Egypt. J. Vet. Sci., pp. 1-8

Egyptian Journal of Veterinary Sciences

https://ejvs.journals.ekb.eg/

The Impact of Bee Pollen as a Natural Growth Promoter on the Performance and Blood Characteristics of Growing Calves and Heifers

Eman A. Negm[1], Mohamed Y. Elaref [2] and Raghda A. Taghian[3]

[1]*Physiology Department, Faculty of Veterinary Medicine, Assiut University, Assiut, Egypt.*
[2]*Animal Production Department, Faculty of Agriculture, Sohag University, Sohag, 82524,Egypt.*
[3]*Animal Production Department, Faculty of Agriculture, Assuit University, Assuit, Egypt.*

Abstract

THIS study aimed to explore the impact of Bee Pollen (BP) on the performance and blood characteristics of growing calves and heifers. Twenty healthy cow calves and heifers (aged 8-10 months with an IBW of 136.1 and 129.3 kg for calves and heifers, respectively) were assigned randomly to two groups (5 calves and 5 heifers each). The control group received the basal diet, while the treatment group was given 30 g of fresh commercial multifloral BP with the basal diet three times a week. Animals were weighed monthly, and feed intake was monitored to compute feed conversion. Blood samples were collected monthly to estimate Hb, TP, albumin, globulin, T3 and T4. Animals that received BP had heavier ($P < 0.05$) FBW, BWG and ADG than those in the control group. Likewise, adding BP increased ($P < 0.05$) the DFI, and the FCR improved ($P < 0.05$). Hemoglobin, total protein, globulin, albumin, T3 and T4 of animals in the BP group were enhanced ($P < 0.05$) than those in the control group. In conclusion, incorporating BP into the diet of growing calves and heifers could be considered a way to promote growth, improve feed conversion, and lower feeding costs.

Keywords: Bee pollen, Blood metabolites, Feed consumption, Growing calves, Growth performance.

Introduction

The need for more sustainable and natural growth promoters in livestock production has gained significant attention over the past few years, driven by the need to enhance animal performance while minimizing the use of synthetic additives and their harmful effects. The end products (meat and milk) are affected by the lingering effects of synthetic additives. Humans finally consume these products, and there may be a danger that resistant bacterial strains and other health risks or diseases will develop. Thus, since January 2006, the European Union has prohibited the use of antibiotics as growth promoters in animal nutrition [1]. Consequently, the use of natural resources as feed additives, which provide natural additive properties, would be beneficial in producing safe and hazard-free animal products for human consumption.

Bee pollen (BP) is an agglomerate of flower pollen collected by honeybees from numerous plant sources, which gather grains of floral pollen and mix them with plant nectar and their enzyme-rich saliva, thus changing its composition and improving its therapeutic potential [2]. Pascoal et al. [3] described BP as a complex mixture of proteins, amino acids, lipids, minerals, vitamins, and phenolic compounds that contribute to its antioxidant, anti-inflammatory, and immune-modulatory effects. The Dietary Supplement Health and Education in the USA defined BP as a nutritional supplement for human consumption [4]. Furthermore, BP is considered to be an energy enhancer, a potential antibiotic, and a growth promoter [5-7].

Pollens are rich in flavonoids and phenolic acid derivatives, which possess strong antioxidant and scavenging capabilities [8-9]. Additionally, Hajková et al. [10] point out that BP is a significant source of antioxidant activity and compounds with health-protective potential. These qualities make BP a promising growth promoter in livestock, especially in young animals like calves and heifers, where optimal growth and development are essential for future productivity. The early growth stages of ruminants are crucial for proper digestion, reaching target body

*Corresponding authors: Mohamed Youssef Elaref, E-mail: mohammed.youssef@agr.sohag.edu.eg Tel.: 01004503825
(Received 30 July 2025, accepted 18 September 2025)
DOI: 10.21608/EJVS.2025.408970.3006
©National Information and Documentation Center (NIDOC)

weights, and overall health [11]. However, challenges such as poor feed efficiency, metabolic stress, and increased vulnerability to diseases often limit growth performance. Incorporating natural supplements like BP into the diet may help overcome these challenges by enhancing nutrient absorption, boosting immune function, and increasing metabolic efficiency.

Previous studies have demonstrated the useful effects of BP on growth, feed efficiency, and physiological parameters in various animal species [12-15]. Bee pollen has been widely and successfully used as a growth promoter to enhance the performance and blood metabolites in poultry and rabbits; however, studies on their impact on ruminants are few and inconsistent. There is a scarcity of research that has addressed its application in calves and heifers, particularly over extended periods. This study aims to evaluate the impact of fresh commercial multifloral BP as a dietary supplementation on the performance and blood characteristics of calves and heifers.

