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Effect of Using Different Beebread Types as Natural Hive Pellets or Extract on Reproductive and Productive Performance of Dairy Goats

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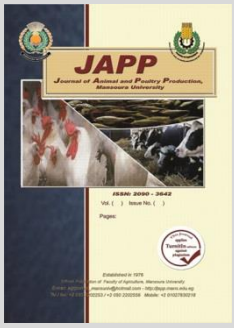

ABSTRACT

Objective was to investigate supplying goats by bee bread (BB) such as natural hive pellets or extract to improve reproductive and productive performance. A total number of 24 goats were used. They were divided into three groups as A, B and C then, BB offered at levels of 0, 4 g and 5.0 ml daily / head, respectively. Reproductive parameters and oestrus resumption were investigated. Also, productive performance such as suckling and peak lactation were determined. The blood parameters were analyzed. Finely, correlation coefficient among feeding and some reproductive and productive procedures were explained. The results indicated that B or C goats had higher (P<0.05) and similar LBW, BCS and BMI than A goats. The reproductive parameters were better in B and C goats than A goats. The B and C goats have shorter (P<0.05) days of estrus and longer (P<0.05) estrus time duration than A goats. Milk yield during suckling and peak of lactation were significantly (P<0.05) higher in B and C goats than A goats. The glucose, total protein, globulin, HDL were significantly (P<0.05) higher in B and C goats than A goats. However, the total lipids, albumin, triglycerides, cholesterol, LDL, AST, ALT and creatinine, in B and C goats were lower (P<0.05) than A goats. The positive correlation coefficient was observed among BB feeding and some reproductive and productive. Conclusion, BB pellets or solution able to improve reproductive and productive performance of goats.

Keywords: bee bread, reproductive, productive of goats.

INTRODUCTION

During the last few years, studies attempt to find some natural diet sources with high nutritional value with potential of health promotion, reduction of illnesses. The scientific researches pay more attention to apiculture bee products namely pollen, honey, bee bread, propolis and royal jelly. Nowadays, these products are considered functional diets, which increase nutritional value and have positive manner to reproductive or productive performances in livestock. It is well known that bee bread (BB) is a product of the hive obtained from pollen collected by bees, to which they added honey and digestive enzymes and subsequently stored in the combs, starting a lactic fermentation (Ivanisova *et al.*, 2015). The lactic acid fermentation of BB has higher nutritional value and better digestibility than bee pollen, because of the fermentation process the walls of pollen cells are partly destructed and enriched with new nutrients (Zuluaga *et al.*, 2015). Also the former authors defined that BB differs from pollen by lower pH (3.8-4.3), it contains less proteins and fats, but more carbohydrates, lactic acid and enzymes. According to scientific studies, it is richer in content of vitamins K (prevention the poor condition of the blood vessels) and B (for nerves activation), detoxification and shows lower pH values because of the lactic acid (Madras-Majewska *et al.*, 2015). Also, the previous authors indicated that ethanol extract of BB products did not change the pH of ruminal fluid, total amount of short-chain fatty acids (SCFA) including acetic acid and propionic acid, increased the production of butyric acid, total number of protozoa and improve the digestibility of dry matter. This natural product owing to its biochemical diverse could be used for immunity system enhancement, regulation of digestive system function, antimicrobial, anti-aging and anti-anemic activities (Asama *et al.*, 2015). Furthermore, BB has a positive influence on functions of endocrine and nervous systems, tissue regeneration and elimination of various toxins forms (Bogdanov, 2015). According to Habryka *et al.* (2016) who defined that BB increase immunity, improve the energy balance, contains larger amounts of peptides, free amino acids, cooperate in protein metabolism, synthesis of nucleic acids and are essential to circulatory system of living organisms. Furthermore, Al-Salem *et al.* (2016) noticed that may benefit from BB as nutritional supplements; then the production is quite specific by digestive processes and energy balance in the bodies of ruminants. Then, the results of research on the actual improvement in livestock productivity after the application of bee products are not unequivocal. In this context, Awad *et al.* (2013) concluded that BB could be used as a growth promoter, improving nutrients digestibility coefficients as well as economical efficiency of hens. Moreover, Attia *et al.* (2014) noticed that bee pollen could be used as a supplement in the growing rabbits with positive effects on growth rate and feed conversion ratio. Fahim (2018) demonstrated that BB may be particularly beneficial in cocks and it could improve the reproductive performance of cocks. On the other hand, Abdel-Hamid and El-Tarabany (2019) concluded that intake of BB supplementation can improve the feed to gain ratios, blood indices and metabolic hormones in different rabbit breeds. Recently, Mona *et al.* (2021) suggested that the goats were quaffed bee bread extract as fed additives during suckling months could be caused positively effect on suckling milk yield which reflected on health and growth rate of their kids.

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The relevant information available in the literature sources for the effect of feeding BB hive pellets on livestock is limited. To our knowledge, our work is the first report dealing with treatment of dairy goats with BB hive pellets. In this study, we comparison the potential benefits of either BB types as bee bread hive pellets or bee bread extract through critical life of diary goats.

MATERIALS AND METHODS

All experimental procedures were carried out at El-Serw Experimental Research Station. The animal herd belongs to Animal Production Research Institute (*APRI*), Agriculture Research Center, Ministry of Agriculture, Egypt. This work was carried out in breeding season of dairy goats at 2020-2021.

Preparing of bee bread extract and dry bee bread

For the extraction process of bee bread, the sample was dried before it can be crushed. Next, 20 g of sample were mixed with 80 mL of 95% ethanol and then put on a shaker at 200 rpm and 37 °C for 24 h. The top layers were decanted and centrifuged at 3000 rpm for 30 min. After that, the supernatant was evaporated at 40°C in the rotary evaporator. Then, the BB extract was stored in dark at 5°C until use to quaff goats as 5 ml / h / d during trial times. The samples of BB pellets were dried before and packaging in rice straws paper like sack and offered as oral dosing in 4 g /h /d all experimental periods. Some of chemical contents of BB according to Ismail *et al.* (2018) are shown in Table (1). The main mineral contents (mg/kg) in BB according to Dranca *et al.* (2020) are presented in Table (2).

Table 1. Some chemical contents of the bee bread sample.

Item	Chemical composition							
	Moist-ure %	Fat %	Carbohy-drate %	Prote-ins %	Fiber %	*Total antioxidant capacity/mg	Phenol /mg	Ash g/100
BB	9.85	2.31	55.10	47.40	8.30	143.78	14.88	1.70

*** As ascorbic acid equivalents/g.**

Table 2. The main mineral contents (mg/kg) of bee bread sample.

Mineral contents (mg/kg)								
Ca^{++}	Fe^{+++}	K^{+}	Mg^{++}	Mn^{++}	Na^{+}	Zn^{++}	P^{+++}	Se^{++}
1547.31	126.43	6524.90	1635.40	61.66	139.70	60.62	6402.28	0.2633

Animals, treatments and experimental design

Twenty-four diary Zaraibi goats in the third parity of production had an average live body weight (LBW) 35.58 kg and 2.54 as body condition score (BCS) were used in a design with three treatments (N=8 in each) during critical periods of dairy goats. All goats were received ration according to (NRC, 2007). The treatment groups were formed as 1st treatment (diet A) serviced as control group has received the basal experimental diet included concentrate feed mixture (CFM) and roughage [as corn silage (CS) and rice straws (RS)] without any addition of bee bread types. The other treatments 2nd and 3rd were nourished the same basal experimental diet. However, the 2nd treatment (diet B) has fed bee bread pellets at 4 g /head /day. Referring to Morsy *et al.* (2013) confirmed that bee by-product as propolis could be fed up to 4 g /day /ewe. While, the 3rd treatment (diet C) has quaffed 5 ml /h /d of bee bread extract described by Mona *et al.* (2021). The A, B and C goat groups were received diets in two equal portions daily. The 1st portion offered at 8.00 am plus BB treatments (pellets or solution) and the 2nd portion fed at 3.00 pm. The A, B and C goats were kept in individual stalls with individual feeders and *ad libitum* fresh water and blocks of minerals are supplied through experimental periods. The chemical compositions of the basal diets as CFM, CS and RS according to AOAC (2007) are presented in Table (3).

