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*Research Article*

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# Broiler Meat Sensory Influence after using Bee Pollen as Alternative Supplemental Diet on their Feed Mixture

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**ABSTRACT**

The study aimed to investigate the effect of pollen as a natural supplement diet on broiler chicken meat sensory. The study was tested 180-day-old chickens, divided into 6 groups (n=30). Sensory evaluation of the thigh and breast meat samples was tested after have been heat-treated and were evaluated by a six-member, trained meat sensory evaluation panel. Participants rated aroma, juiciness, taste, and tenderness on a 5-point hedonic scale where 1 (worst) and 5 (best) were the maximums for each attribute. The aroma, taste, juiciness, and tenderness values of the pectoral beast muscles and thigh in the experimental groups were higher than the control. The pollen has a positive effect on the of chicken sensory with significant impact. The shear strength value of chicken thigh and breast were higher in experimental group compered to control and they found significant in thigh. The broiler carcass baking losses, as technological parameter, were higher without significantly impact by nutrition with pollen supplement.

**Keywords:** Broiler, Sensory, Pollen, Aroma, Taste, Shear Force

## Introduction

Many studies have been showing that bee pollen has a rich and balanced formula that can serve as a nutritional supplement for humans and animals, while its richness in bioactive compounds, especially polyphenols, gives it a wide range of biological and pharmacological activities [1,2]. Pollen from various floral sources have been shown to possess anesthetic, (anti-cancer and anti-mutagenic and antioxidant, anti-ulcer and immunostimulating properties [3-5]. Pollen contains a large and diverse number of phenolic components (total phenols, phenylpropanoids, flavonoids, and anthocyanins) and has antioxidant activity [6-8]. The growing demand for poultry meat has led to a need to increase production, such as pollen is a cheaper and more economical alternative to chicken feed, and has no negative effects [9-11]. Poultry meat has become one of the most important sources of protein for humans in terms of health benefits, economics cost, and production efficiency, poultry production has witnessed significant growth due to increased demand for poultry meat and eggs, driven by population growth, industrial development, and increased purchasing power [12]. This growth has subsequently led to increased demand for poultry meat [13-15]. A sensory test was conducted on meat, Sensory evaluation is an analysis of the properties of a product perceived through the human senses such as smell, taste, touch, and sight, as well as its tenderness [16]. They state that there are two general types of sensory methods, such as laboratory analysis methods that use a small number of participants to determine whether there is a difference between samples, the nature of the trend, and the severity of the difference, and active consumer methods that involve a larger number of participants and include tests that measure how consumers feel or interact with the product to provide a measure of preference, acceptance, liking, or disliking [17].

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## Research Methodology

### Experimental Site and Duration

The treatment was conducted at a poultry farm affiliated to the University of East Kordofan, South Kordofan State, Sudan. Temperatures ranged from 26 to 32°C, reaching 43°C in summer. GPS coordinates of South Kordofan State, Sudan. Latitude: 11.2667, longitude: 30.833.

### Experimental House

Chicks from each replicate were placed in single cages in an open-house system (1 m²). The temperature was controlled during the fattening period and to be 33 C0 at the first day and every week was reduced about 2 C0.The lighting during the experimental period was continuous. each cage equipped with feed trough and water were offered (ad libitum) through a self feed-pump.

### Experimental Chickens

The study was tested 180-day-old chickens (cobb 500) breed, divided into 6 groups (n=30). The chicks were kept under strict hygienic conditions throughout the experiment. The chicks were randomly selected, weighed to obtain initial body weight without any significant difference, and then distributed into six (6) treatment groups. (C, T1, T2, T3, T4 and T5) (n=30) Which was divided into three replicates according to a completely randomized design (CRD) for 42 days.

### Experimental Diets

Two basic diets were used to meet the requirements of the Cobb 500 breed for starter and finisher broiler chicks. The distribution of experimental bird groups was divided into six experimental groups, the first group was the control (C) which was fed a basal diet without bee pollen additives, and after the first week bee pollen was added at a dose to each experimental group. (T1, 1100, T2, 1600, T3, 2600, T4, 3600 & T5, 4600 mg.kg-1). Each group was fed the same starter feed from day 1 to day 21 of age, and from day 22 to day 42, the birds were fed the supplementary feed. Micronutrient analysis was performed according to the methods specified by the American Poultry Association (AOAC) (1990). Nutritional value (Table 1).