Material and Methods

The experiment was accomplished at the Experimental Animal Farm, Animal Production Department, Faculty of Agriculture, Assiut University, Assiut, Egypt. Following the Ethical Committee of the Faculty of Veterinary Medicine, Assiut University, Assiut, Egypt (Reference No. 06/2024/0246).

Animals, Diets, and Experimental Design

Twenty healthy cow calves and heifers (aged 8-10 months; an initial average body weight (IBW) of 136.1 and 129.3 kg for calves and heifers, respectively) were assigned randomly to two groups (5 calves and 5 heifers per group). The control group (Con) received the basal diet consisting of 25% wheat straw, 25% yellow corn, 25% wheat bran, 22% decorticated cottonseed meal, 1% Sodium chloride, 1.5% limestone, and 0.5% premix. The treatment group (BP) was given 30 g of fresh commercial multifloral BP with the basal diet three times a week for three months. Table 1 shows the ingredients and chemical composition of the basal diet. According to the NRC guidelines [16], animals got their daily rations individually at a level of 3% DM of body weight as mixed rations twice daily at 07:00 a.m. and 05:00 p.m. to meet their nutrient requirements. Fresh water was available throughout the day.

Growth Experiment

The animals were acclimatized to the experimental diet over a 15-day preliminary phase before the 90-day growth experiment began. The animals were weighed at the beginning of the growth trial as an IBW and then every month after that to calculate the total body weight gain (BWG) and average daily gain (ADG). Moreover, Daily feed intake (DFI, as dry matter) was calculated to compute the feed conversion ratio (FCR, kg feed/kg gain).

Blood Sampling and Blood Parameters

Two blood samples (approximately 7 ml each) were collected monthly throughout the trial period from all experimental animals via jugular venipuncture. The first was a total blood sample immediately used for hemoglobin (g/L) estimation using the Symex Automated Hematology Analyzer (SAHA). The second was transferred to a tube without anticoagulant and centrifuged at 3000 rpm for 15 min to gain serum, used to estimate total protein (g/L), albumin (g/L), globulin (g/L), A/G ratio, triiodothyronine (T3, ng/mL), and thyroxin (T4, ng/mL), and T4/T3 ratio using kits supplied by Diamond Diagnostics (Egypt). All samples were reserved at -20°C until analysis.

Statistical Analysis

All collected data were analyzed using the General Linear Model (GLM) procedure of SPSS (2008). The statistical model used for analyzing the data was:

$$Y_{ij} = \mu + T_i + G_j + (T \times G)_{ij} + \varepsilon_{ijk}$$

Where Y_{ij} is the dependent variable (blood characteristics and growth performance), μ is the overall mean, T_i is the treatment effect (Con and BP), G_i is the gender effect (male and female), and ε_{ijk} is the residual error.

Results

The growth performance, feed intake and FCR of growing calves and heifers as affected by adding BP to their diet are displayed in Table 2. Calves and heifers that received a basal diet with BP had heavier (P<0.05) FBW, total BWG, and ADG compared with those in the control. Similarly, compared to heifers, calves in the present study exhibited higher (P<0.05) FBW, total BWG, and ADG (Table 2 & Figure 2). Likewise, adding BP to the basal diet of experimental animals increased (P<0.05) the DFI, which did not differ significantly between calves and heifers (Table 2 & Fig 1). Moreover, the FCR improved (P<0.05) in both calves and heifers because of the increase in BWG (Table 2 & Fig 3).

Hematological analysis of blood samples showed that HB was affected by both BP addition and the gender of the animal (Table 3). Animals that received a basal diet with BP had higher (P<0.05) hemoglobin levels than those that received a basal diet alone. Additionally, adding BP to calves' and heifers' diets enhanced most of the blood biochemical indicators, which did not differentiate significantly between the genders. Total protein, albumin, and globulin levels were greater (P<0.05) in calves and heifers in the BP group than in the control group. Similarly, blood samples from animals in the BP group had higher ($P<0.05$) levels of T3 and T4 than those in the control group, and the T3/T4 ratio was increased ($P<0.05$).

Discussion

Changes in body weight are commonly used to monitor the animals' nutritional status and growth performance [17-18]. The addition of BP to the calves' and heifers' baseline diet improved their overall growth performance, as indicated by increases in FBW, total gain in live body weight, and ADG compared to the animals in the control group that only received the basal diet. There was an improvement of about 27.4% in both total BWG and ADG in the BP group compared to the control group. Similar results were achieved on Friesian calves [19]; Saidi rams [20], and Rahmani lambs [21], who found that increasing BP supplementation levels in the diet led to significant increases in both total body gain and ADG. In the same vein, adding BP to the diet of New Zealand rabbits resulted in increases in both FBW and ADG when compared to the control group [15, 22]. Tu et al. [23] explained that the enhancement in growth performance of calves receiving BP supplementation could be attributed to the enhancement in DM and CP digestibility. The findings from other animal species support this interpretation. In chickens, dietary BP enhanced growth performance, egg productivity, feed utilization efficiency, immunity, disease resistance, and survival rate [24]; in growing-finishing pigs, it enhanced digestion, absorption, and immunological function [25].

