requirements of the existing animal population is one of the most critical problems of animal production in Egypt **(Yousef and Fayed, 2001)**. For many years, ruminant nutritionists and microbiologists have been interested in manipulating the microbial ecosystem of the rumen to improve feed utilization and productive efficiency by ruminants. The manipulation of rumen microbial activity including dietary antibiotics and probiotics has been widely studied during the last 20 years. The probiotics (bacterial and yeast cultures) are live microbial feed supplements and have been used as growth promoters to replace the widely used antibiotics and synthetic chemical feed supplements **(Higginbotham and Bath, 1993; Brydt *et al*., 1995; Sumeghy, 1995 and Strzetelski, 1996).** Using yeast culture (YC) in ruminant diets to improve performance has been reviewed by **Williams (1989) and Wallace (1994**) and it was found to increase blood total protein **(El-Shaer, 2003)**, glucose concentration **(Sharma *et al*., 1998)** and decrease cholesterol **(Fayed *et al*., 2005)**. An improvement in reproductive performance was also obtained by **Abdel-Khalek (2003)** in Friesian cows and **Ebrahim (2004)** in

Egyptian buffaloes. During heat stress, sheep performance was improved by adding YC. **El-Shaer, (2003)** detected a decrease of rectal and skin temperatures as well as pulse and respiration rates.

The objectives of the present study were to determine and assess the effect of yeast culture supplementation during pre-mating and gestation periods on reproductive performance, some blood components and thermo-cardio-respiratory responses of pregnant Suffolk crossbred ewes, as a reliable biological indicators of animals' health and performance.

MATERIALS AND METHODS

The present study was conducted at El-Gemmaiza Experimental Station, Animal Production Research Institute, Agriculture Research Center, Egypt. In this respect, 48 crossbred Suffolk ewes of 3-4 years old and 58.54 ± 1.34 kg body weight were divided into 3 comparable groups. The first group was fed in group according to **NRC (1989)** on a basal ration composed of 60%concentrate feed mixture (CFM) plus 40 % clover, or clover hay and rice straw and served as control. The other two groups were fed the same basal ration and supplemented daily with either 2.5 or 5.0 g YC, which were added to part of the ground CFM. Chemical composition of the basal rations and of YC are shown in Tables 1 and 2. All animals were free from diseases and parasites and housed in semi-shaded well ventilated pens.

After two weeks of starting YC addition, all ewes were subjected to heat detection 3-times daily. Ewes exhibited receptive and stood for mounting were subjected to natural mating by a fertile and mature ram. Reproductive traits of ewes in response to YC supplementation and in control ewes were recorded including the following:

1) Conception rate (CR): percentage of ewes conceived/ewes joined.
2) Fertility: percentage of ewes lambed/ewes joined.
3) Fecundity: percentage of lambs born / ewes joined
4) Prolificacy: percentage of lambs born/ewes lambed (lambing rate).
5) Reproductive ability: percentage of lambs weaned of ewes joined.
6) Percentage of lambs weaned/ewes lambed.
7) Kilograms of lambs born/ewes joined.
8) Kilograms of lambs born/ewes lambed.
9) Kilograms of lambs weaned/ewes joined.
10) Kilograms of lambs weaned /ewes lambed.
11) Mortality: percentage of died lambs from birth to weaning.

Blood samples were collected regularly at 3 weeks intervals from 3-4 ewes / each group by jugular vein puncture just before morning feeding and drinking which started at mating day. Harvested serum, after centrifugation at 4000 rpm/15 minutes, was stored at – 20^{o} C until chemical analysis that included aspartate amino transferase (AST), alanine amino transferase (ALT) enzyme activities according to **Reitman and Frankel (1957)**; glucose, cholesterol, urea (**Henry, 1965);** creatinine (**Bartels, 1971);** total protein and albumin (**Doumas and Biggs, 1972 a and b**) using commercial colorimetric kits. Globulin was calculated by subtraction concentration of albumin from that of total protein then albumin / globulin ratio (A/G ratio) was also estimated.

Rectal temperature (RT), skin temperature (ST), pulse rate (PR) and respiration rate (RR) were individually recorded using 5 ewes from each group which started 30 days after mating day. Rectal temperature was measured using Tele-thermometer (one-digit, inserted 3-4 cm into the rectum and hold in place for a minute). Skin temperature measured with a plate of 10 mm diameter fixed in skin folds. Ambient temperature (AT) was also recorded using dry bulb thermometer and relative humidity percent (RH) using thermo-hygrograph located about 1.5 meters above the ground. Temperature humidity index (THI) was calculated according to **Lphsi (1990)** using the following equation:

THI = db – (0.55 – 0.55 RH) (db – 58), Where:
Db = dry bulb temperature ^{0} F
RH = relative humidity / 100

THI values < 72 are probably not stressful, 72 – 78 are stressful, and > 78 extremely stressful.
The obtained data were subjected to statistical analysis using general liner model procedure adapted by **SPSS (1999).** Significant differences among means were separated by **Duncan (1955)** multiple range test.

