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EFFECT OF ORAL ADMINISTRATION OF RABBIT BUCKS WITH EGYPTIAN PROPOLIS DURING SUMMER, IN EGYPT

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This study aimed to evaluate the effect of oral administration of rabbit bucks with Egyptian propolis at levels of 0.5 and 1 g/h/d for 6 weeks on live body weight, hematological and some biochemical parameters, semen quality and sperm count, and initial fructose concentration in seminal plasma, during summer months in Egypt. Total of 15 New Zealand White (NZW) rabbit bucks at 4.5 months of age and 2.27 kg live body weight were randomly divided into three similar groups, 5 bucks in each. Bucks received commercial pelleted diet (18% CP and 12.6% CF) and treated with propolis in an oral dose of 0 (G1), 0.5 g/h/d (G2) and 1 g/h/d (G3) for six weeks as a treatment period, then semen was collected for another 6 weeks (twice/week) as a semen collection period. Blood samples were collected to analyze blood parameters.

***Results showed** no significant effect of propolis on LBW of bucks during treatment period. Oral administration of propolis at a level of 0.5 g/h/d for 6 wk (G2) increased (P<0.05) count of red blood cells and platelets concentration of blood plasma hemoglobin, total proteins, albumin, globulin and testosterone, while decreased (P<0.05) count of white blood cells as compared to controls (G1). Albumin/globulin ratio in blood of rabbit bucks was not affected by propolis administration. Semen volume, and percentages of mass motility, sperm progressive motility and livability as well as sperm cell concentration increased (P<0.05) in G2 and G3 as compared to G1, being the highest in G2. Sperm abnormality was not affected by propolis treatment. Sperm cell production as total, live, motile and normal outputs was the highest in G2, moderate in G3 and the lowest in G1 (P<0.05). Concentration of initial fructose in the seminal plasma increased (P<0.05) in G2 and G3 as compared to G1, respectively.*

***In conclusion**, oral administration of propolis at a level of 0.5 g/h/d for six weeks could be as a useful treatment for improving semen*

quality and enhancing production of live, normal and motile spermatozoa with good health status and body weight of rabbit bucks.

Keywords: Rabbit bucks, propolis, blood parameters, testosterone, semen traits, fructose.

The New Zealand White (NZW) rabbit is a commercial meat rabbit breed introduced in Egypt to participate in increasing meat production as it is a prolific animal, fast growing and high fecundity. Under the Egyptian conditions, these advantages are affected to a great extent by several factors such as the environmental and management conditions (Yamani *et al*.,1991). Heat stress which induces hyperthermia in rabbit is deleterious to any form of reproduction and occurs regardless of breed and stage of adaptation. Boland (2002) indicated the relationship between nutrition and reproduction is complex and often quite variable. However, nutrient supply is a component of the management system that is under the control of the farmer needs to be carefully evaluated. In this respect, Hegazi and Abdel-Hady (2001) found significant effect of dietary CP (15-17%) on sperm quality of rabbits.

Propolis is a honeybee product with a very complex chemical composition (honey bee glue). It is an adhesive, dark yellow to brown colored balsam that smells like resin collected from the buds, leaves and similar parts of trees and other plants like pine, oak, eucalyptus, poplar, chestnut, and so on by bees and mixed with their wax (Seven *et al*., 2010). It has an antioxidant property owing to its high content of polyphenolic composites including flavonoids, tannins, terpenoids and phenolic compounds which have free-radical scavenging activity. Numerous biological and pharmacological properties of propolis have been noted, including anti-bacterial, anti-fungal, anti-inflammatory, anti-oxidant, immune- modulatory, antiviral and anti-carcinogenic properties (Ramos and Miranda, 2007; Sabuncuoglu *et al*., 2007). Propalis shows biological activities such as anti-bacterial (Sforcin, 2000; Nagaoku et al., 2003), anti-fungal, anti-viral and anti-trypanosomal (Kartal *et al.,* 2003; Prytzyk *et al.,* 2003; Güler *et al.,* 2003) as well as anti-cancer and anti-inflammatory (Wang *et al.,* 2004; Kumazawa *et al.,* 2004; Blonska *et al.,* 2004) properties**.**