However, the results of the present study in Table 2 revealed that the DFI (as dry matter) for animals receiving the BP supplement increased by almost 10% compared to those in the control group, with no significant differences between calves and heifers. Likewise, suckling lambs given 0.5 and 1.0 g of BP orally had a considerably higher feed intake compared to lambs in the control group [21]. This finding is in line with that of Braakhuis [26] and Khalifa et al. [27], who claimed that BP supplementation could improve the quality and palatability and raise DFI because it contains several bioactive components that have antioxidant and antimicrobial properties, such as flavonoids and phenolic acids. In contrast, a meta-analysis on broiler chickens [28] and rabbits [15] fed BP supplementation showed a reduction in the DFI. Attia et al. [29] suggest that BP contains vitamins and minerals soluble in water, which enhance nutrient metabolism and increase the availability of metabolic energy in rabbits, resulting in reduced DFI.

Although calves and heifers receiving BP supplementation increased their DFI in the present study, FCR showed significant improvement, and values were lower in calves than in heifers. This outcome was in line with results from suckling lambs [21]; Friesian calves pre- and post-weaning [19]; and growing rabbits [30], which fed BP supplements; they obtained that the feed amount per kilogram of live BWG was lower for BP-supplemented groups than for the non-supplemented group. Taghian et al. [20] attributed this improvement in the FCR and the decline in feed intake to the potential ability of Bp to lower the number of harmful bacteria and increase the digestibility of all nutrients.

The blood analysis in the current study demonstrates that both calves' and heifers' hemoglobin concentrations significantly increased because of BP supplementation. Additionally, most blood biochemical indicators show an increase, with no discernible variations between calves and heifers. Similar results for hemoglobin concentrations, total protein, albumin, and globulin were obtained with weaning Friesian calves [31]; and weaned and growing New Zealand White rabbits [12-32]. Moreover, the dietary BP of iron-deficient rats, as an experimental model of anemia, leads to increased hemoglobin level and significantly reduces the adverse effects of iron deficiency, exerting a restorative effect and enhancing the absorption and utilization of dietary iron [33].

Mohamed [34] suggested that BP has a stimulating effect on the hematopoietic system as it increases Hb, RBCs, ferritin, iron, albumin, globulin, and total protein levels, having a therapeutic effect against disturbances in the oxidant/antioxidant balance of RBCs in diabetic rats. These results indicate that due to its high iron content, BP has an anti-anemic effect [35] and can enhance the function of bone marrow, the main organ responsible for erythropoiesis [36]. Thus, it can be assigned to the BP content of vitamin C, histidine, bioflavonoids, fructose, and the preference for iron absorption [5].

Furthermore, the dietary BP also increases the levels of proteins, albumin, and globulin, helping well in fattening chickens [37-38], which can be attributed to its high free amino acid content [39]. In addition, pollen water extracts enhanced biochemical parameters and hepatic enzymes and decreased oxidative stress markers [40]. On the other hand, Tu et al. [23] did not find any significant differences in concentrations of total protein, albumin, and globulin between Holstein calves fed BP and those fed the control diet.

Moreover, the current study indicated an increase in the levels of T3 and T4 and an improved T3/T4 ratio. This finding is consistent with Tata [41]; Mohamed [34], and Yavuz et al. [42], who found that BP improves thyroid dysfunction and elevates T3 and T4 levels, which correlate with higher metabolic rates, particularly during normal growth and development, indicating a critical function in controlling energy metabolism and growth processes.

Conclusion

The current study concluded that inclusion of BP in the diet of growing calves and heifers improved their feed intake, feed conversion, and blood characteristics, which in turn improved their growth performance and lower feeding expenses. Enhancing animal growth, especially during the growing stage, undoubtedly contributes to the healthy development of various body organs, particularly for breeding animals that will serve as parents to future generations. Future comprehensive studies are required to demonstrate the effect of dietary BP on the digestion of nutrients in the digestive tract and its effects on blood measurements and the productivity of calves and heifers.

Acknowledgments

We are grateful to the Stuff of Animal Production Research Farm at Assuit University for helping us with animal care and administration.

Funding statement

This study didn't receive any funding support.