Table (1): Chemical composition of feedstuffs on DM basis

Ingredients	Items %						
	DM	OM	CP	EE	CF	NFE	ASH
Yeast culture	91.66	97.72	37.83	4.51	8.44	46.94	2.28
CFM*	88.7	91.20	14.70	3.02	13.90	59.58	8.80
Berseem 2nd cut	15.3	86.3	16.40	1.90	20.40	47.60	13.70
Berseem 3rd cut	19.3	88.8	14.70	3.10	22.60	48.40	11.20
Rice straw	91.21	84.38	3.63	0.99	37.54	42.22	15.62

*CFM: concentrate feed mixture composed of 30% wheat bran, 15 % undecorticateted cotton seed meal, 35 % yellow corn, 15 % sunflower meal, 3 % molasses, 1.5 % limestone and 0.5 % salt.

Table (2): Contents of YC (*BGY-35, Manufactured by F. L. Emert., Co. USA),* as fed.

Vitamins, TDN & NEM		Amino acids		Minerals	
E	36.80 IU/kg	Arginine	1.83%	Calcium	0.22 %
Biotin	2.44 mg/kg	Cystine	0.58%	Phosphorus	0.60 %
Choline	3401.00 mg/kg	Histidine	0.85 %	Sodium	0.15%
Folic acid	7.80 mg/kg	Isoleucine	1.45 %	Potassium	0.20%
Niacin	245.50 mg/kg	Leucine	3.46 %	Magnesium	0.22%
Pantothenic acid	59.20 mg/kg	Lysine	1.63 %	Manganese	21.30 ppm
Riboflavin	18.25 mg/kg	Methionine	0.62 %	Iron	184.05 ppm
Thiamine	46.20 mg/kg	Phenylalanine	2.03 %	Copper	5.00 ppm
Pyridoxine	22.00 mg/kg	Threonine	1.37 %	Zinc	75.00 ppm
TDN	70.00 %	Tryptophan	0.38 %	Selenium	1.00 ppm
NEM	1.72 mcal/kg	Valine	2.05%	-	-

RESULTS AND DISCUSSION

Reproductive and productive performance

Data in Table (3) clearly indicate that dietary supplementation of YC significantly (P<0.05) improved each of the following reproductive and productive traits: prolificacy, reproductive ability, lambs born/ewes joined, lambs weaned/ewes lambed, kilograms of lambs born or weaned/ewes joined or /ewes lambed while insignificantly affected conception rate, fertility, fecundity and twinning frequency as compared to control ewes. Mortality rate of lambs from birth to weaning was the lowest with 2.5g YC-supplemented group (0%) followed by 5g YC-supplemented group (19.04 %) and the highest for control group (20%). These findings may partially due to trace elements contents of YC, especially iron, zinc, manganese, copper and selenium (Table 2) and /or improvement of digestibility of CP, CF, EE and NFE (Komonna, 2007).

The present results agree with those of **Abdel-Hafez (2002)** in sheep, **Abdel-Khalek (2003)** in Friesian cows, **Ebrahim (2004) and Abdel-Latif (2005)** in lactating buffaloes and buffalo heifers, which reported considerable improvement in reproductive performance in response to YC supplementation yielding a positive effect on the general animal health of treated animals. **Saleh (2004)** also stated that probiotics (bacteria or yeast) had a positive effect on activities of lactic acid bacteria in sheep intestine, which in turn improved their inhibition potency to the unfriendly bacteria such as E. coli. Otherwise, **Callaway and Martin, (1997)** demonstrated that YC provides soluble growth factors (i.e., organic acids, vitamin B and amino acids, which would stimulate growth of rumen bacteria that utilize lactate and digest cellulose.

Blood constituents

Yeast culture supplementation significantly increased (P<0.05) albumin and glucose concentrations, meanwhile it was not significantly affected blood total protein or globulin. A/G ratio was noticeably increased with 5% level while 2.5% level had insignificant increase compared to the control group (Table 4). The significant increase in blood albumin suggested normal status of liver function, since the liver is the main organ of albumin synthesis. The obtained results are in accordance with those reported by **El-Shaer (2003)** and **Mahrous and Abou-Ammou (2005)** on sheep and **Kholif (2001)** on goats. They found that YC supplementation did not affect blood A/G ratio. However**, Khattab *et al*. (2003)** with sheep and **Shahin *et al*. (2005)** with buffalo calves recorded a decrease in A/G ratio due to YC supplementation. Regarding the effect of gestation period on protein fractions and glucose content in the blood serum, it clearly appears that concentration of total protein, globulin progressively increased (P<0.05) with the advance of gestation period up to 15 weeks, meanwhile A/G ratio showed an opposite trend while albumen was not significantly affected (Table, 4). However, serum total protein, and globulin concentrations were decreased (P<0.05) and A/G ratio increased (P<0.05) during the last two weeks before lambing.