Table 3. Chemical composition of basal experimental diet as CFM, CS and RS.

Items	Chemical composition (% on dry matter basis)						
	DM	OM	CP	EE	CF	NFE	Ash
CFM*	88.70	92.82	14.16	2.30	11.05	65.31	7.18
CS	36.24	86.90	9.15	2.56	24.67	50.52	13.10
RS	89.22	83.75	3.86	1.75	36.70	41.44	16.25

*** Concentrate feed mixture (CFM) consisted of: 38% ground yellow corn, 22% undecorticated cotton seed meal, 7% soybean meal, 12% wheat bran, 13% rice bran, 5% cane molasses, 2% lime stone and 1% common salt.**

Data collection and procedures

Live body weight (LBW) of does during critical periods

A, B and C groups were individually weighed at critical periods (beginning of flushing, pre-mating season, post-mating season, at 100 days of gestation, at 140 days of gestation, post-kidding, post-weaning and at 8 weeks of lactation).

Body condition scoring (BCS) of does during critical periods

Table (4) was estimated the BCS during the same critical periods in A, B and C groups.

Body mass index (BMI)

It was calculated in A, B and C groups during the critical periods according to this equation:-

BMI (kg m^{-2}) = [BW (kg) / WH (meter) / BL (meter)] /10.

BW: is a body weight recorded with a digital balance.

WH: is a withers height measured from the highest point of the scapulae vertically to the ground.

BL: is a body length measured as the distance between the dorsal point of the scapulae and the ventral point of the tuber coxae.

Table 4. Scales of body condition scoring.

Scales	Characteristics	Descriptions
1.0	Very thin or emaciated	Spinous processes are sharp and prominent. Transverse processes are sharp. No fat cover.
1.5-2.0	Thin	Spinous processes are less sharp and prominent. Transverse processes are sharp. Less fat cover.
2.5-3.0	Medium or moderately lean	Spinous processes are smooth and rounded. Transverse processes are smooth and well covered. Some fat cover. Ideal body condition score.
3.5-4.0	Moderately fat	Spinous and transverse processes well covered and rounded. Thick muscle.
4.5-5.0	Very fat/obese	Spinous processes cannot be detected. Muscle is very full with very thick fat cover.

Reproductive performance

After A, B and C groups were served by a fertile billy goats, the reproductive traits of each group was recorded as conception rate (number of does conceived / does mating), fertility (number of does kidded / does mating), fecundity (number of all kids born / does mating), prolificacy (number of a live kids born / does kidded).

Patterns of birth were recorded as single birth rate (number of does kidded singles/ number of does kidded), twins birth rate (number of does kidded twins/ number of does kidded) and triplet birth rate (number of does kidded triplet/number of does kidded).

Reproductive potential included: number of kids weaned / does kidded, kilograms of kids' birth/ does served, kilograms of kids' birth/ does kidded, kilograms of kids weaned/ does served and kilograms of kids weaned / does kidded.

Oestrus resumption

Detection of A, B and C goats in heating were carried out at post-kidding and post-weaning by observed the mating of teaser billy goat on trial groups. The oestrous cycle was observed two times daily at 12 hours interval and one hour as monitor. The nanny goat in A, B and C groups were experienced estrus behavior is walking trend billy goat or increased vocalizations for the teaser, will stand and allowed teaser to mount. Also, heating rate % was calculated as No. of does display estrus / total No. of kidding does x100.

Milk yield during suckling and peak weeks of lactation

The quantities of suckling milk in A, B and C groups were evaluated at 7, 15, 30, 60 and 90 days by following the protocol of Khalifa *et al.* (2013). Then, this protocol was used the oxytocin method as injecting double doses each dose included 2 IU/maternal goat intravenously after kids were separated. The 1st dose was injected and after two minutes of injection the udder milk emptied handly and then this amount of milk discarded. After 4 hours of kids' separation the 2nd dose was injected. Then, this amount of milk was recorded after the udder milking handly. The suckling milk amount was calculated using the following equation= suckling milk amount (g) obtained in 4 hours (as the isolation time of kids from their maternal) × 6 (as a factor) give the amount of milk was suckled during 24 hours. Milk yield during peak weeks of lactation in A, B and C goats was recorded by weekly up to eight weeks of lactation where hand milk yield / nanny goat /group assayed weekly by added morning cooled milk into the evening milk as one sample and multiplication in 7 days.

Blood parameters

Blood samples were taken from the jugular vein of three animals in each group (as A, B and C goats) after 8 weeks of lactation at 8.00 am into vacationer tubes. Then, blood samples allowed to coagulate and centrifuged at 3000 rpm for 20 min to obtain blood serum. The supernatant was frozen and stored at -20ºC for subsequent analysis. Stored serum samples were analysed for total protein, albumin, globulin, glucose, cholesterol, low density lipoprotein (LDL), high density lipoprotein (HDL), total lipids, urea, creatinine and the activities of aspartate amino-transferase (AST) and alanine amino-transferase (ALT). The determination was assayed by commercial kits produced by Bio-Merieux (Craponne, France).

Statistical Analysis

Statistical evaluation of significant difference between means (mean ± SEM) were performed by ANOVA followed by the Duncan post hoc test to determine significant differences in all the parameters among all energy addition types using the SPSS/PC computer program (SPSS Statistics version 2020). The significance level considered was $P<0.05$. Correlation between BB feeding and body weight (BW), body condition scoring (BCS), body mass index (BMI), suckling milk flow (SM), milk yield (MY), oestrus resumption after parturition (ORP) and oestrus resumption after weaning (ORW) were calculated using the Pearson's coefficients of SPSS programmes.

RESULTS AND DISCUSSION

Live body weight (LBW) of does during critical periods

The means of LBW of does during critical periods included start of flushing, pre-mating, post-mating, at 100 days of pregnancy (trimester), at 140 days of gestation, post-kidding, post-weaning and after 8 weeks of lactation are presented in Figure (1). In the current study, LBW obviously ($P<0.05$) differed among A, B and C groups at 100 and 140 days of gestation, post kidding and post-weaning and at 8 weeks of milking. However, LBW at pre-mating and post-mating could be ameliorated ($P>0.05$) in B and C groups compared to A group. The goats in B or C groups may be had improved feed intake which was reflected on LBW than A group. This result confirms with those of Haščík *et al.* (2012) who explicated that receiving BB in based diets enhancement in LBW due to higher anabolism of protein and the numerous enzymes supporting the digestive process. Also, these results were given by Morsy *et al.* (2015). On the other hand, Awad *et al.* (2013) demonstrated that BB resulted in significant increases in daily body weight gain, digestibility of nutrient, feed intake and feed conversion efficiency. The BB contains a number of polyphenolic compounds, phenolic acid derivatives and mostly hydroxycinnamic acids and flavonoid glycosides which ameliorated voluntary feed intake and LBW (Urcan *et al.*, 2017). Also, Abdel-Hamid *et al.* (2019) suggest that BB promotes animal growth, improves animal products quality, security and enhances immunizing function of intestinal tract health. Furthermore, Hashem *et al.* (2021) indicated that BB has many enzymes which support the digestive, increased the intestinal absorptive capacity through the longer and thicker villi which stimulates the digestive and protein anabolism of the livestock. According to, Mona *et al.* (2021) also found that there was more improvement in LBW of diary goats at weaning (39.79kg) when, intake bee bread extract (BBE) than control goats (38.69kg).