Declaration of Conflict of Interest

The authors declare that there is no conflict of interest.

Ethics of approval

This study follows the Ethical Committee of the Faculty of Veterinary Medicine, Assiut University, Assiut, Egypt (Reference No. 06/2024/0246).

TABLE 1. Ingredient and chemical composition of basal diet

Item	Basal diet
Ingredient, %	
Wheat straw	25
Yellow corn	25
Wheat bran	25
Decorticated cottonseed meal	22
Limestone	1.5
Sodium chloride	1
Premix mixtures*	0.5
Chemical composition	
DM (%)	90.23
OM (% DM)	88.92
CP (% DM)	14.21
CF (% DM)	17.32
EE (% DM)	2.46
NFE (% DM)	54.93
Ash (% DM)	11.08

* Premix mixtures: content 200,000 IU vitamin A, 200 mg vitamin E, vitamin 100,000 IU D3, 10,000 mg Fe, 2500 mg Cu, 100 mg Mo, 20,000 mg Mn, 100 mg Co, 800 mg I, 20,000 mg Zn and 100 mg Se; DM: Dry matter; OM: Organic matter; CP: Crude protein; CF: Crude fiber; NDF: Nitrogen free extract; EE: Ether extract;

TABLE 2. Effect of bee pollen supplement on growth performance, Feed intake and Feed conversion ratio of growing calves and heifers

	Treatment		Gender		SEM	*P*-value		
Item	Con	BP	Male	Female		T	G	T×G
IBW, kg	133.6	131.8	136.1	129.3	1.088	0.274	0.001	0.804
FBW, kg	204.0	221.5	218.9	206.6	2.565	<0.001	<0.001	0.672
BWG, kg	70.4	89.7	82.8	77.3	2.362	<0.001	<0.001	0.797
ADG, g	782.2	996.7	920.0	858.9	26.24	<0.001	<0.001	0.796
DFI, kg	5.12	5.63	5.40	5.35	0.062	<0.001	0.299	0.873
FCR	6.56	5.66	5.92	6.30	0.124	<0.001	0.005	0.697

Con: experimental animals received basal diet; BP: experimental animals received basal diet + 30 g of fresh commercial multifloral bee pollen three times a week; IBW: Initial body weight, FBW: Final body weight, BWG: Body weight gain, ADG: Average daily gain, DFI: daily feed intake, FCR: Feed conversion ratio.

TABLE 3. Effect of bee pollen supplement on blood hemoglobin, biochemical and serum thyroid hormonal parameters of growing calves and heifers

	Treatment		Gender		SEM	*P*-value		
Item	**Con**	**BP**	**Male**	**Female**		**T**	**G**	**T×G**
Hb, g/L	10.63	11.63	11.29	10.97	0.077	<0.001	0.041	0.982
Total Protein, g/L	5.06	6.16	5.73	5.49	0.092	<0.001	0.216	0.088
Albumin, g/L	2.79	3.31	3.09	3.01	0.046	<0.001	0.350	0.114
Globulin, g/L	2.27	2.85	2.63	2.49	0.048	<0.001	0.138	0.092
Albumin/Globulin ratio	1.23	1.16	1.18	1.21	0.009	<0.001	0.092	0.942
T3, ng/mL	1.35	1.63	1.50	1.47	0.019	<0.001	0.429	0.585
T4, ng/mL	90.98	114.10	103.25	101.83	1.681	<0.001	0.677	0.344
T4/T3 ratio	67.62	70.08	68.58	69.13	0.312	<0.001	0.379	0.216

Con: experimental animals received basal diet; BP: experimental animals received basal diet + 30 g of fresh commercial multifloral bee pollen three times a week; Hb: hemoglobin; T3: triiodothyronine; T4: thyroxin.