These findings are in agreement with those reported by **Al-Saied *et al*. (1999)** on Friesian cows, **Abdel-Hafez (2002**) on Suffolk x Ossimi ewes and **Abdel-Ghani *et al*. (2003)** on Egyptian buffaloes. **Abdel-Hafez (2002**) reported that such a pre-partum decrease in blood protein fractions could be attributed to the increase in fetus weight.

Abdel-Ghani *et al*. (2003) suggested that the respective decrease seems mainly due to an increase in protein breakdown required for gluconeogenesis, while **Putnam and Schwab (1994)** reported that YC stimulates rumen microbes that altered microbial protein synthesis and increased protein passage as well as protein yield**.** The obtained results regarding effect of gestation period are in agreement with those reported by **Abdel-Ghani *et al*. (2003)** who reported a decrease in blood globulin concentration during late pregnancy in buffaloes. However, **El-Malky (2007)** found that YC supplementation had no significant effect on A/G ratio during pregnancy.

Data in Table 4 indicate that supplementation with YC increased (P<0.05) glucose level during pregnancy compared to the control ewes. The present results are in accordance with those obtained by **Abdel-Khalek *et al*. (2000**) and **Talha *et al*. (2009)**. The increase of glucose level in blood may be related to rapid rate of hydrolysis and absorption of the dietary carbohydrates in alimentary tract. This finding may be related to the effect of YC through activity of amylase that led to increasing carbohydrates hydrolysis in the small intestine **(Williams, 1989).**

Table (3): Effect of YC supplementation on reproductive traits of Suffolk crossbred ewes

Items	Treatments		
	Control	2.5 g / d YC	5 g / d YC
Number of ewes joined with rams	16	16	16
Conception rate, No. (%)	15 (93.75%)	16 (100.0%)	16 (100.0%)
Fertility, ewes lambed/ ewes joined, No. (%)	13 (81.25%)	15 (93.75%)	16 (100.0%)
Ewes lambed / ewes conceived, No. (%)	13 (86.67%)	15 (93.75%)	16 (100.0%)
Ewes aborted / ewes conceived, No. (%)	2 (13.33%)	1 (6.25)	0 (0.0%)
Fecundity, lambs born/ewes joined, No. (%)	15 (93.75)	15 (93.75)	21 (131.25)
Lambs born per ewes joined, (%)	93.75 ± 0.1^{b}	93.75 ± 0.1^{b}	131.3 ± 0.09^{a}
Prolificacy, lambs born/ewes lambed, No. (%)	$15\ (115.38)^{ab}$	$15\ (100.0)^{b}$	$21\ (131.25)^{a}$
Lambs born per ewes lambed, (%)	$115.38^{ab} \pm 0.10$	$100.00^{b} \pm 0.09$	$131.25^{a} \pm 0.09$
Twining frequency, No. (%)	2 (15.4%)	0	5 (31.3%)
Number of viable lambs at weaning	12	15	17
Reproductive ability (lambs weaned/ewes joined), %	75.0 ± 0.1^{b}	93.75 ± 0.1^{ab}	106.3 ± 0.08^{a}
Lambs weaned/ewes lambed, %	92.3 ± 0.1	100.0 ± 0.05	106.3 ± 0.05
Kg. Of lambs born per ewe joined	2.31 ± 0.3^{b}	3.91 ± 0.3^{a}	3.88 ± 0.30^{a}
Kg. Of lambs born per ewe lambed	2.85 ± 0.23^{b}	4.17 ± 0.21^{a}	3.88 ± 0.2^{a}
Kg. Of lambs weaned per ewe joined	9.66 ± 1.2^{b}	14.98 ± 1.2^{a}	$15.9\,4^{a} \pm 1.20$
Kg. Of lambs weaned per ewes lambed	11.89 ± 0.9^{b}	15.99 ± 0.9^{a}	15.94 ± 0.84^{a}
Mortality rate of lambs from birth to weaning ,%	20.0	0.0	19.04

[a and b], values in the same row not sharing the same superscripts significantly differed (P<0.05).

Otherwise, this could be attributed to increasing the activity of cellulolytic bacteria that act on cellulose fibers degradation and thus produce more glucose and increase the glucogenic precursor propionate in rumen or decrease plasma insulin and insulin-glucose ratio leading to an increase in gluconeogenesis. Data in Table (4) also illustrate the effect of gestation period on the blood serum glucose showing that it progressively increased up to the 3rd week of pregnancy (P<0.05), then maintain the level till week 18th, thereafter, it decreased till lambing. This result is in accordance with those reported for sheep (**Abdel-Hafez, 2002**). Data in Table (5) illustrate that blood cholesterol concentration decreased (P<0.05) only in response to the low level of YC, starting from week 9th, in the same time urea concentration and activity of AST increased (P<0.05) in response to both levels of YC supplementation. Meanwhile, blood creatinine concentration and activity of ALT were not significantly affected by YC supplementation.