The chemical composition of propolis is quite complicated. Its compounds and biological activities depend on many different factors such as the geographical region, collecting time, and plant source (Bankova *et al.,* 2002; Sforcin *et al.,* 2000). Depending upon its composition, propolis may

show powerful local anti-biotic and anti-fungal properties (Orsi *et al.,* 2005). Propolis also exhibits immuno-stimulant effects (Brätter *et al.,* 1999; Ansorge *et al.,* 2003). Several workers have investigated the chemical composition and anti-microbial properties of propolis of different origin including the Egyptian (Abdel-Hady and Hegazi, 2002; Hashem *et al.,* 2013).

Propolis is also used extensively in food and beverages to improve health and prevent different diseases such as inflammations, diabetes (Burdock, 1998). It is recently a most important dietary supplement as ant-ioxidant compound (Seven *et al*., 2008, 2009 and 2011), therefore it is used in poultry feeding because of their anti-stress effects (Seven *et al*., 2008). Researchers suggest that propolis and especially propolis in dose supplemented with 3 mg/kg diet might be considered to prevent oxidative stress in the broilers exposed to heat stress (Seven *et al*., 2009).

Unfortunately, available data on reproductive performances of rabbit bucks as affected by propolis administration under hot condition in Egypt are scare. Therefore, the current study aimed to evaluate the effect of oral administration with propolis at two levels (0.5 and 1 mg/h/d) for 6 weeks on reproductive performance and some blood parameters of rabbit bucks during summer months in Egypt.

MATERIALS AND METHODS

The present study was planed at the Animal Production Department, Tanta University, while the experimental work was carried out on the flock of NZW rabbits at a private rabbit farm during the period from May 2013 to August 2013.

Animals and experimental groups:

A total number of 15 NZW rabbit bucks were used in this study having average live body weight (LBW) of 2.27 ±0.25 kg and 4.5 months of age. Rabbit bucks were randomly divided into 3 groups, 5 animals in each group. Bucks in the 1st group (G1) were considered as a control group without any treatment, while those in the 2nd and 3rd groups were orally administered with propolis by gavage at dose of 0.5 g (G2) and 1.0 g (G3) / buck daily for 6 weeks, respectively. All bucks were housed individually in flat-deck cages made of galvanized wire (50 x 60 x 40 cm) supplied with automatic drinking system (coprophagy wasn't prevented). Rabbits were free of any disease and with healthy appearance. The animals were

accommodated to the experimental condition and treated for one week before being experimented as adapting preparatory period.

Feeding system:

Diet was formulated to meet or exceed all the essential nutrient requirements of growing rabbits according to the recommendation of the NRC (1977) allowances. The ingredients and chemical composition are shown in Table 1. All the diets were in pelleted form (3.5 mm diameters) and animals were fed *ad libitium*. The experimental diets were offered to animals in all groups at 8 a.m. and 4 p.m. Chemical analysis of different feedstuffs was determined according to A.O.A.C. (1980).

Table (1): Ingredients (%) of the experimental diets.

Ingredient	%	Chemical composition	%
Berseem hay	15	Dry matter	91.4
Barley	24	Organic matter	89.6
Yellow corn	20	Crude protein	18.0
Soybean meal (44%)	14	Crude fiber	12.6
Wheat bran	24	Either extract	1.9
Molasses	2	Nitrogen free extract	57.1
Premix*	0.5	Ash	10.4
Sodium chloride	0.5		

* **One kg of premix contained**: 3.3 x 10^6 IU Vit. A; 3.3 g Vit. E; 3.3 x 10^6 IU Vit. D_3 ; 0.33 g Vit. K; 0.33 g Vit B_1; 1.33 g Vit. B_2; 6.67 g Vit B_5; 0.50 g Vit B_6; 3.3 g Vit. B_{12} ; 3.3 Pantothenic acid ; 0.33 Folic acid ; 16.67 mg Biotin ; 166.67 g Choline ; 1 g Copper ; 10 g Iron ; 13.3 g Mn ; 15 g Zn ; 0.1 g Iodin ; 0.03 g Se and $CACO_3$ (carrier) to 1 kg.