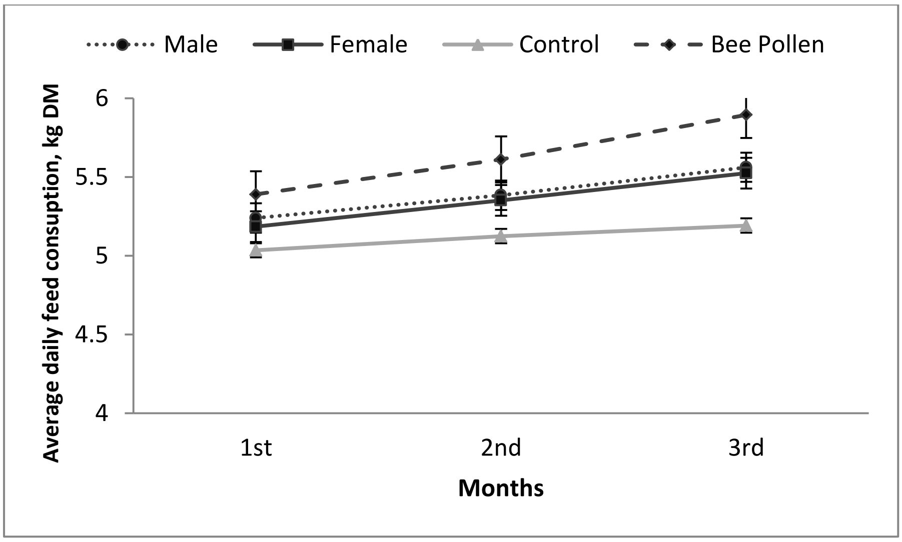

Fig 1. Average daily feed intake of growing calves and heifers as affected by BP supplementation

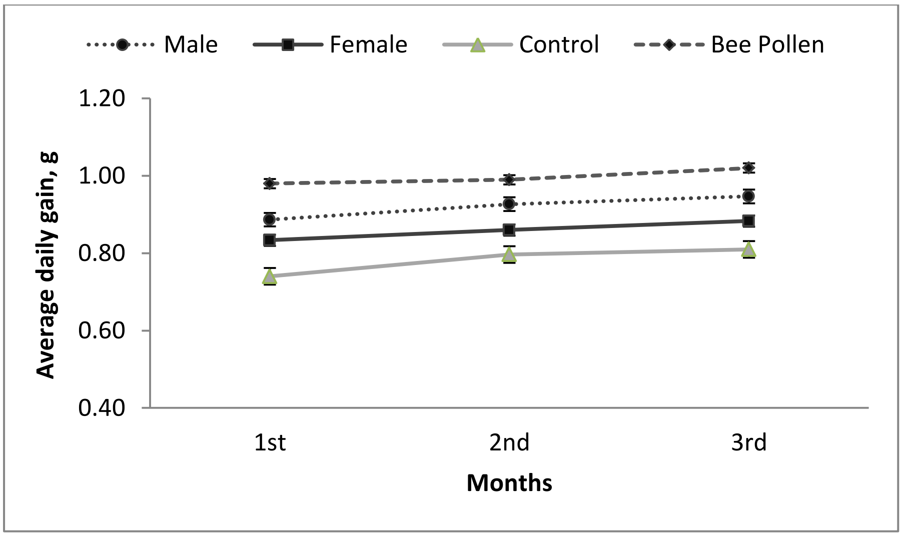

Fig. 2. Average daily gain of growing calves and heifers as affected by BP supplementation

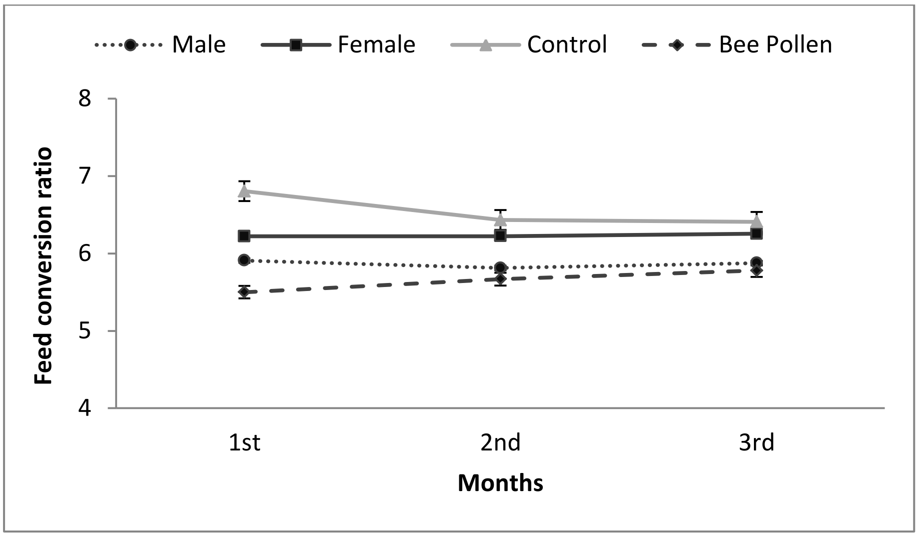

Fig 3. Feed conversion ratio of growing calves and heifers as affected by BP supplementation