El-Ashry *et al*. (2003), Abdel-Khalek *et al*. (2000), Ragheb *et al*. (2003) working on Friesian calves and **El-Asrhy *et al*. (2004)** on buffalo heifers found that feeding diets treated with yeast or fungi resulted in a decrease of cholesterol concentration, which may be attributed to stimulation of bacterial lipids synthesis **(Williams, 1989)** and/or due to anti-cholesteroleamic effect of YC treatments **(Fuller, 1989).** On the other hand, the increase in serum urea-N of ewes in response to YC supplementation (Table 5) may reflect a tendency for improved N utilization of feed, which agrees with that reported by **El-Shaer (2003**), **Fayed *et al*. (2005**) with sheep and **Ragheb *et al*. (2003**) and **Ibrahim *et al*. (2005)** with Friesian calves.

Table (4): Blood protein fractions and glucose concentrations in Suffolk crossbred pregnant ewes as affected by daily yeast culture supplementation.

Blood components	Gestation Period, (wk)	Daily treatments			Overall mean
		Control	2.5g YC	5.0 g YC	
Total protein (g/dl)	Mating day	6.37 ± 0.81	6.27 ± 0.08	6.46 ± 0.34	6.37^{e} ± 0.41
	3	6.45 ± 0.33	6.83 ± 0.21	6.55 ± 0.49	6.61^{d} ± 0.34
	6	6.99 ± 0.17	7.07 ± 0.21	7.34 ± 0.20	7.13^{c} ± 0.19
	9	7.05 ± 0.43	7.20 ± 0.14	7.45 ± 0.18	7.23^{bc} ± 0.25
	12	7.12 ± 0.15	7.61 ± 0.21	7.53 ± 0.22	7.^{42ab} ± 0.19
	15	7.72 ± 0.10	7.84 ± 0.25	7.97 ± 0.08	7.84^{a} ± 0.14
	18	6.58 ± 0.19	6.38 ± 0.59	6.18 ± 0.23	6.38^{e} ± 0.34
	21	5.51 ± 0.42	5.64 ± 0.31	5.95 ± 0.59	5.70^{f}± 0.44
	Overall mean	**6.72^{A} ± 0.3**	**6.85^{A} ± 0.3**	**6.93^{A} ± 0.3**	**-**
Albumin (g/dl)	Mating day	2.87 ± 0.35	3.32 ± 0.05	3.52 ± 0.12	3.24^{a} ± 1.10
	3	3.66 ± 0.16	3.31 ± 0.17	3.64 ± 0.29	3.54^{a} ± 0.21
	6	3.14 ± 0.62	3.32 ± 0.10	3.60 ± 0.13	3.35^{a} ± 0.28
	9	3.08 ± 0.08	3.26 ± 0.39	3.50 ± 0.14	3.28^{a} ± 0.44
	12	3.02 ± 0.20	3.14 ± 0.07	3.43 ± 0.47	3.20^{a} ± 0.25
	15	2.84 ± 0.28	3.13 ± 0.09	3.36 ± 0.15	3.11^{a} ± 0.17
	18	2.98 ± 0.04	3.18 ± 0.06	3.29 ± 0.12	3.15^{a} ± 0.07
	21	2.99 ± 0.29	3.03 ± 0.16	3.29 ± 0.09	3.10^{a} ± 0.18
	Overall mean	**3.07^{C} ± 0.3**	**3.21^{B} ± 0.1**	**3.45^{A} ± 0.2**	**-**
Globulin (g/dl)	Mating day	3.50 ± 0.58	2.95 ± 0.09	2.94 ± 0.26	3.13^{c} ± 0.31
	3	3.13 ± 0.56	3.53 ± 0.22	2.91 ± 0.71	3.19^{c} ± 0.50
	6	3.85 ± 0.29	3.74 ± 0.28	3.73 ± 0.28	3.77^{b} ± 0.28
	9	3.84 ± 0.42	3.95 ± 0.34	3.97 ± 0.16	3.92^{ab} ± 0.31
	12	4.10 ± 0.32	4.48 ± 0.28	4.10 ± 0.69	4.23^{a} ± 0.43
	15	4.88 ± 0.35	4.71 ± 0.30	4.61 ± 0.13	4.73^{a} ± 0.62
	18	3.59 ± 0.23	3.20 ± 0.63	2.88 ± 0.28	3.22^{c} ± 0.38
	21	2.52 ± 0.32	2.62 ± 0.31	2.66 ± 0.81	2.60^{e} ± 0.48
	Overall mean	**3.68^{A} ± 0.4**	**3.65^{A} ± 0.3**	**3.48^{A} ± 0.4**	**-**
A/G ratio	Mating day	0.82 ± 0.13	1.13 ± 0.05	1.20 ± 0.09	1.05^{a} ± 0.07
	3	1.06 ± 0.25	0.93 ± 0.08	1.25 ± 0.45	1.08^{a} ± 0.15
	6	0.82 ± 0.16	0.89 ± 0.09	0.97 ± 0.11	0.89^{b} ± 0.06
	9	0.78 ± 0.07	0.83 ± 0.29	0.89 ± 0.05	0.83^{bc} ± 0.05
	12	0.74 ± 0.10	0.70 ± 0.06	0.84 ± 0.27	0.76^{bc} ± 0.08
	15	0.58 ± 0.09	0.66 ± 0.06	0.73 ± 0.06	0.66^{dc} ± 0.04
	18	0.83 ± 0.07	1.00 ± 0.19	1.14 ± 0.14	0.99^{b} ± 0.07
	21	1.18 ± 0.19	1.15 ± 0.15	1.23 ± 0.37	1.19^{a} ± 0.15
	Overall mean	**0.85^{A} ± 0.1**	**0.91^{A} ± 0.1**	**1.03^{A} ± 0.2**	**-**
Glucose (mg/dl)	Mating day	31.50 ± 0.41	35.08 ± 1.24	34.60±0.79	33.73^{d} ± 0.8
	3	43.09 ± 1.94	44.28 ± 0.77	44.62±1.02	43.10^{ab} ± 1.2
	6	40.65 ± 1.40	43.09 ±1.78	43.69±0.62	42.48^{b} ± 1.3
	9	41.78 ± 2.38	42.73 ± 1.00	42.50±1.90	42.34^{b} ± 1.8
	12	42.14 ± 2.63	44.22 ± 1.84	43.57±1.64	43.31^{ab} ± 2.0
	15	44.09 ± 1.44	44.10 ± 2.09	44.58±0.36	44.26^{a} ± 1.3
	18	41.50 ± 1.45	45.95 ± 0.34	43.96±0.26	43.80^{ab} ± 0.7
	21	37.67 ±1.18	43.23 ± 1.86	41.13±1.13	40.68^{c} ± 1.4
	Overall mean	**40.30^{B} ± 1.6**	**42.83^{A} ± 1.4**	**42.33^{A}±1.0**	**-**

