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Addition of VêO® premium and Vitamin C to improve the productive and reproductive performance of local Iraqi ewes

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ABSTRACT

The present study was conducted to know the effect of VêO® premium and Vitamin C on productive and reproductive performance of local Iraqi ewes during the heat stress. The study was conducted in a private farm in Fallujah, Al-Anbar province during the period from 6/8/2019 to 8/2/2020. Twenty local Iraqi ewes were divided randomly into four equal groups. The first group (T₁) was given VêO® premium 4 g/ ewe/ day. The second group (T₂) was given VêO® premium 2 g/ ewe/ day, the third group (T₃) was given Vit. C 40 mg/ ewe/ daily and the fourth group (T₄) left without treatment as a control group. The results showed significant (P<0.05) increase in body weight in the T₂ as compared with other treatments. Estrogen were increased (P<0.05) in T₁ and T₄ as compared with T₂ and T₃ at the fourth period. There was significant (P<0.05) increase in progesterone level in the T₂ and T₃ during the first period of the experiment, the T₄ in the second and fourth period and within all the same treatments. The fourth period within the same treatment increased significantly in the concentration of progesterone levels for T₁, T₃ and T₄. While the third and fourth period showed increase in the level of progesterone for T₂. There was a higher estrus rate in the T₂ (80%). Fertility rate, conception rate and lambing rate were increased in the T₂ and T₃. Barrenness rate was decrease in females in T₂ and T₃. It was concluded from the current study that addition of VêO® premium and Vit. C to the feed of ewes during heat stress was beneficial on body weight and reproductive performance.

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إضافة VêO® premium وفيتامين C لتحسين الأداء الإنتاجي والتناسلي في النعاج العراقية المحلية

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الخلاصة

تهدف الدراسة لمعرفة تأثير VêO® premium وفيتامين C على الأداء الإنتاجي والصفات التناسلية للنعاج العراقية المحلية خلال فترة الإجهاد الحراري. أجريت الدراسة في إحدى الحقول الخاصة في منطقة الصقلاوية التابعة لمدينة الفلوجة للمدة من 6/8/2019 إلى 8/2/2020. استخدمت 20 نعجة عراقية محلية قسمت الإناث عشوائياً إلى أربع معاملات متساوية. أعطيت المعاملة الأولى VêO® premium 4 غم/ رأس/ اليوم، والثانية VêO® premi 2 غم/ رأس/ اليوم، والثالثة فيتامين C 40 ملجم/ رأس/ اليوم. والرابعة السيطرة. أظهرت النتائج تفوق معنوي (P<0.05) في وزن الجسم للمعاملة الثانية. تفوق مستوى هرمون

الأستروجين معنوياً ($P<0.05$) في المعاملتين الأولى والرابعة في المدة الرابعة. تفوق تركيز هرمون البروجستيرون معنوياً ($P<0.05$) في المعاملتين الثانية والثالثة خلال المدة الأولى، والمعاملة الرابعة خلال المديتين الثانية والرابعة، والثانية خلال المدة الثالثة من التجربة. لوحظ زيادة تركيز هرمون البروجستيرون معنوياً ($P<0.05$) في المدة الرابعة للمعاملات الأولى والثالثة والرابعة. ارتفعت نسبة ظهور الشبق في المعاملة الثانية، كانت نسبة الخصوبة، ونسبة الإخصاب، ونسبة الولادات مرتفعة في المعاملتين الثانية والثالثة. انخفضت نسبة التفويت في النعاج في المعاملتين الثانية والثالثة. نستنتج من الدراسة ان إضافة VêO® premium وفيتامين C إلى علائق النعاج خلال فترة الإجهاد الحراري كانت مفيدة في الزيادة الوزنية والصفات التناسلية.

الكلمات المفتاحية:

VêO® premium، فيتامين C، الأداء الإنتاجي، الأداء التناسلي، النعاج العراقية المحلية.