References

1. Castanon, J.I.R. History of the use of antibiotics as growth promoters in European poultry feeds. *Poultry Science*, **86**(11), 2466-2471 (2007).
2. Campos, M.G., Bogdanov, S., de Almeida-Muradian, L.B., Szczesna, T., Mancebo, Y., Frigerio, C. and Ferreira, F. Pollen composition and standardisation of analytical methods. *Journal of Apicultural Research,* **47**(2), 154-161(2008).
3. Pascoal, A., Rodrigues, S., Teixeira, A., Feás, X. and Estevinho, L.M. Biological activities of commercial bee pollens: Antimicrobial, antimutagenic, antioxidant and anti-inflammatory. *Food and Chemical Toxicology*, **63**, 233-239 (2014).
4. Kroyer, G. and Hegedus, N. Evaluation of bioactive properties of pollen extracts as functional dietary food supplement. *Innovative Food Science & Emerging Technologies,* **2**(3), 171-174 (2001)
5. Roulston, T.H. and Cane, J.H. Pollen nutritional content and digestibility for animals. *Plant systematics and Evolution*, **222**, 187-209 (2000).
6. Villanueva, M.O., Marquina, A.D., Serrano, R.B. and Abellán, G.B. The importance of bee-collected pollen in the diet: a study of its composition. *International Journal of Food Sciences and Nutrition*, **53**(3), 217-224 (2002).
7. Almaraz-Abarca, N., da Graça Campos, M., Avila-Reyes, J.A., Naranjo-Jimenez, N., Corral, J.H., and Gonzalez-Valdez, L.S. Antioxidant activity of polyphenolic extract of monofloral honeybee-collected pollen from mesquite (*Prosopis juliflora, Leguminosae*). *Journal of Food Composition and Analysis,* **20**(2), 119-124 (2007).
8. Carpes, S.T., Begnini, R., Alencar, S.M. and Masson, M.L. Study of preparations of bee pollen extracts, antioxidant and antibacterial activity. *Ciência e Agrotecnologia*, **31**(6), 1818-1825 (2007).
9. Graikou, K., Kapeta, S., Aligiannis, N., Sotiroudis, G., Chondrogianni, N., Gonos, E. and Chinou, I. Chemical analysis of Greek pollen-Antioxidant, antimicrobial, and proteasome activation properties. *Chemistry Central Journal*, **5**(1), 33 (2011).
10. Hajková, Z., Toman, R., Hluchý, S., Gálik, B., Bíro, D., Martiniaková, M., Omelka, R. and Bobоňová. I. The effect of pollen on the structure of the small intestine in rats after an expérimental addition in diet. *Animal Science and Biotechnologies,* **46**(1), 232-237 (2013).
11. Mousa, M.A., Osman, A.S. and Elaref, M. The influence of fiber particle size on body performance, feed intake and digestibility of Egyptian buffalo heifer. *Journal of International Academic Research for Multidisciplinary,* **6**(2), 47-57 (2018).
12. Attia, Y.A., Al-Hanoun, A. and Bovera, F. 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**(1), 17-26 (2011).
13. Attia, Y.A., Bovera, F., Abd-Elhamid, A.E.H.E., Calabrò, S.M., Mandour, A. Al-Harthi, M.A. and Hassan, S.S. Evaluation of the carryover effect of antibiotic, bee pollen and propolis on growth performance, carcass traits and splenic and hepatic histology of growing rabbits. *Journal of Animal Physiology and Animal Nutrition*, **103**(3), 947-958 (2019).
14. Hashem, N.M., Hassanein, E.M. and Simal-Gandara, J. Improving reproductive performance and health of mammals using honeybee products. *Antioxidants,* **10**(3), 336 (2021).
15. Sierra-Galicia, M.I., Rodríguez-de Lara, R., Orzuna-Orzuna, J.F., Lara-Bueno, A., Ramírez-Valverde, R. and Fallas-López, M. Effects of supplementation with bee pollen and propolis on growth performance and serum metabolites of rabbits: A meta-analysis. *Animals*, **13**(3), 439 (2023).

16. NRC. National Research Council. Nutrient requirements of small ruminants. National Academy of Sciences, Washington, DC (2007).

17. Chimonyo, M., Kusina, N.T., Hamudikuwanda, H. and Nyoni, O. Reproductive performance and body weight changes in draught cows in a smallholder semi-arid farming area of Zimbabwe. *Tropical Animal Health and Production*, **32**, 405-415 (2000).

18. Ndlovu, T., Chimonyo, M., Okoh, A.I., Muchenje, V., Dzama, K. and Raats, J.G. Assessing the nutritional status of beef cattle: current practices and future prospects. *African Journal of Biotechnology*, **6**(24), 2727-2734 (2007).

19. Mohsen, M.K., Abdel-Raouf, E.M., Gaafar, H.M. and Mesbah, R.A. Productive performance of early weaning Friesian calves supplemented with bee pollen and black seeds. *Egyptian Journal of Agricultural Research*, **95**(2), 913-930 (2017).