### Statistical Analysis

The experimental data were evaluated using the General Liner model using SPSS 17.0 (Statistical Package for the Social Sciences, released on August 23, 2008). Statistical significance was determined using one-way analysis of variance, followed by Duncan's test ($P \leq 0.05$) as the significance threshold [18].

**Table 1: Broiler chicken complete feed mixture (CFM)**

| Ingredient (%) | Starter (1 to 21 days) | Grower (22 to 42 days) |
|---|---|---|
| Wheat | 35.00 | 35.00 |
| Maize | 35.00 | 40.00 |
| Soybean meal (48 % N) | 21.30 | 18.70 |
| Fish meal (71 % N) | 3.80 | 2.00 |
| Dried blood | 1.25 | 1.25 |
| Ground limestone | 1.00 | 1.05 |
| Monocalcium phosphate | 1.00 | 0.70 |
| Fodder salt | 0.10 | 0.15 |
| Sodium bicarbonate | 0.15 | 0.20 |
| Lysine | 0.05 | 0.07 |
| Methionine | 0.15 | 0.22 |
| Palm kernel oil Bergafat | 0.70 | 0.16 |
| Premix Euromix BR 0,5 % | 0.50 | 0.50 |
| **Nutrient composition ($g.kg^{-1}$)** | | |
| Crude protein | 210.76 | 190.42 |
| Fibre | 30.19 | 29.93 |
| Ash | 24.24 | 19.94 |
| Ca | 8.16 | 7.28 |
| P | 6.76 | 5.71 |
| Mg | 1.41 | 1.36 |
| Linoleic acid | 13.51 | 14.19 |
| $ME_N$ ($MJ.kg^{-1}$), calculated | 12.02 | 12.03 |

Active substance:Salinomycin sodium; 4 active substances per kg of the premix: vit. A 2,500,000 IU; vita. E 50,000 mg; vitamin D3 800,000 IU; niacin12,000 mg; d-pantothenic acid 3,000 mg; riboflavin 1,800

## Results and Discussion

The recent experiment was conducted to study the effect pollen as a nutritional supplement diet in different dose on broiler (cobb 500) meat sensory. Tables (2 & 3) show that the values of chicken breast and thigh muscles in terms of aroma, taste, juiciness and tenderness, the results mentioned that the experimental flocks were higher compared to the control and significant differences ($P \leq 0.05$) were found in aroma and juiciness in breast also the significant differences ($P \leq 0.05$) were found in aroma, teste, juiciness and tenderness in broiler thigh, moreover how used pollen and propolis as alternatives in different level into broiler feed mixture for study broiler meat sensory they also found a positive effect of bee pollen and propolis on the sensory quality and oxidative stability of poultry meat [17-23]. evaluated the effect of propolis used in broiler feed mixtures on selected quality indicators of cooked pork and it was found that propolis extract as a feed additive for broiler chickens did not show any negative sensory parameters for the broiler feed mixture and cooked and ready-to-eat pork and was not significantly affected ($P>0.05$). [24] tested the effects of pollen inclusion on the performance and carcass characteristics of broiler chickens, and variation, meat pH, shear strength and sensory evaluation were not affected in both sexes ($P>0.05$). On the other hand, found that pollen causes negative effects on the physicochemical properties of meat and sensory evaluation in both male and female broiler chickens [25]. Table (4) the results of specific shear forces and weight loss values in the pectoral muscles showed no significant increase at T2 and T4, while they decreased significantly at T1 and T3 compared to the control group. Statistically significant differences were also found between the experimental and control groups [26]. studied the functions of propolis as a natural feed additive in poultry and found in his results the effect of propolis as an antioxidant on performance, carcass characteristics, behavior, immunity and physiological balance in domesticated poultry species (broiler, egg, quail and duck); and

the future needs of poultry research. The results of this study indicate that pollen and propolis supplementation (50 µl/kg body weight) can be used as a prophylaxis against coccidiosis and a natural growth promoter in rabbits without affecting animal health and meat quality [27]. This result is consistent with other studies that have shown that the addition of several additives with powerful antioxidants effects, such as selenium, Ginkgo biloba leaves, propolis, and pollen, significantly reduced drip loss values in chicken meat. [28-30]. The findings of this study indicate that the use of propolis as a nutritional supplement has an overall better effect on meat quality, positively impacting several parameters, while pollen significantly affects chicken meat color and skin color [31].