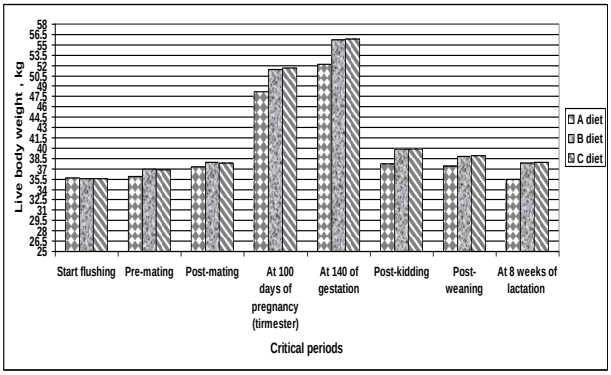

Fig. 1. Live body weight of does received A, B and C rations during critical periods.

Body condition scoring (BCS) of does during critical periods

Diagram in Figure (2) shown that the BCS during start of flushing, pre-mating, post-mating, at 100 days of pregnancy, at 140 days of gestation, post-kidding, post-weaning and after 8 weeks of lactation. At the beginning of critical periods (start flushing, pre-mating and post-mating)

the A, B and C groups have (P>0.05) an equal BCS < 3.0. However, the advanced of feeding BB (from 100 days of pregnancy to 8 weeks of lactation) the B and C groups having BCS more (P<0.05) than A group. The improvement of BCS in either B or C goats may be attributed to the highest LBW of these does indicated in Figure (1). Similarly, Ghani *et al.* (2017) recommended that it is important to implement a proper feeding program to the herd to ensure that the goats are ready and in the best BCS for breeding as well as improvement in growth performance with respect to the body weight. The most ingredients and the best nutritional substances in BB types as antioxidant, vitamins and minerals may be improved LBW which refluxed on BCS (Urcan *et al.*, 2017). The differences in results of BCS between trial groups (B and C groups) and control group (A group) could be ascribed to feed quality (Ribeiro *et al*., 2018) revealed that minerals (macrominerals and microminerals) could be had a major function for the most body weight and the basic principle of metabolic processes then, disability has disturbances, cause impair animals performance, retard growth and reduce the digestibility of diet. Mărgăoan *et al*., (2019) indicated that the highest level of antioxidants and vitamins in feedstuffs could be considered as one of the most important ways to prevent less weight in livestock. Generally for this study, the best average of BCS of the B and C groups was observed in different critical periods compared to the A group. This is consistent with a previous study by Mona *et al.* (2021) who found that the best an average of BCS in goats received 5.0 ml of bee bread extract was 2.97 compared to 2.61 of BCS in control goats at 90 days of suckling.

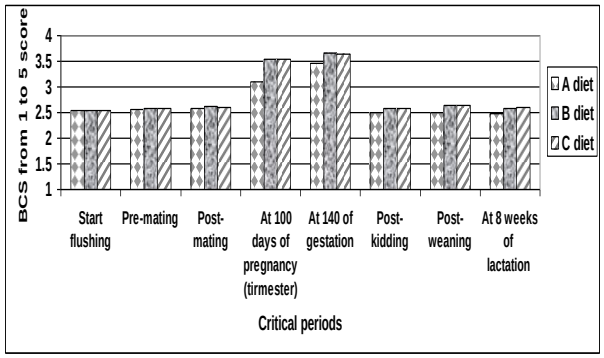

Fig. 2. BCS of does received A, B and C rations during critical periods.

Body mass index (BMI)

The BMI during critical periods respectively as start of flushing, pre-mating, post-mating, at 100 days of pregnancy, at 140 days of gestation, post-kidding, post-weaning and after 8 weeks of lactation was 12.21, 11.39, 11.82, 15.31, 16.57, 11.97, 11.87 and 11.25 kgm^{-2} in A goats, it was 12.25, 12.21, 12.60, 17.18, 18.83, 13.57, 13.26 and 13.17 kg m^{-2}in B goats and it was 12.18, 12.33, 17.50, 19.16, 13.81, 13.56, and 13.43 kg m^{-2} in C goats Figure (3). The B and C goats had more (P<0.05) BMI from pre-mating to 8 weeks of lactation than A group. In accordance with Hafsa *et al.* (2014) the BMI seems to have an average value up to 12.16 kg m^{-2} when BMI calculated with Zaraibi goats in minimum (10.09 kg m^{-2}) and maximum (13.56 kg m^{-2}) values in breeding season. Changing in BMI may be related to variation on LBW during the critical periods. As shown also by Chavarría-Aguilar *et al.* (2016) who indicated that a positive relationship between BMI and LBW and BCS. The BMI is widely used as an indicator of energy status and degree of obesity (Ortega *et al.*, 2016). Several studies have also considered the BMI as an energy status indicator for different livestock (Ptácek *et al.*, 2018). Also, Liu *et al.* (2019) confirmed that BMI as an alternative to BCS for flock management. In the current study, significant differences (P < 0.05) were found in BMI with respect to BCS. The lowest BMI of 11.25 kg m^{-2} was found for a BCS of 2.47 in the A group, but the highest BMI of 13.43 kg m^{-2} was found for a BCS at 2.59 in the C group at 8 weeks of lactation. However, the B group observed BMI at 13.17 kg m^{-2} was obtained for a BCS at 2.59 with 8 weeks of lactation. Similar to the results were observed with Liu *et al.* (2019) found that a stronger relationship between BMI and BCS.

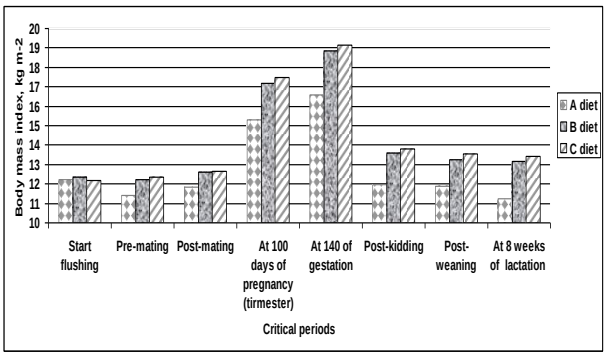

Fig. 3. BMI of does received A, B and C rations during critical periods.