20. Taghian, R.A., El-Ati, A., Allam, F.M. and Mahmoud, G.B. Effect of Date Palm Pollen and Bee Pollen as Growth Promoters on the Performance of Saidi Rams. *Assiut Journal of Agricultural Sciences*, **48**, 86-98 (2017).

21. Gaafar, H.M., El-Nahrawy, M., ElKersh, M.F., El-Esawy, G.S. and Mesbah, R.A. Effect of using bee pollen as feed additive for suckling Rahmani lambs on immunity response, diseases infection, mortality rate, growth performance and output of weaning weight. *Egyptian Journal of Sheep and Goats Sciences*, **19**(3), 23-32 (2024).

22. Abdel-Hamid, T.M. and El-Tarabany, M.S. Effect of bee pollen on growth performance, carcass traits, blood parameters, and the levels of metabolic hormones in New Zealand White and Rex Rabbits. *Tropical animal health and production*, **51**(8), 2421-2429 (2019).

23. Tu, Y., Zhang, G.F., Deng, K.D., Zhang, N.F. and Diao, Q.Y. Effects of supplementary bee pollen and its polysaccharides on nutrient digestibility and serum biochemical parameters in Holstein calves. *Animal Production Science*, **55**(10), 1318-1323 (2014).

24. Zeng, Z.J., Liu, S.F. Pan, K., Wu, H.X. and Yang, K.J. Effects of pollen and propolis on productive and immune performance in meat fowls. *Scientia Agricultura Sinica,* **5**, 751–755 (2004).

25. Wang, J., Wang, Q.F. and Li, S.H. Effect of bee pollen on the organizational structure of porcine small intestine of growing-finishing pigs. *Journal of Cereal & Feed Industry*, **8**, 41-42 (2004).

26. Braakhuis, A. Evidence on the health benefits of supplemental propolis. *Nutrients*, **11**(11), 2705 (2019).

27. Khalifa, S.A., Elashal, M.H., Yosri, N., Du, M., Musharraf, S.G., Nahar, L., Sarker, S.D., Guo, Z., Cao, W., Zou, X., Abd El-Wahed, A.A., Xiao, J., Omar, H.A., Hegazy, M.E.F. and El-Seedi, H.R. Bee pollen: Current status and therapeutic potential. *Nutrients,* **13**(6), 1876 (2021).

28. Sadarman, S., Erwan, E., Irawan, A., Sholikin, M.M., Solfaine, R., Harahap, R.P., Irawan, A.C., Sofyan, A., Nahrowi, N. and Jayanegara, A. Propolis supplementation affects performance, intestinal morphology, and bacterial population of broiler chickens. *South African Journal of Animal Science*, **51**(4), 477-487 (2021).

29. Attia, Y.A., Bovera, F., El-Tahawy, W.S., El-Hanoun, A.M., Al-Harthi, M.A. and Habiba, H.I. Productive and reproductive performance of rabbits does as affected by bee pollen and/or propolis, inulin and/or mannan-oligosaccharides. *World Rabbit Science*, **23**(4), 273-282 (2015).

30. Zeedan, K., El-Neney, B.A.M., Aboughaba, A.A.A.A. and El-Kholy, K. Effect of bee pollen at different levels as natural additives on immunity and productive performance in rabbit males. *Egyptian Poultry Science Journal*, **37**(1), 213–231 (2017).

31. Abdel-Raouf, E.M., Mohsen, M.K. Gaafar, H.M.A. and Mesbah, R.A. Blood biochemical, haematological, immunity response and diarrhea incidence of early weaning Friesian calves supplemented with bee pollen and black seeds. *International Journal of Research Studies in Agricultural Science,* **4**(9), 22-33 (2018).

32. Elnany B.A. and Elkholy, K.H. Effect of natural additive (bee pollen) on immunity and productive and reproductive performances in rabbits. 1- Growth performance, digestive and immune responses in growing rabbits. *Egyptian Poultry Science Journal*, **34**(2), 579-606 (2014).

33. Haro, A., López-Aliaga, I., Lisbona, F., Barrionuevo, M., Alférez, M.J. and Campos, M.S. Beneficial effect of pollen and propolis on the metabolism of iron, calcium, phosphorous, and magnesium in rats with nutritional ferropenic anemia. *Journal of Agricultural and Food Chemistry*, **48**(11), 5715-5722 (2000).

34. Mohamed, N. Effect of bee and date palm pollen suspensions on hematological, biochemical alterations and thyroid dysfunction in diabetic male rats. *The Egyptian Journal of Experimental Biology* (*Zoology*), **14**(2), 115-125 (2018).