Experimental procedures:

During the treatment period of 6 weeks, LBW was recorded and then semen was collected twice weekly for another 6 weeks, while blood samples were taken at the end of the semen collection period.

Collection and evaluation of semen:

At the end of treatment period, semen was collected twice weekly from bucks in the experimental group with artificial vagina. The ejaculate volume was recorded and semen was evaluated for percentages of mass motility, progressive sperm motility, livability and abnormality as well as sperm cell concentration.

Immediately after semen collection a drop of freshly ejaculated semen was examined under the low power of microscope (x 150) using a warmed microscopic stage adjust at 37^{o}C. Mass motility was estimated as described by Perry (1960). A drop of fresh semen was diluted (1:1) with sodium citrate solution (2.9%) on a slide and covered with a cover slip. Under the high power (400 x), the slide was examined on a warmed microscope stage incubator at 37^{o}C and the percentage of spermatozoa showing progressive forward motility was recorded for a microscopic field of 100-200 spermatozoa according to Perry (1960).

A smear of freshly ejaculated semen was made and stained by eosin-negrosin mixture, prepared as described by Hancock (1951). The percentage of live spermatozoa (unstained ones) was calculated from total number 100-200 spermatozoa counted in different microscopic fields under magnification of (x 600).

The same smear prepared for live/dead count was also used for studying the presence of different morphologically abnormal types of spermatozoa, including primary, secondary and protoplasmic droplets.

The percentage of total abnormalities was assessed as the counting procedure mentioned above using cider oil smears under immersion lens (x 1000). Hemocytometric count of diluted semen (1:200) was done using the technique described by Herman and Madden (1953).

Total output of different sperm characteristics (x 10^6 /ejaculate) was calculated Total sperm output per ejaculate (TSO) as well as motile (MSO), live (LSO) and normal (NSO) sperm output were calculated by the following equations:

TSO = Ejaculate volume (ml) x sperm cell concentration (x 10^6/ml)

MSO = TSO x progressive sperm motility (%)

LSO = TSO x live sperm (%)

NSO = TSO x (100-sperm abnormality %)

Initial fructose concentration (mg/ml semen):

Initial fructose concentration was determined in row semen calorimetrically according to the modification adopted by Mann (1964), for the technique described earlier (Mann 1948) using spectrophotometer (Bamsch and lamb spectronic 20).

Blood analysis:

Blood samples were taken from rabbit bucks during slaughtering in test tubes containing anticoagulant (Heparin). Blood plasma was separated by centrifugation at 1500 rpm and stored at -20^{o}C until subsequent analysis.

Concentration of total proteins and albumin in blood plasma was estimated by spectrophotometer using commercial kites according to Gonal *et al.* (1949) and Weichselaum (1946), respectively, while globulin concentration was calculated by subtracting albumin from total proteins concentration. Hematological parameters including count of red blood cells (RBCs) and white blood cells (WBCs) was carried out by hemocytometer using alcohol fixed blood smears stained with Giemsa's stain methods described by Feldman et al. (2000). Hemoglobin concentration (Hb) was measured calorimetrically according to the method described by Richterich (1969).

Testosterone hormone concentration (ng/ml):

Testosterone concentration (ng/ml) was determined in blood plasma by radioimmunoassay technique using commercial kit (Coat, total testosterone. Diagnostic products, Corporation, Los-Angeles, U.S.A) according to Rawlings *et al.* (1972).