Reproductive performance

The responses of reproductive traits of nanny goats to different treatments in A, B and C groups are shown in Table (5). The data indicated that all calculated reproductive performance seem to have differed variation among the three tested groups. In addition, it could be observed that B and C groups had the highest value of reproductive performance as conception rate, parity type and reproductive ability. It is worth noting that, either BB types as pellets or extract could be improved reproductive performance in B and C groups than A group, which could be related to available beneficial substances in BB types. Then, effect of BB on plasma ovarian hormones and metabolites may be due to its balanced nutrient profiles such as phospholipids and antioxidant features (Ismail *et al.*, 2018), contents of minerals like copper and its role in the reproductive process (Abdelnour *et al.*, 2019) and vitamins (Mohammad *et al.*, 2020). Additionally, the BB components have been recognized as favorable for the hormonal metabolism of animals (Hashem *et al.*, 2021) it has features in keeping healthy sexual steroid hormones and the maintenance of the cell membrane. A short time ago, Attia *et al.* (2015) had shown that rabbit received BB (200 mg/kg BW) obtained higher oestradiol-17 β and lower progesterone serum concentrations than control group. Also the same authors defined that the enhancement of reproductive properties in rabbit might be related to the ability of BB to help boost oestrogen levels appropriately and to balance the hormones that are necessary for conceiving, this is reflected the beneficial effects of BB on productive and reproductive performances. Generally minerals in BB plays an essential role in reproductive performance, as well Mohd Nora *et al.* (2020) found that reproductive problems such as low first service conception rates and silent heats have been related to wide Ca^{++}: P^{+++} ratios and to phosphorus deficiencies.

Table 5. Effect of A, B and C diets on reproductive performance of dairy goats.

Items	Diet groups		
	A	B	C
No. of does mating	8	8	8
No. of does conceived	7	8	8
Conception rate,%	87.50	100.00	100.00
No. of does kidded	7	8	8
Fertility rate,%	87.50	100.00	100.00
Total number of kids born	12	19	19
No. of alive kids at birth day	11	18	18
Fecundity rate, %	150.00	237.50	237.50
Prolificacy rate, %	157.14	225.00	225.00
No. of alive kids after 1 day of birth	11	18	18
Parity patterns:-			
No. of does kidding single	3	1	1
Single rate, %	42.86	12.50	12.50
No. of does kidding twins	3	3	3
Twinning rate, %	42.86	37.50	37.50
No. of does kidding triplet	1	4	4
Triplet rate, %	14.28	50.00	50.00
Reproductive potential:-			
No. of alive kids at weaning	9	16	16
No. of dead kids during suckling up to weaning	2	2	2
No. of kids weaned / does kidding,%	128.57	200.00	200.00
Total weights of kids at birth, kg	21.00	33.00	33.50
kilograms of kids birth / does mating	2.63	4.13	4.19
kilograms of kids birth / does kidding	3.00	4.13	4.19
Total weights of kids at weaning, kg	97.88	155.44	157.33
kilograms of kids weaned / does mating	12.24	19.43	19.67
kilograms of kids weaned / does kidding	13.98	19.43	19.67

Oestrus cycle resumption

Data of oestrus resumption in A, B and C goats post-kidding or post-weaning are presented in Table (6). It is indicated that does in B and C groups have significantly ($P< 0.05$) shorter days of oestrous cycle and longer estrus duration time than A groups. In goats' generality, Shahnaz *et al.* (2001) explained that postpartum interval was 15 to 65 days (average 56 days) to the first oestrous cycle. Furthermore, these authors defined that 1st estrus resumption after kidding was 34 to 61 days in Barbari goats, 60 days in Black Bengal goats, 51-110 days (average 84 days) in West African Dwarf goats and 68-172 days in Saanen and Toggenburg goats. This information is confirmed with Ensminger (2002) who found that oestrous cycle length ranged from 12 to 24 days (average 20 days) and duration of estrus ranged from 1 to 4 days (average 39-48 hrs). Also, these authors observed that the period from kidding to resumption of next cyclicity is known as postpartum anoestrous and may be affected by nutritional levels and suckling periods. The steroidal hormones might have played a major role to synthesis estrogens which are able to exert many biological effects on bioavailability of sex hormones. Ratify, Gruber *et al.* (2002) reported that structure of estrogen and 17β-estradiol may be of great benefit in increasing oestrous cycle behaviors in mammals. Concerning oestrous cycle resumption post-weaning, Doaa *et al.* (2003) concluded that plasma progesterone levels during postpartum were significantly and negatively correlated with prolactin hormone levels and demonstrated that lactation and suckling lengths have no effect on the estrus resumption and sexual activity. Similarly, Mohamed *et al.* (2011) confirmed that the negative relationship between prolactin and luteinizing hormone (LH); when concentration of prolactin decreasing accompanied by increasing in LH levels which induced the ovulatory event and estrus resumption in goats. In Zaraibi goats, Khalifa *et al.* (2014) revealed that the 1st estrus and estrus duration were 46.33 days and 31.33 hours post- kidding however, 60.50 days and 30.25 hours post-weaning, respectively. In the current study, it was observed that goats receiving the BB diet had a tendency to be in estrus much earlier during suckling and after weaning in comparison with goats receiving the control diet. These results strongly imply that BB contains substances that stimulate estrous cycle resulting in more goats go into estrus. Correlatively, nutritional supplementation with BB has rich nature of minerals, vitamins, lipids, amino acids, enzymes and fatty acids that could be improved number of ovulatory follicles and ovulation rate in cycling goats (Karaman, 2019). In fact, glucose (5.7 g/100g in BB according to Bakour *et al.*, 2019) consumed by ovarian follicular cells (theca and granulosa) can be used for major energy production of ovarian folliculogenesis to maintain follicular growth and prevent follicular atresia during the development of a growing follicle (Widayati *et al.*, 2018). In addition, Sitaresmi *et al.* (2020) explained that oestrus cycle resumption period plays a pivotal role in reproduction performance and early resumption of ovarian activity that required for achieving ovary and uterus to the first service and conception. Actually, calcium has functions in many physiological processes; it must be a precise regulatory mechanism in the ovary glands of animals. In the study by Bayoumi *et al.* (2021) who observed that calcium could reduce urea or ammonia levels in blood that can influence the pattern of ovarian follicular growth and stimulate oestrous cycle.

Table 6. Oestrus resumption post-kidding or post weaning in dairy goat received A, B and C rations.

Items	Experimental groups		
	A	B	C
Estrus resumption post-kidding			
No. of kidding does	7	8	8
No. of does display estrous	5	7	7
Heating rate %	71.42	87.50	87.50
1st oestrus (days)	44.36±6.87^{a}	35.550±4.92^{b}	36.44±5.81^{b}
Oestrus duration (hours)	31.33±5.25^{b}	38.74±4.51^{a}	38.65±4.57^{a}
Estrus resumption post- weaning			
No. of kidding does	7	8	8
No. of does display estrus	6	8	8
Heating rate %	85.71	100.00	100.00
1st oestrus (days)	55.41±6.57^{a}	45.88±5.65^{b}	46.22±6.37^{b}
Oestrus duration (hours)	29.35±5.36^{b}	36.83±4.59^{a}	37.37±5.46^{a}

a, b. Means within rows with different superscripts are significantly different ($P < 0.05$).