$^{A and B}$,: values in the same row bearing different superscripts significantly differed (P<0.05).
$^{a, b, c}$: values in the same column bearing different superscripts significantly differed (P<0.05).

However, **Khattab *et al.* (2003) and Mahrous and Abu-Ammou (2005**) with sheep and **Kholif (2001)** with goats found that YC supplementation had no significant effect on urea concentration, which may be due to the differences in levels and duration of YC treatments.

Regarding the effect of gestation period, Table (5) illustrates that concentration of blood cholesterol was significantly (P<0.01) increased up to week 6th after mating, thereafter it was gradually decreased till lambing. Blood urea concentration did not significantly differ during gestation periods; meanwhile creatinine concentration recorded its maximal value at the 9th week of pregnancy thereafter decreased gradually till lambing. Activity of AST and ALT was significantly decreased (P<0.05) till the 15th week for the former and the 18th week for the latter, then decreased just before lambing (21st week). **Smith and Walsh (1975**) and **Eissa *et al*. (1992)** reported that serum AST and ALT concentrations increased with pregnancy progress of ewes and cows. The present results are not in accordance with those obtained by **Abdel-Hafez (2002)** on sheep, as they reported that creatinine was increased from day 21th after mating till the last week of pregnancy. Meanwhile, the present study showed a significant increase in day 63 of gestation with progressive decreases before and after this day (Table, 5). In general, data in Tables 4 & 5 suggest that the 2 supplementing levels of YC (*Saccharomyces cerevisiae*) had improved the syudied blood components without any undesirable effects on kidney or liver functions.

Thermo-cardio-respiratory activities

The overall mean of ambient temperature during the experimental period was 26.75^{o}C, while that of relative humidity was 57.8% and the THI value was 73.49, which was considered as severe heat stress condition.

Data in Table (6) indicate that the overall average of RT, ST, RR and PR recorded significant lower values for the YC supplemented ewes compared to the control ewes. The obtained results are in agreement with those reported by **Abdel-Samee (1995) and El-Shaer (2003)** on sheep. Such decreases in RT and ST for ewes supplemented with YC may due to a favorable effect on body thermoregulation due to minerals content of YC, especially selenium. These results are in agreement with those obtained by **Marai *et al*. (2009)** working on Suffolk x Ossimi sheep whom observed the same trend when used selenium supplementation**.** Table (6) also shows that RT, ST, PR and RR tended to decrease gradually up to the 16th week of gestation then they increased till lambing. The differences during gestation period were significant (P<0.05) (Table 6).The decrease in thermo-cardio-respiratory activities due to YC supplementation would decrease the adverse effect of heat stress that the animals exposed to it.

Shafie *et al*. (1994) found significant (P<0.05) differences in RR among periods. This result is in accordance with those reported by **El-Shaer (2003)** who indicated that YC supplementation had significant effect (P<0.05) on RR. **Abdel-Samee (1995)** reported that probiotics supplementation decreased RR compared to the control group. In general, data related to RR fell within the range 17.30 – 95.5/min reported for sheep by many investigators (**Shafie *et al*., 1994; Marai *et al*., 1997** and **El-Gazar, 1998).**

CONCLUSION

From the present study it could be recommended that YC supplementation would be added to ewes ration at the level of 5.0 g / head/day during pre-mating and gestation period in order to improve reproductive traits, blood components and thermo-cardio respiratory activities without any adverse effect on either liver or renal functions.