Statistical analysis:

Results were statistically analyzed according to Snedecor and Cochran (1982) using computer program of SAS (2001) to establish the effect of treatment group. The statistical model was: $Y_{ijk} = U + A_i + e_{ijk}$. Where: Y_{ijk} = observed values, U = overall mean, A_i = group (1, 2 and 3), e_{ijk} = random error. The significant differences among means among groups were tested by multiple range test (Duncan, 1955). The percentage values were statistical analyze according to arcsine values.

RESULTS AND DISCUSSION

Live body weight of bucks:

Results illustrated in Figure (1) revealed similar trend of increase in LBW of rabbit bucks during the treatment period (6 wk), with insignificant differences in LBW among groups. This increase was attributed to advancing age of rabbit bucks. No available data are recorded on the effect of propolis on LBW of animals. In fishes (Rainbow Trout), Kashkooli *et al.* (2011) found that feeding fish diets containing 0.5, 1.5, 4.5 and 9 g

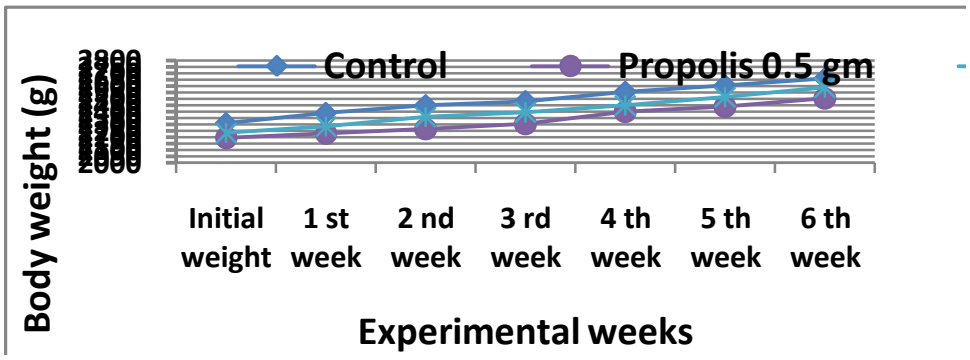

Figure 1: Changes in live Body weight (g) of NZW rabbit bucks (g) in experimental groups during the treatment period.

propolis/kg diet for 8 weeks induced no significant alterations in growth parameters when compared to the control diet.

Blood parameters:

Hematological parameters:

Results presented in Table (2) revealed that daily oral administration of rabbit bucks with propolis at a level of 0.5 g for 6 wk (G2) significantly ($P<0.05$) increased count of RBCs and platelets, as well as Hb concentration, and significantly ($P<0.05$) decreased count of WBCs as compared to controls (G1). Increasing propolis level up to 1 g/buck for the same period (G3) significantly ($P<0.05$) increased count of RBCs only, while count of WBCs and pltelets as well as Hb concentration did not differ significantly from that in the control group (G1).

These results indicated that the significant effect of propolis administration on hematological parameters of rabbit bucks is dependent on its dose, being effective at a level of 0.5 g/buck.

In accordance with the present results, Hashem *et al.* (2013) indicated that rabbit bucks fed diet supplemented with propolis (140 mg/kg) enhanced hematopoiesis including count of red blood cells, and hemoglobin concentration ($P<0.01$), but platelets count was not affected significantly by propolis treatment. The significant improvements in hematological parameters due to propolis supplementation may enhance blood ability to carrying oxygen to different tissues and in turn improving different metabolic and physiological functions (Marai *et al*., 2002).

Table 2 : Effect of propolis treatment on some hematological parameters of NZW rabbit bucks at the end of the experimental period.

Hematological parameter	Experimental groups		
	Control	Propolis (0.5 g)	Propolis (1 g)
RBCs ($x10^6/mm^3$)	4.497^{b}±0.164	5.833^{a}±0.054	5.707^{a}±0.367
WBCs ($x10^3/mm^3$)	7.230^{a}±0.306	5.807^{b}±0.338	6.433^{ab}±0.141
Hemoglobin (mg/dl)	9.533^{b}±0.461	11.433^{a}±0.297	10.293^{ab}±0.452
Platelets ($\times 10^3/mm^3$)	120.33^{b}±8.106	160.20^{a}±8.753	137.00^{b}±5.529

A,B,C **and D:** Means denoted within the same row with different superscripts are significantly different at P<0.05. RBCs: Red blood cells. WBCs: White blood cells.