INTRODUCTION

Many countries all over the world suffer from high temperatures during the summer season and for more than 6 months of the year, which cause economic losses in animal production (Phillips, 2016). Exposure of sheep to heat stress leads to less heat losses from the body compared to the heat gained, which creates stress on the animal in order to maintain a suitable temperature for its body without conform or adapting to this stress (Alhaidary, 2004). In response, the body secretes epinephrine and norepinephrine from the adrenal gland (Goldstein, 2010). Then the corticosteroid hormones is secreted from the adrenal cortex to supply energy to the stored body needed to resist stress (Herman et al., 2016). Exposure of sheep to high ambient temperatures leads to an increase in the gradually losing body heat by evaporation of water (gaspings) from the respiratory system, ears and legs. When the animal's physiological mechanisms fail to lose excess heat, the temperature of the rectum increases. This reflects the occurrence of a series of changes in biological functions, including a lower in the efficiency of feed intake, a disturbance in drinking water, a lack of protein, energy, mineral salts and enzymes in the body. This, in turn, is reflected in the reproductive performance of animals such as lack of estrus, low fertility, and embryonic mortality (Indu et al., 2014). Heat stress directly affects the sex hormones in female ewes, which leads to a decrease in the reproductive process (McManus et al., 2020). Many workers have tended to use aromatic plants and vegetable oils, and the use of medicinal herbs and nutritional supplements such as vitamin (C and E) to reduce heat stress and increase production, reproduction performance and immune response (Gonzalez-Maldonado et al., 2019, Ahmad et al., 2021, Ahmad et al., 2021 and Alani et al., 2021).

The objective of this study was conducted to study the effect of supplementation of VêO® premium and Vit. C on body weight and reproductive performance of local Iraqi ewes during the heat stress.

MATERIAL AND METHODS

The study was conducted in a private field 3 km away from Fallujah in the Saqlawiyah area during the period from 6/8/2019 to 8/2/2020. Twenty local Iraqi ewes aged between 2-4 years, with body weight between 35-60 kg. The animals were isolated for 20 days before the study began and were examined by the ultrasonography apparatus to ensure that it was not pregnant. The animals were divided randomly into four equal groups (5 for each group). It was fed naturally and on one diet and the first group (T1) was given VêO® premium 4 g/ ewe/ day, the second group (T2) was given VêO® premium 2 g/ ewe/ day, the third group (T3) was given Vit. C 40 mg/ ewe/ daily and the fourth group

(T4) left without treatment as control group. VêO[®] premium Ingredients: Orange sweet (Vit. C), Wheat flour, Calcium carbonate, Silicon dioxide and Vit. E (Produced by the company Phodé, French). After 14 days vaginal sponges were inserted for 14 days, and after their withdrawal, the rams were introduced for 6 days. Weights of ewes were measured at the days (6/8, 19/8, 2/9, 2/10, 2/11) to find the average difference in the monthly weights during the study period. Blood samples were collected via vacutainer tubes (10 ml) from jugular vein. The serum were taken after centrifugation of the samples (3000 RPM for 15 minutes) and stored under -20°C until assay. Hormonal concentration were estimated includes; Estrogen according to Tsang et al., (1980) and Progesterone according to Radwanska et al., (1978). Reproductive traits (Estrus rate, Fertility rate, Conception rate, lambing rate, Litter size and Barrenness rate) were calculated according to Al-Kass et al., (1993). Statistical analysis were performed using General Linear Model (GLM) procedure in the SPSS program (version 25) to examine the influence of groups on hormonal concentration. Differences among means were compared using the Least Significant Differences test (LSD) according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

Effect of VêO[®] Premium and Vit. C on body weight of ewes: The effects of VêO[®] Premium and Vit. C on body weight of ewes are presented in Table (1). Body weight showed significant ($P \leq 0.05$) increase in all experiment treatments during the of study period. The treatment T₃ significantly ($P \leq 0.05$) was higher as compared with T₁ and T₄ treatments in the first, third and fifth periods. There was a significant increase ($P \leq 0.05$) in the parameters of T₃ and T₂ as compered with T₄ and T₁ treatments during the second and fourth period. There was a significant difference ($P \leq 0.05$) observed between the periods within a single treatments, for all treatments, as the fifth period significantly increase ($P \leq 0.05$) as compared with other periods. The results of the current experiment was agreed with those of Musa et al., (2018), but disagreed with those of Pliego-Pliego et al., (2019). Heat stress affects the body weight via lowering the growth rate and reduce feed intake (Indu et al., 2014). The significant increase in the weight gain in the current study might be due to the synergistic role of vit. E and Se with other VêO[®] premium components that have a role in reducing heat stress on the animal, which reflects the increased intake of food and the conversion of these substances to live weight (Abdel-Raheem et al., 2019). Vit. C also plays a major role in stimulating thyroid hormone secretion, which has a major role in growth mechanisms (Sahin et al., 2003). Vit. E also plays an important role in retarding lipid oxidation and of met-myoglobin formation, which in turn reflects increased body muscles and live weight of the animal (Saleh and Hama, 2017).