Table (5): Some blood metabolites and enzyme activities of Suffolk crossbred pregnant ewes as affected by daily yeast culture supplementation (BGY-35).

Blood components	Gestation Periods, (wk)	Treatments			Overall mean
		Control	2.5g YC	0.5 g YC	
Cholesterol (g/dl)	Mating day	86.06 ± 0.9	93.78 ± 1.0	90.16 ± 0.8	90.0[d] ± 0.9
	3	94.38 ± 1.0	103.57 ± 1.3	92.19 ± 1.0	96.7[b] ± 1.1
	6	94.74 ± 0.9	109.50 ± 0.4	96.93 ± 0.5	100.4[a] ± 0.6
	9	95.84 ± 1.3	84.02 ± 1.6	106.66 ± 1.1	95.5[b] ± 1.3
	12	100.10 ± 0.6	84.78 ± 0.9	102.40 ± 0.7	95.8[b] ± 0.7
	15	101.74 ± 0.9	85.42 ± 1.0	96.27 ± 0.7	94.5[cb] ± 0.8
	18	103.13 ± 1.0	90.85 ± 0.6	95.40 ± 0.9	96.5[b] ± 0.8
	21	104.37 ± 1.0	83.05 ± 0.9	95.51 ± 0.6	94.3[cb] ± 0.8
	Average	**97.54[A] ± 0.9**	**91.87[B] ± 0.9**	**96.94[A] ± 0.8**	-
Urea,(mg/dl)	Mating day	34.47 ± 2.51	37.49 ± 2.21	38.71 ± 1.12	36.9[a] ± 1.95
	3	37.55 ± 0.94	37.93 ± 0.41	38.91 ± 0.84	38.1[a] ± 0.73
	6	34.93 ± 1.02	37.97 ± 1.10	37.88 ± 1.26	36.9[a] ± 1.13
	9	35.59 ± 1.81	38.28 ± 1.18	38.15 ± 1.55	37.3[a] ± 1.51
	12	37.11 ± 1.63	38.59 ± 0.71	38.67 ± 0.80	38.1[a] ± 1.05
	15	35.67 ± 1.03	37.83 ± 1.12	37.62 ± 0.72	37.0[a] ± 0.96
	18	35.72 ± 0.72	37.72 ± 1.01	37.51 ± 0.95	37.0[a] ± 0.89
	21	35.26 ± 0.98	36.96 ± 1.30	36.09 ± 0.79	36.1[a] ± 1.00
	Average	**35.78[B] ± 1.33**	**37.85[A] ± 1.13**	**37.94[A] ± 1.0**	-
Creatinine mg/dl	Mating day	1.45 ± 0.02	1.21 ± 0.07	1.41 ± 0.09	1.36[b] ± 0.05
	3	1.18 ± 0.04	1.31 ± 0.04	1.37 ± 0.05	1.29[bc] ± 0.03
	6	1.06 ± 0.04	1.21 ± 0.05	1.54 ± 0.02	1.27[c] ± 0.06
	9	1.45 ± 0.04	1.45 ± 0.05	1.41 ± 0.05	1.44[a] ± 0.02
	12	1.33 ± 0.06	1.44 ± 0.14	1.29 ± 0.23	1.35[b] ± 0.08
	15	1.18 ± 0.03	1.39 ± 0.07	1.38 ± 0.11	1.32[bc] ± 0.04
	18	1.26 ± 0.02	1.43 ± 0.03	0.93 ± 0.04	1.21[d] ± 0.07
	21	1.12 ± 0.08	1.08 ± 0.07	1.11 ± 0.12	1.10[e] ± 0.04
	Average	**1.25 ± 0.03**	**1.32± 0.03**	**1.31 ± 0.04**	-
AST (U/L)	Mating day	38.33 ± 11.38	41.00 ± 8.61	48.67 ± 5.31	42.7[cb]± 8.4
	3	35.67 ± 5.9	22.67 ± 2.9	48.00 ± 8.6	35.5[c] ± 5.8
	6	24.75 ± 6.78	29.75 ± 5.76	17.25 ± 4.75	23.9[d] ± 5.8
	9	16.75 ± 2.73	35.50 ± 11.59	54.25 ± 7.79	35.5[c] ± 7.4
	12	26.25 ± 4.68	54.75 ± 6.33	23.00 ± 1.33	34.7[c] ± 4.1
	15	36.00 ± 4.77	66.75 ± 19.22	66.00 ± 2.67	56.2[b] ± 8.9
	18	84.67 ± 9.01	102.00 ± 6.12	74.00 ± 22.05	86.9[a] ±12.4
	21	41.25 ± 26.40	34.00 ± 6.63	26.25 ± 13.18	33.8[c] ± 15.4
	Average	**37.96[(B)] ± 8.96**	**48.30[(A)] ± 8.39**	**44.68[(A)] ± 8.21**	-
ALT (U/L)	Mating day	11.00 ± 1.57	9.00 ± 1.62	10.17 ± 2.35	10.1[ab] ± 1.9
	3	11.50 ± 3.14	6.00 ± 1.23	7.00 ± 1.22	8.2[b] ± 1.9
	6	10.13 ± 1.92	9.88 ± 2.77	9.13 ± 0.83	9.7[b] ± 1.8
	9	8.75 ± 1.11	7.25 ± 1.12	9.75 ± 2.14	8.6[b] ± 1.5
	12	10.0 ± 1.99	10.63 ± 0.43	4.88 ± 0.83	8.5[b] ± 1.1
	15	6.88 ± 1.30	5.13 ± 1.46	5.63 ± 1.24	5.9[c] ± 1.3
	18	6.00 ± 0.62	14.00 ± 3.95	14.00 ± 3.94	11.3[a] ± 2.8
	21	9.50 ± 3.00	6.13 ± 0.83	9.38 ± 2.31	8.3[b] ± 2.1
	Average	**9.22 ± 1.60**	**8.63 ± 1.56**	**8.74 ± 2.09**	-