Blood biochemical parameters:

Data presented in Table (3) revealed that daily oral administration of rabbit bucks with propolis at a level of 0.5 g/buck for 6 wk (G2) significantly (P<0.05) increased concentration of both albumin and globulin, and consequently concentration of total proteins as compared to controls (G1). However, concentration of total proteins and their fractions were not affected significantly by increasing propolis level up to double dose (1 g/buck). On the other hand, albumin/globulin ratio in blood of rabbit bucks was not affected by propolis administration.

In spite the observed effect of propolis on concentration of total proteins and their fractions, their values are within the normal range of rabbits as reported by Hashem *et al*. (2013).

Table 3: Effect of propolis treatment on some plasma biochemical of NZW rabbit bucks at the end of the experimental period.

Blood biochemical	Experimental groups		
	Control	Propolis (0.5 g)	Propolis (1 g)
Total proteins (g/dl)	4.85^{b}±0.157	5.45^{a}±0.066	5.23^{ab}±0.198
Albumin (AL, g/dl))	2.16^{b}±0.113	2.67^{a}±0.098	2.26^{ab}±0.144
Globulin (GL, g/dl)	2.30^{b}±0.218	2.99^{a}±0.156	2.80^{ab}±0.204
AL/GL ratio	0.95±0.078	0.90±0.041	0.82±0.106

A and B: Means denoted within the same row with different superscripts are significantly different at P<0.05.

In accordance with the present results, it was reported that propolis stimulates mammalian tissue regeneration, as it enhances protein biosynthesis (Gabrys *et al.*, 1986). In this respect, Seven *et al.* (2008) reported that supplementation of propolis (5 g/kg diet) was the most

efficient treatment, and increased feed intake and improved digestibility of crude protein in laying hens. Also, Giurgea *et al.* (1981) reported that daily administration of 20 mg/100 g LBW standard propolis extract (SPE) to chicken for 15 days increased plasma total protein, gamma-globulin contents and amino acids. They suggested that propolis has an anabolic effect and stimulated the immunologic processes. In other studies, chicken fed SPE-diet showed a significant increase in serum total proteins (Giurgea *et al.,* 1982) and muscle total proteins (Giurgea *et al.,* 1984) when compared to corresponding controls. However in fishes (Rainbow Trout) fed diets containing 0, 0.5, 1.5, 4.5 and 9 g propolis/kg diet for 8 weeks, Kashkooli *et al*. (2011) showed that all dosages induced no significant alterations in the levels of blood total protein, albumin and globulin when compared to the control group.

Blood plasma testosterone:

Results shown in Table (4) revealed that testosterone concentration in blood plasma of rabbit bucks significantly ($P<0.05$) increased by about 38% as compared to controls when rabbit bucks were orally administrated with propolis only at a level of 0.5 g/buck (G2). However, concentration of plasma testosterone insignificantly increased by increasing level of propolis up to 1 g/buck (G3).The observed increase in testosterone concentration may suggest improvement of sexual desire, semen volume and spermatogenesis of rabbit bucks treated with propolis at a level of 0.5 g/buck.

Table 4: Effect of propolis treatment on concentration of testosterone (ng/ml) in blood plasma of NZW rabbit bucks at the end of the experimental period.

Item	Experimental groups		
	Control	**Propolis (0.5 g)**	**Propolis (1 g)**
Testosterone(ng/ml)	$1.873^{b}\pm0.058$	$2.603^{a}\pm0.167$	$2.110^{b}\pm0.065$

A and B: Means denoted within the same row with different superscripts are significantly different at $P<0.05$.

