

EFFECTS OF DRONE PUPAE (*APIS MELLIFERA* L.) POWDER ON STORAGE AND ANTIOXIDANT STABILITY OF PORK PATTIES DURING COLD STORAGE

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I. INTRODUCTION

The decline in honeybee populations has emerged as an important issue due to climate change or environmental pollution [1, 2]. One of the by-products of the beekeeping industry, drone pupae was recently approved as an edible and new food ingredient in Korea [3]. Drone pupae contain essential nutrients, various amino acids, fatty acids, vitamins, and minerals [4, 5]. Moreover, it has effects such as antioxidant, anti-tumor, and anti-aging [6]. In this study, an experiment was conducted to determine the optimal amount of drone pupae that affects the storage stability and antioxidant capacity of pork patties.

II. MATERIALS AND METHODS

Table 1 is the formulation of pork patties with drone pupae powder (DP) contents. Storage stability and antioxidation were conducted through total microbial count (TMC), volatile basic nitrogen (VBN), 2-thiobarbituric acid reactive substance (TBARS), and DPPH radical scavenging activity (DPPH) (4°C, 1-7days). The statistical processing program SAS (9.4 for Windows, USA) was used to test the significance of the results. To compare significant differences between the measured values, a significance test ($p < 0.05$) was performed using Duncan's multiple range test.

Table 1 Formulation for pork patties with drone pupae powder

Ingredients g	Treatments				
	CON	T1	T2	T3	T4
Pork patty ¹	100	100	100	100	100
Drone pupae powder (DP)	-	1.00	3.00	5.00	7.00
Isolated soy protein	1.00	-	-	-	-
Ascorbic acid	0.10	-	-	-	-
STPP ²	0.20	-	-	-	-

¹ Pork patty: pork meat 88.0 g, ice 10.0 g, salt 1.50 g, pepper 0.50 g. ² Sodium tripolyphosphate.

III. RESULTS AND DISCUSSION

The results of TMC, VBN, and TBARS values are shown in Figure 1, and DPPH values in Table 2. In the case of TMC, there were significant differences for 1 day, and T2 showed a significantly lower value than CON. T2 had significantly lower VBN and TBARS values than CON. DPPH showed significantly higher values in T2, T3, and T4 added with DP than CON. Drone pupae had antibacterial activities and antioxidant effects due to phenolic compounds [7]. Therefore, DP is considered that the growth of microbial, protein deterioration, and lipid oxidation of patties are inhibited, which affects the improvement of storage stability.

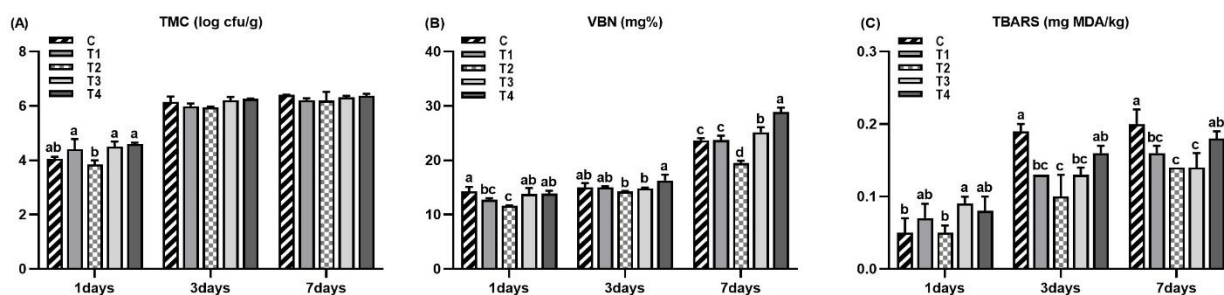


Figure 1. (A) TMC, (B) VBN, and (C)TBARS of pork patties were added with DP during storage at 4°C for 7 days. ^{a-d} Means with different superscripts within the bar significantly ($p < 0.05$)

Table 2 DPPH radical scavenging activity pork patties added with DP during storage at 4°C for 7 days

Item	Storage time (days)	CON	T1 (1 g)	T2 (3 g)	T3 (5 g)	T4 (7 g)	SEM ¹	P-value
DPPH (%)	1	71.43 ^c	70.45 ^c	83.23 ^a	79.57 ^{ab}	74.49 ^{bc}	1.587	0.116
	3	67.75 ^c	62.37 ^d	74.84 ^a	72.84 ^{ab}	69.94 ^{bc}	1.275	0.023
	7	46.77 ^b	45.32 ^b	58.92 ^a	55.09 ^a	56.39 ^a	1.637	0.023

¹ Standard error of means. ^{a-d} Means in a row with different letters are significantly different ($p < 0.05$).

IV. CONCLUSION

In conclusion, adding 3 g of DP had a positive effect on the storage stability and antioxidant capacity of pork patties. Therefore, this study shows that DP can be used as an antioxidant in meat product manufacturing, and the basis for the utilization of drone pupae, a by-product in the beekeeping industry.

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