Milk yield during suckling and peak weeks of lactation

Milk yield during suckling (Fig. 4) and peak weeks of lactation (Fig.5) were significantly ($P<0.05$) higher B and C groups than those of A group. Definitely results are cleared that BB might be performed as lactogenic substance, because it can increase milk production by scavenging activity of free radical (Bakour *et al.*, 2017), supplied goats with vitamins (Mărgăoan *et al.*, 2019), antioxidant (Bleha *et al.*, 2019), goodness energy (Dranca *et al.*, 2020) and organic acids (Mohammad *et al.*, 2020). In addition, the ingredients of BB as zinc (Zn) appeared an essential function in milk production. Similar trends were obtained by Abdelnour *et al.* (2019) observed that Zn plays an important role in the proper function of the first mechanism of milk products and it also affects the degree of keratinisation of the teat canal, thereby protecting the udder against bacterial penetration after milking. Also, the same authors explained that feeding Zn improved milk production and reduced milk SCC in dairy animals. A related study by Swain *et al.* (2021) who

demonstrated that deficiency of Zn was a result of the depression in appetite of animals and consequently milk yield, feed dry matter intake, digestibility and nutritive feed values which reflect on the decrease of the available nutrients to the mammary gland. Also the same authors revealed that Zn important for thyroid hormone activation which plays a role in milk protein synthesis and enhance immunoglobulin in colostrum and in blood serum. It was also reported that the availability values of Ca and P were significantly improved during the lactation period which was explained by Mohd Nora *et al.* (2020). Recently, Mona *et al.* (2021) found that a significant increase in average suckling milk production it was 1.15, 2.02 and 2.06 kg at 90 days of suckling period in goats received bee beard extract up to 0.0, 2.5 and 5.0 ml, respectively.

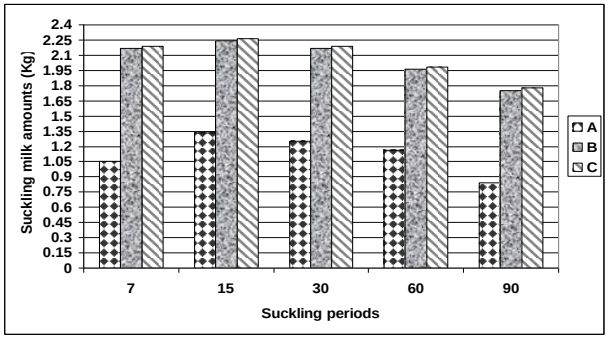

Fig. 4. Sucking milk of does received A, B and C rations during suckling periods.

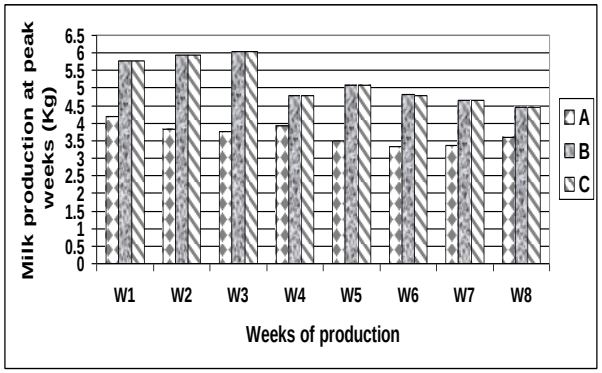

Fig. 5. Milk harvest of does received A, B and C rations at peak weeks of lactation.

Blood parameters

Previous works were explained by Awad *et al.* (2013), Fahim (2018), Abdel- Hamid *et al.* (2019) and Mona *et al.* (2021) were indicated that improvements of almost of blood parameters after the BB addition to ration (Table 7). Surprisingly, addition 4 g (group B) or 5.0 ml/ (group C) of BB could be increased ($P<0.05$) blood parameters of glucose, total protein, globulin and HDL, while decreased blood parameters ($P<0.05$) of albumin, cholesterol, LDL, AST, ALT and creatinine. Using of different types of BB as either pellets or extract can observe non-significant ($P>0.05$) differences among them in blood parameters. The positive effect of BB types may be related to a lot of nutrition substances such as protein, carbohydrates, energy, antioxidants, vitamins, mineral and essential fatty acids which caused the best feed digestibility and absorption (Barene *et al.,* 2015). Improving of blood glucose level (within the normal range) was due to BB supplementation. In fact, BB is riches in natural glucose (from 8.2 to 13.1), fructose (around 19.9) and sucrose (from 15.8 to 18.4) according to Ismail *et al.,* (2018). Increasing total protein and globulin may be due to the highest percentage of protein (47.40%) in BB (Bakour *et al.,* 2017). In rabbit, Attia *et al.* (2011) observed that BB could be increased blood protein (7.00 g/dl), glucose (124.20 mg/dl) and globulin (3.04 g/dl) concentration without harm compared to blood protein (5.06 g/dl), glucose (94.30mg/dl) and globulin (2.42 g/dl) concentration in control. Therefore, the current study could be showed that albumin significantly lower in either B or C groups than those goats in A group. This is agreement with Ghorbel *et al.* (2015) who explained that BB might encounter or ameliorate albumin toxicity by its antioxidant activity. Furthermore, Sharma *et al.* (2016) reported that the most albumin exposure could be caused oxidative stress (OS) and inflammation and it decreased activity of the antioxidant enzymes such as superoxide dismutase, catalase, and glutathione peroxidase. Also, the lowest of albumin blood of B or C groups was agreement with Awad *et al.* (2013) who found that albumin was 2.77g/dl in hens were fed 0.5 g of bee bread / kg diet compared to 2.80 g/dl in hens fed control diet. The lowest levels of blood total lipids and cholesterol were shown due to administration of BB types in relation to the control diet. The decrease in serum lipids and cholesterol could be due to phospholipids and PUFA particularly linolenic fatty acid which represented at 2.31 % in bee bread extract (Bakour *et al.,* 2017). In addition, Klaric *et al.* (2018) reported that the explanation for lowering cholesterol levels is also associated with the effect of flavonoids that have contented in BB. On the other hand, Attia *et al.* (2011) found that the cytotoxic effect as indicated by liver damage in the control rabbits increased their serum cholesterol up to 72.6 mg/dl and, such increases were nearly (55.0 mg/dl) prevented in rabbits given BB at 200 mg/kg. Also, Awad *et al.* (2013) indicated that hens were received BB at 1.0 g/kg diet had lower cholesterol (143.33 mg/dl), LDL (152.33 mg/dl), triglyceride (418.33 mg/dl) than 157.67, 187.67, 586.67mg/ dl in control diet, respectively. Also, the same authors defined that serum HDL concentration was 111.67 and 93.33 mg/dl in treated and control hens, respectively. Regarding to liver function, our studies showed that BB types could causes amelioration of elevated positive action on liver enzymes during acute blood loss and food restriction (Bakour *et al.,* 2017) who mention that the preventive effect against liver injury might be due to honey effect and probably BB. Also, Sharma *et al.* (2016) found that the use of BB antioxidants improved liver enzymes and restores antioxidant system. Also the best liver function was explained by Attia *et al.* (2011) who confirmed that lower AST (36.40 U/ml) and ALT (28.90 U/ml) in BB rabbit than 43.80U/ml and 36.60 U/ml in control rabbits, respectively. Regarding kidney parameters, the elevation of creatinine clearance might be due to renal injury or other mechanisms, therefore (Al- Dera, 2016) found that BB improved renal function in normal individuals which has been suggested due to increasing nitric oxide and decreasing prostaglandins. Fihri *et al.* (2016) indicated that BB in diets is causes renoprotective effect on acute blood loss, carbon tetrachloride (CCI4) toxicity and lead toxicity. Also, Bakour *et al.* (2019) noticed that the antioxidant properties of BB might play a role in their favorable effect of kidney function by decreased CCI4 which causes cellular damage in multiple

organs, mostly in the liver, kidneys and lungs. Recently, Mona *et al.* (2021) obtained that application of BB as an additives in dairy goats' diet enables the production of more vital and healthier goats, which significantly improves the natural range of the blood parameters in Zaraibi goats.

Table 7. Blood parameter in dairy goat received A, B and C rations.