Table (1): Effect of VêO® Premium and Vit. C on body weight of ewes (kg) in the four groups (Mean ± SE)

Treatment	Periods					Level of significance
	Before pregnant		During pregnant			
	1	2	3	4	5	
T₁	45.00 ± 2.51 C b	44.60 ± 2.35 C b	44.60 ± 2.37 C b	48.80 ± 4.81 C ab	51.20 ± 5.28 C a	**
T₂	50.60 ± 2.31 AB b	52.80 ± 3.82 A b	51.40 ± 3.60 AB b	59.00 ± 4.38 A a	61.80 ± 3.28 B a	**
T₃	53.00 ± 3.54 A c	54.80 ± 4.75 A b	55.80 ± 4.83 A b	60.00 ± 4.80 A ab	64.60 ± 2.92 A a	**
T₄	47.40 ± 3.52 B c	49.40 ± 3.99 B c	49.00 ± 3.72 B c	56.00 ± 4.01 B b	60.00 ± 3.83 B a	**
Level of significance	*	*	*	*	*	--

*The different capital letters refer to significant differences between different treatment groups (column) at (P≤0.05)

**The different small letters refer to significant differences between different periods (row) at (P≤0.05)

Effect of VêO® Premium and Vit. C on hormones concentration.

Estrogen level: The effect of VêO® Premium and Vit. C on estrogen level is illustrated in Table (2). There was a significant increase (P≤0.05) in the level of estrogen for treatment T₁ and T₄ as compared with T₂ and T₃ in the fourth period. Also, a significant higher (P≤0.05) was observed for all experiment treatments between the fourth period within one treatment compared to all other periods within treatment.

Our results was in agreement with those of Parraguez et al., (2013) who reported that the estrogen concentration increased when vit. C and E were given in the ewe diet during the 40 days before birth that helped the fetus to grow during pregnancy, but disagreed with those of Alawiy et al., (2019).

Exposure to heat stress leads to a decrease in follicular fluid and estrogen concentrations in the plasma, due to reduced GnRH secretion as well as lower feed intake, with lower levels of LH receptors leading to delayed ovulation (Indu et al., 2014). The secretion of estrogen by ovarian follicles under thermal stress leads to a decrease in the production of theca cells androstenedion associated with a decrease in 17- α -hydroxylase expression, in addition to a decrease in the aromatic activity of granulosa cells that reduce estrogen secretion (Wakayo et al., 2015).

Table (2): Effect of VêO® Premium and Vit. C on estrogen level (ng/ ml) in the four groups (Mean ± SE)

Treatment	Periods				Level of significance
	Before pregnant		During pregnant		
	1	2	3	4	
T ₁	82.42 ± 6.22 b	73.75 ± 9.14 b	99.02 ± 12.38 b	206.98 ± 25.94 A a	**
T ₂	85.24 ± 13.96 b	70.64 ± 9.10 b	92.13 ± 2.93 b	182.40 ± 13.10 B a	**
T ₃	66.52 ± 8.75 b	76.55 ± 5.38 b	89.00 ± 15.13 b	167.67 ± 31.13 B a	**
T ₄	48.27 ± 12.06 c	84.14 ± 5.34 b	105.86 ± 32.22 b	203.24 ± 18.58 A a	**
Level of significance	NS	NS	NS	*	--

*The different capital letters refer to significant differences between different treatment groups (column) at (P≤0.05)

**The different small letters refer to significant differences between different periods (row) at (P≤0.05)

NS= Non-significant

The placenta developed in the first period of embryonic development, and secretes estrogen at early stage of pregnancy, and the hormone's concentration increases as the pregnancy progresses (Schuler et al., 2018). Estrogen is the second important hormone in save and maintaining pregnancy. It works indirectly on the endometrium to cancel the development of the endometrium mechanism and in cooperation with the progesterone, as it is secreted in lower quantities during the early stages of pregnancy and increases in the middle of pregnancy (Spencer et al., 2004).