Similar results were recently reported on rabbit bucks by Hashem *et al.* (2013), who found that bucks in the propolis group (140 mg/kg diet) had significantly ($P<0.01$) higher blood plasma testosterone concentration (2.5 ng/ml) than in the control group (1.7 ng/ml). This increase was about 47% vs. 38% for bucks treated with 0.5 g/h in the current study. The impact of propolis on plasma testosterone of rabbit bucks in the present study is in

agreement with the results of Capucho *et al.* (2012) and Yousef and Salama (2009) when propolis was fed to male rats.

Semen production:

Physical semen characteristics:

Results presented in Table (5) showed that daily oral administration of rabbit bucks with propolis at both levels (0.5 and 1.0 g/buck) for 6 wk significantly (P<0.05) increased semen volume, and percentage of mass motility, sperm progressive motility and livability as compared to controls, but the differences between both propolis level were significant. The observed increases in the previous traits were 113, 20, 17 and 8% for propolis at a level of 0.5 g/buck, respectively. The corresponding increases for 1 g propolis/buck were 37, 12, 5 and 4%, respectively. On the other hand, sperm cell concentration significantly (P<0.05) improved by about 28% only with propolis at a level of 0.5 g/buck as compared to controls, while sperm abnormality percentage was not affected by propolis administration.

These findings indicated the highest effect of propolis at a level of 0.5 g/buck on semen quality, particularly in term of improving semen volume, sperm cell concentration and mass motility.

Table 5: Effect of propolis treatment on physical semen characteristics of NZW rabbit bucks during the collection period.

Item	Experimental groups		
	Control	**Propolis (0.5 g)**	**Propolis (1 g)**
Physical semen characteristics:			
Semen volume (ml)	0.72^{c}±0.026	1.24^{a}±0.055	0.99^{b}±0.051
Mass motility (%)	45.0^{c}± 0.693	54.0^{a}± 0.829	50.5^{b}±0.751
Progressive sperm motility (%)	53.2^{c}±1.865	62.4^{a}±2.081	56.0^{b}±1.107
Live sperm (%)	75.6^{c}±0.723	82.3^{a}±1.469	79.0^{b}±0.771
Sperm abnormality (%)	13.2±0.528	12.9±0.455	12.8±0.527
Sperm concentration (x 10^6/ml)	192.6^{b}±12.20	246.7^{a}±12.93	217.2^{ab}±13.28

A, B and C: Means denoted within the same row with different superscripts are significantly different at P<0.05.

In agreement with the present results, Hashem *et al.* (2013) found that propolis supplementation (140 mg/kg diet) improved semen quality of rabbit bucks in term of increasing the sperm cell concentration from 118.3 to 187.7 x 10^6/ml (P<0.01) and tendency of increase in percentages of livability and progressive motility of spermatozoa, and ejaculate volume.

They concluded that propolis in male rabbit diets during the hot season could be used effectively to mitigate negative impacts of elevated temperature on semen quality, oxidative status. The remarkable effects of propolis on semen quality observed on rabbit bucks in the current study are similar to those obtained by Capucho *et al.* (2012) and Yousef and Salama (2009) in male rats fed propolis.

Sperm count:

Results presented in Table (6) showed that daily oral administration of rabbit bucks with propolis at both levels 0.5 and 1.0 g/buck for 6 wk significantly ($P<0.05$) improved sperm production as total, live, motile and normal outputs. These increases were 119.9, 139.1, 157.8 and 121.2% for propolis at a level of 0.5 g/buck versus 53.5, 56.6, 61.2 and 54.4%, for propolis at a level of 1 g/buck, respectively.

Such results indicated beneficial effects of both levels of propolis on production of live, motile, normal and consequently total spermatozoa of rabbit bucks. It is of interest to note that all enhancement in semen volume, semen quality and sperm production were paralleled with increasing concentration of testosterone in blood plasma of rabbit bucks treated with propolis at a level of 0.5 g/buck (Hashem *et al.,* 2013).

Table 6: Effect of propolis treatment on sperm output in semen of NZW rabbit bucks during the collection period.