[A and B]: values in the same row bearing different superscripts significantly differed ($P<0.05$).
[a, b, c]: values in the same column bearing different superscripts significantly differed ($P<0.05$).

Table (6): Effect of YC supplements on rectal temperature (RT), skin temperature (ST), respiration rate (RR) and pulse rate (PR) of Suffolk x Ossimi crossbred ewes in experimental groups .

Item	Periods (wks)	Treatments			
		Control	2.5 g / d YC	5 g / d YC	Overall mean
RT (^{0}C)	4	39.66 ± 0.21	38.96 ± 0.21	39.20 ± 0.11	39.27^{abc} ± 0.12
	6	39.58 ± 0.24	38.50 ± 0.12	39.00 ± 0.12	39.03^{cd} ± 0.14
	8	39.44 ± 0.19	38.46 ± 0.06	38.72 ± 0.20	38.87^{d} ± 0.14
	10	39.84 ± 0.15	39.00 ± 0.20	39.28 ± 0.25	39.37^{ab} ± 0.14
	12	39.28 ± 0.09	38.42 ± 0.08	38.70 ± 0.19	38.80^{d} ± 0.11
	14	39.06 ± 0.02	38.62 ± 0.13	38.66 ± 0.13	38.78^{d} ± 0.08
	16	39.28 ± 0.09	38.66 ± 0.19	38.44 ± 0.05	38.79^{d} ± 0.11
	18	39.78 ± 0.15	38.98 ± 0.08	38.88 ± 0.08	39.21^{bc} ± 0.12
	20	39.60 ± 0.12	39.34 ± 0.17	39.46 ± 0.31	39.47^{ab}± 0.11
	22	39.56 ± 0.15	39.36 ± 0.08	39.56 ± 0.33	39.49^{a} ± 0.11
	Average	39.50^{A} ± 0.05	38.83^{C} ± 0.06	38.99^{B} ± 0.07	-
ST (^{0}C)	4	35.42 ± 0.79	36.74 ± 0.52	36.56 ± 0.48	36.24^{bc} ± 0.34
	6	36.96 ± 0.62	35.98 ± 0.35	36.68 ± 0.09	36.54^{bc} ± 0.23
	8	36.36 ± 0.56	36.02 ± 0.25	36.42 ± 0.12	36.27^{bc} ± 0.19
	10	35.80 ± 0.79	34.66 ± 0.52	35.14 ± 0.43	35.20^{e} ± 0.32
	12	35.36 ± 0.26	35.56 ± 0.29	36.24 ± 0.13	35.72^{cde} ± 0.15
	14	35.18 ± 0.30	35.54 ± 0.18	35.50 ± 0.22	35.41^{de} ± 0.12
	16	36.60 ± 0.39	35.76 ± 0.27	35.60 ± 0.20	35.98^{bcd} ± 0.19
	18	37.64 ± 0.45	37.84 ± 0.40	37.24 ± 0.20	37.57^{a} ± 0.20
	20	37.90 ± 0.22	37.38 ± 0.37	37.42 ± 0.27	37.57^{a} ± 0.16
	22	38.16 ± 0.17	36.60 ± 0.15	37.48 ± 0.29	37.41^{a} ± 0.21
	Average	36.54^{A} ± 0.20	36.21^{B} ± 0.16	36.43^{AB} ± 0.13	-
RR (breaths /min)	4	36.8 ± 1.14	38.4 ± 1.03	37.6 ± 1.09	37.60^{ab} ± 0.56
	6	35.2 ± 2.07	33.6 ± 1.30	35.2 ± 2.07	34.67^{de} ± 0.94
	8	37.2 ± 1.67	34.0 ± 1.27	34.0 ± 1.41	35.07$^{cd e}$ ± 0.83
	10	36.8 ± 2.60	36.6 ± 0.97	36.2 ± 1.14	36.53$^{bc d}$ ± 0.86
	12	35.6 ± 1.09	33.0 ± 0.35	32.8 ± 1.14	33.80^{fe} ± 0.58
	14	32.0 ± 0.70	32.0 ± 1.00	29.0 ± 0.61	31.00^{g} ± 0.55
	16	33.4 ± 0.97	30.4 ± 1.30	32.6 ± 0.44	32.13$^{f g}$ ± 0.59
	18	43.2 ± 0.89	35.0 ± 0.86	38.0 ± 0.71	38.73^{a} ± 1.02
	20	39.4 ± 0.44	36.8 ± 1.14	34.6 ± 1.35	36.93^{acb} ± 0.75
	22	38.6 ± 0.67	35.4 ± 1.09	34.2 ± 1.43	36.07^{bcd} ± 0.75
	Average	36.82^{A} ± 0.56	34.52^{B} ± 0.43	34.42^{B} ± 0.47	-
PR (beats /min)	4	82.8 ± 1.71	82.0 ± 2.42	85.8 ± 2.32	83.53^{abc} ± 1.13
	6	86.6 ± 1.48	80.4 ± 1.78	80.8 ± 0.96	82.60^{bc} ± 1.02
	8	83.4 ± 1.68	81.6 ± 2.36	80.2 ± 2.70	81.73^{c} ± 1.15
	10	86.0 ± 1.65	78.4 ± 2.25	81.6 ± 2.36	82.00^{c} ± 1.31
	12	87.4 ± 0.91	81.0 ± 2.00	81.0 ± 2.34	83.13^{abc} ± 1.20
	14	86.4 ± 1.52	80.0 ± 1.36	81.8 ± 2.38	82.73^{abc} ± 2.13
	16	86.2 ± 0.74	84.4 ± 1.48	85.2 ± 1.51	85.27^{ab} ± 0.65
	18	84.4 ± 1.98	86.4 ± 0.91	83.6 ± 2.65	84.80^{abc} ± 1.00
	20	89.0 ± 0.79	84.4 ± 1.95	84.0 ± 2.26	85.80^{a} ± 1.05
	22	87.8 ± 0.74	83.2 ± 2.13	83.4 ± 1.68	84.80^{abc} ± 0.9
	Average	86.00^{A} ± 0.44	82.18^{B} ± 0.59	82.74^{B} ± 0.62	-