Items	Experimental goat groups		
	A	B	C
Glucose, mg/dl	99.55±0.88[b]	114.11±0.66[a]	113.95±0.57[a]
Total protein, g/dl	5.66±0.14[b]	6.23±0.45[a]	6.44±0.37[a]
Albumin, g/dl	3.07±0.15[a]	2.51±0.14[b]	2.55±0.15[b]
Globulin, g/dl	2.77±0.07[b]	3.54±0.15[a]	3.53±0.14[a]
Total lipids, mg/dl	491.24±2.14[a]	471.82±4.27[b]	470.80±4.54[b]
Cholesterol, mg/dl	158.45±0.41[a]	144.22±1.02[b]	143.54±0.45[b]
HDL, mg/dl	95.73±1.25[b]	113.58±0.83[a]	114.04±0.46[a]
LDL, mg/dl	188.98±0.58[a]	153.54±0.52[b]	154.44±1.35[b]
Triglyceride, mg/dl	587.57±1.33[a]	417.38±1.45[b]	416.65±1.35[b]
AST, U/dl	30.17±0.35[a]	26.51±0.35[b]	25.63±0.54[b]
ALT, U/dl	20.91±0.56[a]	16.22±0.18[b]	15.52±0.14[b]
Creatinine, mg/dl	133.75±0.51[a]	131.22±0.65[b]	130.54±0.56[b]

Means within the same row direction with different superscripts are significantly different (P<0.05).

Correlation between feeding and body weight (BW), body condition scoring (BCS), body mass index (BMI), suckling milk (SM), milk yield (MY) and oestrus resumption after parturition (ORP) and oestrus resumption after weaning (ORW)

Results of correlation between feeding BB and productive and reproductive traits are shown in Table (8). The highest correlation coefficient was found between feeding BB types and BW, BMI, ORP and ORW ($r = 1.000$, $P < 0.001$) has been given approval by Mona *et al.* (2021). A significantly correlated ($r=0.99$, $P<0.05$) with feeding BB types and BCS, SM and MY supported by Abdel-Hamid *et al.* (2019). A significantly correlated between BW ($r= 0.99$, $P < 0.05$) with SM, MY, ORP and ORW, but the highest correlation ($r=1.000$, $P<0.01$) with BMI accede to Khalifa *et al.* (2014). The BCS was significantly correlated positively with BMI, SM, MY, ORP and ORW according to Venkata Reshma *et al.* (2021).

Table 8. Correlation coefficient among feeding and some reproductive and productive procedures.

Items	BW	BCS	BMI	SM	MY	ORP	ORW
Feeding	1.000**	0.995	1.000**	0.999*	0.998*	1.000**	1.000**
BW		0.996	1.000**	0.997*	0.998*	0.998*	0.997*
BCS			0.996	0.985*	0.999*	0.989	0.986*
BMI				0.999*	0.999*	0.999*	0.988
SM					0.988	0.997	0.898
MY						0.948	0.955
ORP							0.988

***Correlation is significant at the (P<0.05).**
****Correlation is significant at the (P<0.01).**

CONCLUSION

The present paper has aimed to demonstrate the broad applicability of bee bread types. Receiving BB up to 4.0 g or 5ml could improve efficiency and stamina of dairy goats. Also, natural substances located in BB able to ameliorate reproductive and productive performance and some blood parameters without any negative effects on goats healthy.

REFERENCES

Abdel-Hamid, T. M. and El-Tarabany, M. S. (2019). Effect of bee pollen on growth performance, carcass traits, blood parameters, and the levels of metabolic hormones in New Zealand White and Rex rabbits. Trop Animal Health Production, 51(8):2421-2429.

Abdelnour, A. S., Abd El-Hack, M. E., Alagawany, M., Farag, M. R. and Elnesr, S. S. (2019). Beneficial impacts of bee pollen in animal production, reproduction and health. Journal Animal Physiology Animal Nutrition, 103: 477-484.

Al- Dera, H. (2016). Protective effect of resveratrol against aluminum chloride induced nephrotoxicity in rats. Saudi Medical Journal, 37(4):369-378.

Al–Salem, H. S., Bhat, R. S., Al–Ayadhi, L. and El–Ansary, A. (2016). Therapeutic potency of bee pollen against biochemical autistic features induced through acute and subacute neurotoxicity of orally administered propionic acid. BMC Complementary and Alternative Medicine, 16 (1): 120 -125.

AOAC (2007). Association of Official Analytical Chemists. Official Methods of Analysis. 19th Edition. Washington DC, USA.

Asama, T., Arima, T. H., Gomi, T., Keishi, T., Tani, H. and Kimura, Y. (2015). Lactobacillus kunkeei YB38 from honeybee products enhances IgA production in healthy adults. Journal of Applied Microbiology, 119 (3): 818-826.

Attia, Y. A., Al-Hanoun, A. and Bovera, F. (2011). Effect of different levels of bee pollen on performance and blood profile of New Zealand White bucks and growth performance of their offspring during summer and winter months. Journal of Animal Physiology and Animal Nutrition, 95 (2011): 17-26.

Attia, Y. A., Bovera, F., EL-Tahawy, W. S., EL-hanoun, A. M., AL-harthi, M. A. and Habiba, H. I. (2015). Productive and reproductive performance of rabbits does as affected by bee pollen and / or propolis, inulin and / or mannan-oligosaccharides. World Rabbit Science, 23: 273-282.

Attia, Y. A., El-Hanoun, A. M., Bovera, F., Monastra, G., El-Tahawy, W. S. and Habiba, H. I. (2014). Growth performance, carcass quality, biochemical and haematological traits and immune response of growing rabbits as affected by different growth promoters. Journal Animal Physiology Animal Nutrition, 98(1):128-139.

Awad, A. L., Beshara, M. M., Ibrahim, A. F. and Fahim, H. N. (2013). Effect of using bee bread as a natural supplement on productive and physiological performance of local Sinai hens. Egyptian Poultry Science Journal, 33 (IV): 889-913.

Bakour, M., Fernandesb, Â., Barrosb, L.,Sokovicc, M., Isabel C. F. R. Ferreirab and lyoussia, B. (2019). Bee bread as a functional product: Chemical composition and bioactive properties. LWT - Food Science and Technology, 109: 276 -282.

Bakour, M., Noori , S.A.W., Nawam E., Hamada , I., Anna, C. F., Al- Waili, T. and Badiaa, L. (2017). Antioxidant activity and protective effect of bee bread (honey and pollen) in aluminum-induced anemia, elevation of inflammatory makers and hepato-renal toxicity. Journal Food Science Technology, 5 4(13):4205-4212.

Barene, I., Irena, D. and Sanita, S. (2015). Investigation of bee bread and development of its dosage forms. Medicinos Teorija ir Praktika, 21 (1):16-22.

Bayoumi, Y. H., Behairy, A., Abdallah, A. A. and Attia, N. E. (2021). Peri-parturient hypocalcemia in goats: Clinical, hematobiochemical profiles and ultrasonographic measurements of postpartum uterine involution, Veterinary World, 14 (3): 558-568.

Bleha, R., Shevtsova, T. and Kruzik, V. (2019). "Bee breads from Eastern Ukraine: composition, physical properties and biological activities. Czech Journal of Food Sciences, 37 (1):1-12.

Bogdanov, S. (2015). Pollen: Production, Nutrition and Health: A Review. Bee Product Sciences, 10:1-35.