Item	Experimental groups		
	Control	**Propolis (0.5 g)**	**Propolis (1 g)**
Sperm output (x10^6/ejaculate):			
Total	137.5^c±5.696	302.4^a±10.05	211.1^b±10.53
Live	103.9^c±4.187	248.5^a±7.949	162.8^b±8.612
Motile	73.50^c±4.743	189.5^a±11.13	118.5^b±6.725
Normal	119.2^c±4.639	263.7^a±9.949	184.2^b±9.410

A, B and C: Means denoted within the same row with different superscripts are significantly different at $P<0.05$.

The beneficial effects of propolis on semen quality and sperm count of rabbit bucks are mainly attributed to that propolis increases concentrations of blood plasma glucose as a source of energy and enhanced oxidative status of the blood plasma in term of increasing total antioxidant capacity and decreasing malondialdehyde activity in the propolis-treated bucks compared with the control bucks (Hashem *et al.,* 2013). Propolis stimulates

mammalian tissue regeneration, as it caused strong activation of mitosis of cells cultured *in vitro* (Gabrys *et al.,* 1986). Therefore. propolis may increase the division of spermatogenic layer of the somniferous tubules within the testis.

In general propolis has been reported to be an important anti-oxidant (Mani *et al.,* 2006; Abd El-Mawla and Osman, 2011). In broiler, propolis at a level of 3 mg/kg diet might be considered to prevent oxidative stress during exposure to heat stress (Tatli Seven *et al.,* 2009). Propolis has an anti-oxidant property owing to its high content of polyphenolic composites including flavonoids, tannins, terpenoids and phenolic compounds which have free-radical scavenging activity (Ramos and Miranda, 2007; Seven *et al.,* 2010). Also, it contained mainly pinocembrin, pinobanksin, chrysin, galangin, prenyl esters of caffeic and ferrulic acids (Bankova *et al.,* 2002). Another compound in the structure of propolis, caffeic acid phenethyl ester, blocks the production of reactive oxygen species (Hosnuter *et al*., 2004) such as H_2O_2 and NO that might be responsible for its anti-inflammatory effects (Tan-No *et al*., 2006).

Anti-oxidants either block or remove excessive amounts of these radicals keeping the organism from its harmful action. Thus, reducing intra-cellular peroxides, anti-oxidants by themselves can improve healthy status and spermatogenesis of rabbit bucks. Ability of propolis to reduce the testicular oxidative stress as an antioxidant was supported by Yousef and Salama (2009), who proved that propolis attenuated the testicular toxicity induced by aluminum by decreasing level of thiobarbituric acid-reactive substances.

Energy source in semen:

Results in Table (7) showed that concentration of initial fructose in semen of rabbit bucks significantly ($P<0.05$) increased by about 51 and 13% when rabbit bucks were orally administrated with propolis at levels of 0.5 and 1 g/buck as compared to controls, respectively. This result may indicate improvement of energy source in semen for sperm activities in rabbit bucks treated with both propolis levels.

Results of Hashem *et al.* (2013) indicated that bucks in prpolis group (140 mg/kg diet) had higher concentration of seminal plasma initial fructose than in seminal plasma of control bucks by about 26% (from 26.9 to 34.0 mg/dl). However, in the present study this increase mounted 52% (from 69.0 to 34.0 mg/dl for propolis at a level of 0.5 g/h) or 42% (from 45.3 to 64.7 mg/dl for propolis at a level of 1 g/h). Okab (2007) reported that

Table 7: Effect of propolis treatment on concentration of fructose (g/dl) in semen of NZW rabbit bucks during the collection period.

Item	Experimental groups		
	Control	**Propolis (0.5 g)**	**Propolis (1 g)**
Semen fructose (mg/dl)	$45.3^{b}\pm7.05$	$69.0^{a}\pm8.66$	$64.7^{a}\pm6.06$

A and B: Means denoted within the same row with different superscripts are significantly different at ($P<0.05$).

fructose as the main energy source for spermatozoa is produced by the accessory sex glands and this production is dependent on the secretion of testosterone by Leydig cells within the testes. Therefore, the observed increase in initial fructose content in seminal plasma was associated with increasing testosterone concentration in blood plasma of rabbit bucks.