$^{A\ and\ B}$,: values in the same row bearing different superscripts significantly differed (P<0.05).
$^{a,\ b,\ c}$: values in the same column bearing different superscripts significantly differed (P<0.05).

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الملخص العربى

الاستجابة الفسيولوجية لاضافة الخميرة في علائق الاغنام

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أستخدم فى هذه الدراسة 48 نعجة خليط سافولك عمر 3- 4 سنوات ومتوسط وزنها 58.54 ± 1.34 كجم وذلك لدراسة تأثير اضافة الخميرة على بعض الصفات التناسلية وبعض مكونات الدم والاستجابة الحرارية والتنفسية خلال فترتى التلقيح والحمل. قسمت هذه النعاج الى ثلاث مجموعات متماثلة (16 بكل مجموعة). غذيت الحيوانات على عليقة أساسية (60% علف مركز : 40 % مادة خشنة (برسيم + قش أرز) مع اضافة الخميرة الجافة يوميا الى العلف المركز بمعدل 2.5 جم / رأس للمجموعة الثانية و 5.0 جم / رأس للمجموعة الثالثة بينما تركت المجموعة الأولى دون اضافة الخميرة كمجموعة مقارنة . وأوضحت نتائج هذة الدراسة أن اضافة الخميرة أدت الى تحسن معنوى فى كل من القدرة الاخصابية ومعدل الولادة ونسبة الحملان المولودة : النعاج المعدة للتلقيح ونسبة الحملان المفطومة : النعاج التى وضعت وكذلك الى زيادة كيلوجرامات الحملان المولودة وكيلوجرامات الحملان المفطومة سواء لكل نعجة معدة للتلقيح أو لكل نعجة وضعت . كما أدت اضافة الخميرة . الى تحسن- ولكن غير معنوى- فى معدل الحمل ونسبة الخصوبة والتوائم مقارنة بمجموعة الكنترول. لم يلاحظ تغيير معنوى فى تركيز كل من الألبيومين واليوريا بالدم خلال فترات الحمل بينما لوحظت زيادة معنوية فى تركيز كل من البروتين الكلى والجلوبيولين والجلوكوز والكولسترول وانخفاض معنوى فى نسبة الألبيومين/الجلوبيولين حتى الأسبوع 15 من الحمل و تلى ذلك انخفاض معنوى حتى الولادة. بينما أظهر تركيز الكرياتينين ونشاط انزيمى AST و ALT (الانزيمات الناقلة لمجموعة الأمين) تذبذب واضح خلال فترة الحمل . إنخفضت درجة حرارة المستقيم و الجلد و معدل النبض والتنفس نتيجة اضافة الخميرة . من نتائج هذه الدراسة يمكن التوصية باستخدام الخميرة خاصة عند مستوى 5جم / رأس / يوميا للنعاج خلال فترتى التلقيح والحمل لتحسين الأداء التناسلى والاستجابة الحرارية والتنفسية دون حدوث تأثير معاكس على قياسات الدم و أداء وظائف الكبد و الكلى