Chavarría-Aguilar, L. M., García-Herrera, R. A., Salazar-Cuytun, R., Chay-Canul, A. J., Casanova-Lugo, F., Piñeiro-Vázquez, A. T. and Aguilar-Caballero, A. J. (2016). Relationship between body fat depots and body mass index in Pelibuey. Small Ruminant Research, 141: 124-126.

Doaa, F. Teleb, Mohamed, K. G. and Khadiga, M. Gaafar. (2003). Manipulation of lactation and suckling on the resumption of postpartum reproductive activity in Damascus goats. Small Ruminant Research, 49 (2): 183-192.

Dranca, F., Florin, U. and Mircea, U. (2020). Bee bread: Physicochemical characterization and phenolic content extraction optimization. Foods, 9: 2-14.

Ensminger, M. E. (2002). Sheep and Goat Science. 6th ed. Illinois: Interstate Publishers, Inc., 2002.

Fahim, H. N. (2018). Semen quality and fertilizing ability of Sinai cocks fed bee bread as a natural supplement to the diet. Journal Animal and Poultry Production, Mansoura Univerisity, 9 (2): 77-83.

Fihri, A. F., Al-Waili, N. S., El-Haskoury, R., Bakour, M., Amarti, A., Ansari, M. J. and Lyoussi, B. (2016). Protective effect of morocco carob honey against lead-Induced anemia and hepato-renal toxicity. Cell Physiology Biochemistry, 39:115-122.

Ghani, A. A. A., Shahudin, M. S., Zamri-Saad, M., Zuki, A. B., Wahid, H., Kasim, A., Salisi, M. S. and Hassim, H. A. (2017). Enhancing the growth performance of replacement female breeder goats through modification of feeding program. Veterinary World, 10 (6): 630-635.

Ghorbel, I., Maktouf, S., Kallel, C., Ellouze, C. S., Boudawara, T., Zeghal, N. (2015). Disruption of erythrocyte antioxidant defense system, hematological parameters, induction of pro-inflammatory cytokines and DNA damage in liver of co-exposed rats to aluminium and acrylamide. Chemistry Biological Interaction, 236:31-40.

Gruber, C. J., Tschugguel, W., Schneeberger, C. and Huber, J. C. (2002). Production and actions of estrogens. New England Journal of Medicine, 346:340-352.

Habryka, C., Kruczek, M. and Drygas, B. (2016). Bee products used in apitherapy. World Scientific News, 48, 254-258.

Hafsa, F. H. Youssef, El-Gendy, M. E., Saifelnasr, E. O. H., Heba A. El-Sanafawy and Fatma E. Saba. (2014). Relationship between body conformation and milk yield and composition in Zaraibi and Damascus goats. Egyptian Journal of Sheep & Goat Sciences, 9 (3): 83-94.

Haščík, P., Elimam, I. O. E. and Garlík, J. (2012). The effect of addition bee pollen to feed mixtures on internal fat of broiler Ross 308. Journal of Microbiology Biotechnology and Food Sciences, 246: 246-252.

Hashem, N. M., Hassanein, E. M. and Simal-Gandara, J. (2021). Improving reproductive performance and health of mammals using honeybee products. Antioxidants, 10 (336): 2-25.

Ismail, W. I. W., Nurul, N. H., Siti, N. F. M., Nur, H. H. and Mohd, N. F. M. R. (2018). Physicochemical analysis, antioxidant and anti proliferation activities of honey, propolis and beebread harvested from Stingless bee. The International Fundamentum Sciences Symposium, 440:1-7.

Ivanisova, E., Kacaniova, M., Francakova, H., Petrova, J., Hutkova, J., Brovarskyi, V., Velychko, S., Adamchuk, L., Schubertová, Z. and Musilová, J. (2015). Bee bread perspective source of bioactive compounds for future. Potravin Science Journal Food Indian, 9: 592-598.

Karaman, R. M. (2019). Evaluation of some nutritional and antioxidant values of bee bread (*Perga*) for athletes. Sportif Bakış: Spor ve Eğitim Bilimleri Dergisi, 6 (2), 390-398.

Khalifa, E. I., Behery, H. R., Hafez, Y. H. , Mahrous, A. A., , Amal, A. Fayed and Hanan, A. M. Hassanien (2013). Supplementing non-conventional energy sources to rations for improving production and reproduction performances of dairy Zaraibi nanny goats. Egyptian Journal of Sheep & Goat Sciences, 8 (2):69-83.

Khalifa, E. I., Hana, A. M. Hassanien, Mohamed, A. H. and Abdel-El-Magied, A. (2014). Effects of using yucca schidigera powder as feed additive on productive and reproductive efficiency of Zaraibi dairy goats. Egyptian Journal of Sheep & Goat Sciences, 9 (2): 9-21.

Klaric, I., Ivan, M., Vatroslav, S., Albina, D., Jasna, J. and Maja, M. (2018). The effects of propolis and bee pollen supplementation on biochemical blood parameters of broilers. Acta Veterinaria-Beograd, 68 (2):190-200.

Liu, H., Gipson, T. A., Puchala, R. and Goetsch, A. L. (2019). Relationships among body condition score, linear measures, body mass indexes, and growth performance of yearling Alpine doelings consuming high-forage diets. Applied Animal Science, 35: 511-520.

Mărgăoan, R., Mirela, S., Alina, V., Erkan, T., Banu, Y., Cornea-Cipcigan, M., Maria G. Campos and Dan C. Vodnar (2019). Bee collected pollen and bee bread: bioactive constituents and health benefits. Antioxidants, 8 (12):568.

Madras-Majewska, B., Ochnio, L. and Ochnio, M. (2015). Use of bee products in livestock nutrition and therapy. Medycyna Weterynaryjna, 71 (2): 94-99.

Mohamed, M. M. K., Watanabe, G., Sosa, G. A., Abou El-Roos, M. E., Abdel-Ghaffar, A. E., Li, J. Y., Manabe, N., El Azab, A. E. and Taya, K. (2011). Ovarian follicular dynamics and concentrations of ovarian and pituitary hormones during the peri-ovulatory phase of the postpartum goats. Banha Veterinary Medicine Journal Special Issue, (1): 7-13.

Mohammad, S. M., Rashid, N. M. and Zawawi, N. (2020). Botanical Origin and Nutritional values of bee bread of stingless bee (*Heterotrigona itama*) from Malaysia. Journal of Food Quality, 2020: 1-12.

Mohd Nora, M. F., Ruslia, N. D., Mata, K., Hasnitaa, C. H. and Mira, P. (2020). Milk Composition and milk quality of Saanen crossbreed goats supplemented by mineral blocks. Tropical Animal Science Journal, 43(2):169-175.

Mona, E. Farag, Azza, A. Helmy and Amal, M. M. El-Nimer (2021). Effect of using bee bread extract as feed additives on digestibility and productive performance of maternal goats during suckling period. Egypt Journal Applied Science, 36 (3): 1-20.

Morsy, A. S., Abdalla, A. L., Soltan, Y. A., Sallam, S. M. A., El-Azrak , K. M., Louvandini, H. and Alencar, S. M. (2013). Effect of Brazilian red propolis administration on hematological, biochemical variables and parasitic response of Santa Inês ewes during and after flushing period, Tropical Animal Health and Production, 45 (7):1609–1618.

Morsy, A. S., Soltan, Y. A., Sallam, S. M. A., Kreuzer, M., Alencar, S. M. and Abdalla, A. L. (2015). Comparison of the in vitro efficiency of supplementary bee propolis extracts of different origin in enhancing the ruminal degradability of organic matter and mitigating the formation of methane, Animal Feed Science and Technology, 199 (1): 51– 60.