In conclusion, oral administration of propolis at a level of 0.5 g/h/d for six weeks could be as a useful treatment of rabbit bucks to improve semen quality and enhancement of live, normal and motile spermatozoa production with good health status and body weight.

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تأثير صمغ النحل المصرى على الاداء التناسلى وبعض صفات الدم فى الارانب (غير واضح)

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تهدف هذه الدراسة الى المعاملة بصمغ النحل على بعض الصفات الهيماتولوجية والبيوكميائية وصفات السائل المنوى لذكور الارانب النيوزيلاندي الابيض، استخدم فى هذه الدراسة عدد١٥ ذكر نيوزيلاندى ابيض يتراوح اعمارها من ٤-٥ شهور بمتوسط وزن ٢,٢٧٥ كجم قسمت عشوائيا الى ثلاث مجموعات تجريبية كلا منها يحتوى على خمسة ذكور، المجموعة الاولى مجموعة مقارنة لم تعلمل بصمغ النحل، المجموعة الثانية عوملت بصمغ النحل بمعدل ٠,٥ جم/ راس /يوم والمجموعة الثالثة عوملت بمعدل ١جم/ راس يوميا من صمغ النحل استمرت المعاملة لمدة ستة أسابيع بعدها تم جمع السائل المنوى من جميع الذكور باستخدام المهبل الصناعى لمدة ستة اسابيع اخرى بواقع مرتين اسبوعيا كما تم اخذ عينات الدم لتقدير قياسات الدم.

أوضحت النتائج تفوق ذكور المجموعة الثانية معنويا فى عدد كرات الدم الحمراء والصفائح الدموية بالمقارنة بالمجموعة الاولى كذلك تركيز الهيموجلوبين كما قل عدد كرات الدم البيضاء ايضا حدث زيادة معنوية فى البروتين الكلى، الالبيومين والجلوبيولين فى المجموعة الثانية مقارنة بالكنترول بينما لم تتاثر هذه المكونات معنويا فى المجموعة الثالثة مقارنة المجموعة المقارنة كما ان نسبة الالبيومين للجلوبيولين لم تتاثر بالمعاملة بصمغ النحل. تركيز الهرمون الذكرى زاد معنويا بحوالى ٣٨% فى المجموعة الثانية بالمقارنة بالمجموعة الاولى ،ذكور المجموعة الثانية والثالثة حدث بها زيادة معنوية فى حجم القذفة، النسبة المئوية للحركة الكلية ، الحركة الفردية والاسبرمات الحية بالمقارنة بالمجموعة الاولى (١١٣، ٢٠ ، ١٧ ، ٨ % على التوالي)، تركيز الحيوانات المنوية زاد معنويا بحوالى ٢٨ % فى المجموعة الثانية مقارنة بالمجموعة المقارنة بينما نسبة الحيوانات المنوية الغير طبيعية لم تتاثر بالمعاملة بصمغ النحل.كان الإنتاج الكلى للحيوانات المنوية، الحيوانات المنوية الكلية المتحركة، والحيوانات المنوية الكلية المتحركة و الحيوانات المنوية الكلية الطبيعية كان عاليا فى المجموعة الثانية ومتوسطا فى المجموعة الثالثة ومنخفضا فى المجموعة الاولى، كما لوحظ زيادة معنوية فى تركيز الفركتوز فى بلازما السائل المنوى فى المجموعة الثانية والثالثة بالمقارنة بالمجموعة الأولى على التوالي.

التوصية: توصى هذه الدراسة بان المعاملة بصمغ النحل بمعدل٠,٥ جم / راس يوميا لمدة ستة اسابيع ادت لتحسن صفات السائل المنوى مع حالة جيدة للوزن والصحة لذكور الارانب.