Effect of synergistic components of the VeO® Premium mixture has a role in increasing the level of estrogen. The administration of Vit. E which is a component of VeO® Premium resulted in an increase in estrogen concentration (Ali et al., 2017).

Progesterone level: The interactive effects of VêO® Premium and Vit. C on progesterone level are shown in Table (3). The interactive effect of VêO® Premium and Vit. C on progesterone level was significant (P≤0.05) in the treatment T₃ during the first period of the experiment. The treatment T₄ at the second and fourth period showed significant increase (P≤0.05) within the treatments. The treatment T₂ showed an increase all the treatments in the third period with no significant differences between the T₁ and T₂ treatments during the fourth period. The fourth period within treatments increased significantly in the concentration of progesterone levels for T₁, T₃ and T₄ treatments. While the third and fourth period showed an increase in progesterone for treatment T₂.

Table (3): Effect of VeO® Premium and Vit. C on progesterone level (ng/ ml) in the four groups (Mean ± SE)

Treatment	Periods				Level of significance
	Before pregnant		During pregnant		
	1	2	3	4	
T ₁	0.06 ± 0.01 B c	0.37 ± 0.13 C c	2.87 ± 0.31 AB b	4.88 ± 1.34 AB a	**
T ₂	0.33 ± 0.12 AB b	1.11 ± 0.57 B b	3.56 ± 0.24 A a	3.99 ± 0.69 AB a	**
T ₃	1.58 ± 0.13 A bc	0.46 ± 0.30 C c	2.10 ± 0.44 B b	3.78 ± 0.60 B a	**
T ₄	0.46 ± 0.30 AB c	2.61 ± 0.91 A b	3.24 ± 0.96 AB b	5.10 ± 0.26 A a	**
Level of significance	*	*	*	*	--

*The different capital letters refer to significant differences between different treatment groups (column) at (P≤0.05)

**The different small letters refer to significant differences between different periods (row) at (P≤0.05)

NS= Non-significant

These results is similar to those obtained by Alawiy et al., (2019). The concentration of progesterone in dominant follicles decreases under the influence of heat stress and leads to a small size of follicle with reduced stimulation of LH and steroids (Wakayo et al., 2015). The corpus luteum is the main source of the secretion of the progesterone in the second stage of the estrus cycle. It is also secreted from the placenta during pregnancy to prevent the oxytocin to cause uterine muscle contractions. The secretion of low progesterone limits the function of the endometrium and the development of the fetus (Bridges et al., 2005). The progesterone maintains pregnancy (Rahman, 2006). Free radicals in animals are activated under different types of heat stress and oxidized fat products accumulate in different parts of the body (Yarovan, 2008). The free radicals generated in steroid cells and macrophages in the corpus luteum affect progesterone synthesis and can cause reproductive problems such as low vitamin E may cause silent heat (Sangha and Nayyar, 2004). Vit. E and selenium are essential nutrients that act as antioxidants to reduce cellular damage caused by internal peroxides (El- Shahat and Abdel Monem, 2011). Erisir et al., (2009) reported that an increase in fat and MDA in the blood, is a sign of an oxidative stress. The high concentrations of MDA present in the placenta promote high oxidative stress due to the high metabolism of the placenta and steroid hormones (Myatt, 2006).

Effect of synergistic components of the VeO® Premium mixture has a role in increasing of progesterone level. As the administration of vit. E led to an increase in the concentration of the

progesterone (Ali et al., 2017). High vit. C concentrations are necessary to produce progesterone during pregnancy (Luck and Zhao, 1993).

Effect of VêO® Premium and Vit. C on Reproductive performance.

Estrus rate: Table (4) shows the effects of VêO® Premium and Vit. C on the estrus rate. The higher of estrus rate in the T₂ treatment (80%) compared to all treatments of T₁, T₃ and T₄. These results was in agreement with results obtained by Musa et al., (2018), and disagreed with results observed by Soliman (2018). The higher aestrus rate in T₂ treatment is might be due to the synergistic action of the vitamin E-premium VEO® components that improve the concentration of Follicle-Stimulating Hormone (FSH) and Luteinizing Hormone (LH) while improving reproductive performance (Yin et al., 2019).