NRC (2007). Nutrient Requirements of Small Ruminants: Sheep, Goats, Cervids, and NewWorld Camelids, 6th ed. National Academy Press, Washington, DC, 384 pp.

Ortega, F. B., Sui, X., Lavie, C. J. and Blair, S. N. (2016). Body-mass index, the most widely used but also widely criticized index: would a criterion standard measure of total body fat be a better predictor of cardiovascular disease mortality. Mayo Clinical Procedings, 91: 443-455.

Ptácek, M., Milerski, M., Schmidová, J., Duchá˘cek, J., Tan˘cin, V., Uhrin˘ca, M., Hakl, J. and Stádník, L. (2018). Relationship between body mass index, body energy reserves, milk, and meat production of original Wallachian sheep. Small Ruminant Research, 165: 131-133.

Ribeiro, L. P. S., Medeiros, A. N., Carvalho, F.F.R., Pereira, E. S., Souza, A. P., Santos, J. M., Neto, Bezerra, L. R., Santos, S. A. and Oliveira, R. L. (2018). Performance and mineral requirements of indigenous Canindé goats. Small Ruminant Research, 169 (2018):176-180.

Shahnaz, A., Khanum, M., Hussain, M., Ali, S. H., Naqvi, M., Kausar, R. and Cheema, A. M. (2001). Productive efficiency and progesterone profile from parturition to parturition in Dwarf goat. Pakistan Veterinary Journal, 21(4): 170-177.

Sharma, D. R., Wani, W. Y., Sunkaria, A., Kandimalla, R. J., Sharma, R. K., Verma, D., Bal, A. and Gill, K. D. (2016). Quercetin attenuates neuronal death against aluminum-induced neurodegeneration in the rat hippocampus. Neuroscience, 324:163-176.

Sitaresmi, P. I., Widyobroto, B. P., Bintara, S. and Widayati, D. T. (2020). Effects of body condition score and estrus phase on blood metabolites and steroid hormones in Saanen goats in the tropics. Veterinary World, 13(5): 833-839.

SPSS Statistics Version. (2020). Statistical package for social sciences, IBM®SPSS Statistics Data Editor 25.0 version 26.0 License Authorization Wizard, Chicago, USA.

Swain, P. S., Rao, B. N. S., Rajendran, D., Krishnamoorthy, P., Mondal, S., Pal, D. and Selvaraju, S. (2021). Nano zinc supplementation in goat (Capra hircus) ration improves immunity, serum zinc profile and IGF-1 hormones without affecting thyroid hormones. Journal Animal Physiology Animal Nutrition, 105:621-629.

Urcan, A., Mărghitaş, L. A., Dezmirean, D. S., Bobiş, O., Bonta, V. and Mureşan, C. I. (2017). Chemical composition and biological activities of beebread-review. Bulletin of the university of agricultural sciences & veterinary medicine Cluj-Napoca. Animal Science & Biotechnologies, 74: 6-14.

Venkata Reshma, C. H., Anitha, A., Jagadeeswara Rao, S. and Muralidha, M. (2021). Relationship between body condition score and postpartum changes in local goats under field conditions. International Journal of Current Microbiology and Applied Sciences, 10 (01): 2639-2645.

Widayati, D. T., Sitaresmi, P. I., Bintara, S. and Widyobroto, B. P. (2018). Estrus detection trough vaginal pH in Saanen Ettawah crossbreed goats. Pakistan Journal Biological Sciences, 21(8): 283-286.

Zuluaga, C. M., Serrato, J. M. and Quicazan, M. C. (2015). Chemical, nutritional and bioactive characterization of Colombian bee-bread. Chemical Engineering Transactions, 43: 175-180.

تأثير استخدام أنواع مختلفة من خبز النحل كحبوب طبيعية لخلية النحل أو مستخلصها على الأداء التناسلي والإنتاجي للماعز الحلاب

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الهدف من هذا العمل هو دراسة إمداد الماعز الحلاب بخبز النحل (BB) كحبيبات الخلية الطبيعية أو مستخلصها لتحسين الأداء التناسلى والإنتاجي خلال الفترات الإنتاجيةالحرجة للعنزات. تم استخدام عدد إجمالي من 24 ماعز زرابيي في المرحلة الثالث للإنتاج يصل وزن الجسم الحي (LBW) إلى 58و35 كجم ودرجة حالة الجسم (BCS) عند 54و2. تم تقسيم الماعز إلى ثلاث مجموعات أ ، ب، ث حيث تم تقديم معاملات BB بمستويات 0و0، 0و 4 جم ، 0و5 ملى يومياً / رأس على التوالي. تم تقييم LBW و BCS ومؤشر كتلة الجسم (BMI) للماعز خلال الفترات الحرجة. تم تقييم الأداء التناسلى واستنشاف الشبق. كما تم تحديد الأداء الإنتاجي مثل كإنتاج اللبن أثناء الرضاعة وأسابيع الذروة من إنتاج اللبن. بالإضافة إلى ذلك ، تم تحليل الدم. تم شرح معامل الارتباط بين التغذية وبعض الإجراءات التناسلية والإنتاجية. أشارت النتائج إلى أن الماعز المجموعتين ب و ث قد تم تغذيتها على علائق مضافة بأنواع BB كانت أعلى (P <0.05) وأنواع LBW و BCS و BMI مماثلة مقارنة بتلك الماعز في المجموعة أ . تم تحسين المعلمة الإنجابية للمجموعات ب و ث مقارنة بالمجموعة أ. كان لاستنشاف الشبق للمجموعتين ب و ث قيم تحسن معنوية (P <0.05) مقارنة بالمجموعة أ. ومن ثم ، فإن الماعز في المجموعتين ب و ث لديها أيام أقصر من دورة الشبق ومدة أطول لدورة الشبق من الماعز في المجموعات أ. بينما تحسن إنتاج الحليب خلال فترة الرضاعة حتى 90 يوم وأسابيع الذروة من الرضاعة حتى 8 أسابيع معنوياً (P <0.05) في الماعز ب و ث مقارنة بالماعز في المجموعة أ. كانت كميات البن الرضاعة في أيام التقييم التجريبية 5.63 و 10.29 و 10.40 كجم ، أما كميات اللبن المحصول في أسابيع التقييم التجريبية فقد كانت 29.52 و 41.54 و 41.50 كجم في المجموعات أ و ب و ث على التوالي. كان تركيز الجلوكوز في الدم ، البروتين الكلي ، الجلوبيولين ، HDL أعلى معنويا (P <0.05) في المجموعتين ب و ث من المجموعة أ. ومع ذلك ، فإن تركيز الدهون الكلية في الدم ، الألبومين ، الدهون الثلاثية ، الكوليسترول ، LDL، AST، ALT والكرياتينين في الماعز ب و ث كانت أقل (P <0.05) من المجموعة أ. لوحظ أن معامل الارتباط الإيجابي بين التغذية وبعض الإجراءات التناسلية والإنتاجية. يمكن أن نستنتج أن الماعز يمكن أن تستفيد من أنواع BB مثل حبيبات أو محلول عند 4 جم أو 5 مل خلال الفترات الحرجة ، وبالتالي يمكن التوصية بها كعامل معزز إنتاجي في إدارة الماعز لقدرته على تحسين الأداء التناسلى والإنتاجي ومعايير الدم من الماعز.