**Table 2: Breast meat muscles sensory evaluation for broiler chickens (cobb 500)**

| | N | C (BP 0) | T1 (BP 600) | T2 (BP (1600) | T3 (BP 2600) | T4 (BP 3600) | T5 (BP 4600) |
|---|---|---|---|---|---|---|---|
| **Aroma** | **30** | 4.18±0.17$^{a}$ | 4.21±0.19$^{a}$ | 4.40±0.17$^{b}$ | 4.37±0.20$^{b}$ | 4.22±0.23$^{abc}$ | 4.25±0.12$^{abc}$ |
| **Tase** | **30** | 4.04±0.20 | 4.05±0.27 | 4.19±0.21 | 4.18±0.11 | 4.11±0.13 | 4.14±0.12 |
| **Juiceness** | **30** | 3.76±0.25$^{a}$ | 3.80±0.26$^{ab}$ | 4.08±0.31$^{b}$ | 3.85±0.18$^{ab}$ | 3.86±0.22$^{ab}$ | 3.97±0.26$^{ab}$ |
| **Tenerness** | **30** | 3.82±0.30 | 3.91±0.28 | 4.08±0.34 | 3.97±0.24 | 4.01±0.29 | 4.40.22 |

*C: control flocks, T1, T2, T3, T4, T5: experimental flocks, *mean: average, *S. D: standard deviation, BP: bee pollen, Mean values in the same columns with different superscripts (a,b,c) are significant (P≤0.05) levels.

**Table 3: Thigh meat muscles sensory evaluation for broiler chickens (cobb 500)**

| | N | C (BP 0) | T1 (BP 600) | T2 (BP (1600) | T3 (BP 2600) | T4 (BP 3600) | T5 (BP 4600) |
|---|---|---|---|---|---|---|---|
| **Aroma** | **30** | 4.11±0.32$^{a}$ | 4.19±0.21$^{ab}$ | 4.24±0.27$^{ab}$ | 4.16±0.18$^{ab}$ | 4.35±0.12$^{b}$ | 4.33±0.10$^{b}$ |
| **Tase** | **30** | 3.94±0.22$^{a}$ | 4.17±0.24$^{b}$ | 4.07±0.14$^{ab}$ | 4.06±0.23$^{ab}$ | 4.13±0.18$^{ab}$ | 4.18±0.16$^{b}$ |
| **Juiceness** | **30** | 4.10±0.15$^{a}$ | 4.17±0.29$^{ab}$ | 4.23±0.16$^{ab}$ | 4.13±0.11$^{ab}$ | 4.22±0.23$^{ab}$ | 4.27±0.13$^{b}$ |
| **Tenerness** | **30** | 4.19±0.70$^{a}$ | 4.25±0.17$^{ab}$ | 4.31±0.16$^{ab}$ | 4.29±0.13$^{ab}$ | 4.38±0.14$^{b}$ | 4.35±0.15$^{b}$ |

*C: control flocks, T1, T2, T3, T4, T5: experimental flockss, *mean: average, *S. D: standard deviation, BP: bee pollen, Mean values in the same columns with different superscripts (a,b,c) are significant (P≤0.05) levels.

**Table 4: Meat Quality indicators for broiler chickens (cobb 500)**

| | | N | C (BP 0) | T1 (BP 600) | T2 (BP (1600) | T3 (BP 2600) | T4 (BP 3600) | T5 (BP 4600) |
|---|---|---|---|---|---|---|---|---|
| Shear force [kg.cm$^{-2}$] | Breast | 30 | 1.93±0.6 | 1.87±0.9 | 2.03±0.3 | 1.89±0.8 | 2.07±0.7 | 1.66±0.5 |
| | Thigh | 30 | 1.31±0.3ac | 0.94±0.3b | 1.52±0.4a | 0.98±0.3b | 1.13±0.2abc | 1.17±0.4bc |
| wieght loss[%] | Broiler carcass | 30 | 30.30±1.6 | 28.27±1.9 | 29.86±1.7 | 29.22±1.4 | 29.70±1.4 | 30.29±0.7 |

*C: control flocks, T1, T2, T3, T4, T5: experimental flockss, *mean: average, *S. D: standard deviation, BP: bee pollen, Mean values in the same columns with different superscripts (a,b,c) are significant (P≤0.05) levels.

## Conclusion

Research has shown that bee pollen has a positive effect on sensory of chicken thighs and breasts. Shear strength in chicken thighs was also significantly improved, and weight loss, a second technological criterion, was not significantly affected by the addition of bee pollen.

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