Fertility rate: The results of Table (4) showed a high fertility rate in T₂ and T₃ treatment as compared with T₁ and T₄ treatments. The results is disagreed with those of Musa et al., (2018). The increase in the treatment of T₂ and T₃ is might be due to the role of vit. E that plays arole in fertility rate, reduces abortion, retained placenta (McDowell et al., 1996). Vit. E deficiency is directly related to fetal loss, through its immune role of the reproductive system (Lean et al., 1998). Studies have shown that glycodelin, which is secreted from the uterine glands, is considered as a chemical inhibitor within the middle epithelium. This protein acts as a transporter of vit. E to the fetal membranes (Jauniaux et al., 2004). Vit. E also increases uterine contractions towards the oviduct during the reproductive period in order to transmit sperm and fertilize the ova (Segcrson and Ganapathy, 1981).

Conception rate: T₂ and T₃ treatments showed an increased rate as they gave higher conception rate as compared with T₁ and T₄ treatments (Table 4). These results was similar to those obtained by Musa et al., (2018). The higher T₂ and T₃ treatment is attributable to the synergistic action of the components of VêO® Premium, as Vit. C promotes bloody roses by releasing nitric oxide gas in higher a amount and speed of nutrients appropriate for the genitals (Taddei et al., 1998). During the period of implantation of fertilized eggs in the uterus, the fetal membranes during pregnancy provide the nutrients and oxygen from the mother to the fetus (Bazer et al., 2011).

Lambing rate: Table (4) showed an increase in the lambing rate in T₂ and T₃ treatments compared to T₁ and T₄ treatments. The results are in consistent with those of Dønnem et al., (2015). Addition of vit. E leads to higher a amount of nutrients transported to the body's organs, including the genitalia (El-Shahat and Abdel Monem, 2011). Vit. C also increases the growth and development of the corpus luteum, which in turn enhances the action of the progesterone and maintains fertilization and parturition (Luck and Zhao, 1993). Vitamin C has an important role in increasing fetal protein accumulation, low heat shock proteins, and increased birth weight (Richter et al., 2012). In synergy with vit. E acts to support the growth and development of the fetus, increase the efficiency of the placenta and increase the rates of births as the placenta is the main organ of the fetus' nutrition (Sales et al., 2019). The high temperatures, increased heat stress on the animal and the animal's lack of acceptance of some substances due to the high levels of the additive work to reduce appetite, which affects the nutritional, physiological and reproductive functions, which are negatively reflected on the reproductive performance, which includes a decrease in the development of follicles and the corpus luteum and a decrease in fertility and pregnancy rate after, and fetal death also affect the

mother's body weight and the amount of milk production (Takahashi, 2012). This is observed in T₁ and T₄ treatments.

Litter size: No differences were observed in the ratios of Litter size in one abdomen between the treatments of the experiment Table (4). The addition of the VêO® premium formula develop the fetus with the presence of vit. C and E, which in turn reflects the increase in the Litter size (Sales et al., 2019).

Barrenness rate: The results of Table (4) showed a significant reduction (P<0.05) in the Barrenness rate in females of T₂ and T₃ treatments as compared with T₁ and T₄ treatments. This might be due to the effectiveness of vit. C as it acts to promote bloody of liberating nitric oxide to the body's organs, including the ovaries, and thus higher the efficiency of the ovarian follicles and the corpus luteum (Taddei et al., 1998). These results were agreement Fierro et al., (2013) who stated that the increase of bloody roses to the ovaries is followed by an increase in the growth, development and enhancement of the level of the estrogen, and the occurrence of a large amount of nutrients leads to an increase in ovarian activity and stimulates the follicular growth during the final development of follicle and ovulation Early pregnancy and this reflects on the survival of the fetus.

Table (4): Effect of VêO® Premium and Vit. C on Reproductive characteristic's in the four groups (Mean ± SE)

Treatment	Estrus rate (%)	Fertility rate (%)	Conception rate (%)	Lambing rate (%)	Litter size (%)	Barrenness rate (%)
T ₁	60	20	20	20	1	80
T ₂	80	40	60	40	1	60
T ₃	60	40	60	40	1	60
T ₄	60	20	40	20	1	80

CONCLUSION

It was concluded from this study that addition of VêO® premium (2 g) and Vit. C (40 mg) supplementation to the diet of ewes during heat stress have beneficial effect on body weight and reproductive performance.

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