35. Harmanescu, M., Despina, B. and Gergen, I. Heavy malals contents of bee's pollen from diffèrent locations of Romania. *Lucrări Ştiinţifice Medicină Veterinară*, **40**, 253-260 (2007).

36. Orhue, E.G., Idu, M., Atamari, J.E. and Ebite, L.E. Haematological and Histopathological Studies of Jatropha tanjorensis (J.L. Ellis and Soroja) Leaves in Rabbits. *Asian Journal of Biological Sciences,* **1**(2), 84-89 (2008).

37. Khalil, F.A. and El-Sheikh, N.M. The effects of dietary Egyptian propolis and bee pollen supplementation against the toxicity if sodium fluoride in rats. *Journal of American Science,* **6**(11), 310-316 (2010).

38. Salles, J., Cardinault, N., Patrac, V., Berry, A., Giraudet, C., Collin, M.L., Chanet, A., Tagliaferri, C., Denis, P., Pouyet, C., Boirie, Y. and Walrand, S. Bee pollen improves muscle protein and energy metabolism in malnourished old rats through interfering with the Mtor signaling pathway and mitochondrial activity. *Nutrients*, **6**(12), 5500-5516 (2014).

39. Maruyama, H., Sakamoto, T., Araki, Y. and Hara, H. Anti-inflammatory effect of bee pollen ethanol extract from Cistus sp. of Spanish on carrageenan-induced rat hind paw edema. *BMC complementary and alternative medicine*, **10**, 1-11 (2010).

40. Eraslan, G., Kanbur, M., Silici, S., Liman, B.C., Altınordulu, Ş., and Sarıca, Z.S. Evaluation of protective effect of bee pollen against propoxur toxicity in rat. *Ecotoxicology and Environmental Safety*, **72**(3), 931-937 (2009).

41. Tata, J.R. Looking for the mechanism of action of thyroid hormone. *Journal of Thyroid Research*, **2011**(1), 730630 (2011).

42. Yavuz, S., Salgado Nunez del Prado, S. and Celi, F.S. Thyroid hormone action and energy expenditure. *Journal of the Endocrine Society*, **3**(7), 1345-1356 (2019).

تأثير حبوب لقاح النحل كمحفز طبيعي للنمو على أداء وخصائص الدم للعجول والعجلات النامية

إيمان أحمد نجم[1] ، محمد يوسف العارف[2] ورغدة عادل تغيان[3]

[1] قسم الفسيولوجيا، كلية الطب البيطري، جامعة أسيوط، مصر.

[2] قسم الإنتاج الحيوانى، كلية الزراعة، جامعة سوهاج، مصر.

[3] قسم الإنتاج الحيوانى، كلية الزراعة، جامعة أسيوط، مصر.

الملخص

هدفت هذه الدراسة إلى استكشاف تأثير حبوب لقاح النحل (BP) على أداء وخصائص الدم للعجول والعجلات النامية .تم توزيع عشرين من العجول والعجلات السليمة (تتراوح أعمارهم بين 8 و10 أشهر بوزن فى بداية التجربة 136,1 و129,3 كجم للعجول والعجلات على التوالي) عشوائيًا على مجموعتين (5 عجول و5 عجلات لكل منهما) .حصلت المجموعة الكنترول على النظام الغذائي الأساسي، بينما حصلت المجموعة المعاملة على 30 جم من BP التجاري الطازج مع النظام الغذائي الأساسي ثلاث مرات في الأسبوع. تم وزن الحيوانات شهريًا وتم تسجيل كمية العلف المستهلك لحساب معدل التحويل الغذائى .تم جمع عينات الدم شهريًا لتقدير الهيموجلوبين والبروتين الكلى والألبيومين والجلوبيولين و T3وT4. كان الوزن ومتوسط الزيادة اليومية للحيوانات التي حصلت على BP أعلى (P<0.05) من تلك الموجودة في المجموعة الكنترول. كذلك، أدت إضافة BP إلى زيادة (P<0.05) في كمية المأكول من العلف (DFI)، وتحسن (P<0.05) معدل التحويل الغذائى (FCR). أيضاً، تحسنت مستويات كل من الهيموجلوبين، والبروتين الكلي، والجلوبيولين، والألبيومين، و T3وT4 فى دم الحيوانات في مجموعة BP مقارنةً بالحيوانات المجموعة الكنترول. وفي الختام، يمكن اعتبار إضافة BP إلى النظام الغذائى للعجول والعجلات النامية وسيلةً لتعزيز النمو، وتحسين معدل التحويل الغذائي، وخفض تكاليف التغذية.

الكلمات الدالة: حبوب لقاح النحل، ميتابولزم الدم، استهلاك العلف، العجول النامية، أداء النمو.