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Effects of humic acid and blueberry leaf powder supplementation in pig feeds on physicochemical characteristics of longissimus thoracis (#460)

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Introduction

Both humic acid and blueberry leaf are functional materials. Humic acid has been studied extensively due to its positive effects on meat quality and productivity in the past. The addition of humic acid to feed is known to promote germination by increasing nutrient intake (David et al., 1994). Blueberry is known to have positive effects on human health and disease prevention because it contains anthocyanin with antioxidant activities (Brownmiller et al., 2008). However, there is a lack of research on effects of blueberry leaf and humic acid supplements on physicochemical characteristics as pig feed additives. Therefore, this study was conducted to investigate the effects of humic acid and blueberry leaf powder supplementation in pig feeds on the physicochemical characteristics of *longissimus thoracis*.

Methods

All animal studies were approved by Institutional Animal Care and Use Committee (IACUC) of Chungbuk University. Landrace × Yorkshire × Duroc cross hybrid growing pigs (n = 120) were examined. Their initial body weight was ~60 kg. Feeding study was conducted for 7 weeks. The experimental design consisted of six treatments: 1) CON : basic feed 2) T1 : basic feed + 0.1% blueberry leaf powder; 3) T2 : basic feed + 0.2% blueberry leaf powder; 4) T3 : basic feed + 2% humic acid powder; 5) T4 : basic feed + 2% humic acid powder+ 0.1% blueberry leaf powder; and 6) T5 : basic feed + 2% humic acid powder + 0.2% blueberry leaf powder. Each treatment was assigned with 20 pigs. The final *longissimus thoracis* was vacuum packed and stored at 4 ℃ for 14 days and analyzed. Analytical items were moisture, protein, fat, ash, pH, water holding capacity, drip loss(minced), cooking loss, meat color (L*, a*, b*) were measured. Results were analyzed with SAS program (2012) using analysis of variance (ANOVA) and Duncan's multiple test. Statistical significance was set at $p < 0.05$.

Results

Table 1 shows proximate compositons of longissimus thoracis from finishing pigs supplemented with humic acid (HA) and blueberry leaf powders (BLP). T4 treatment elevated moisture contents in porcine *longissimus thoracis*. Ash contents in porcine *longissimus thoracis* were higher in pigs that consumed 2% HA mixed with BLP (T4 and T5) than those in others ($p<0.05$). Table 2 shows Meat quality characteristics of *longissimus thoracis* from finishing pigs supplemented with humic acid and blueberry leaf powders. Lightness (L*) and redness (a*) values of T5 treatment were significantly lower than those of the control. b*values were significantly lower in T5 (2% HA+BLP) than those of the control ($p<0.05$). Cooking loss of *longissimus thoracis* in the group with 2% HA consumption (T3) was higher than that with 0.2% BLP consumption. Table 3 shows pH value of storage characteristics of *longissimus thoracis* from finishing pigs supplemented with humic acid and blueberry leaf powders. HA and BLP consumption markedly decreased pH of porcine *longissimus thoracis* during 14 d of storage. Moreover, HA consumption during the storage period showed lower tendency than treatment with BLP consumption. HA and BLP reduced pH of meat. This might be due to formation of propionic acid and lactic acid (Wanapat et al., 2011).

Conclusion

As a result, humic acid(HA) and blueberry leaf powder(BLP) supplementation in pig feeds did not show negative effect on the physicochemical characteristics of *longissimus thoracis*, HA and BLP might be useful for the development of functional meat processing product as excellent additives to improve productivity and meat quality of finishing pigs.

Notes

Table 1. Proximate composition of *longissimus thoracis* from finishing pigs supplemented with humic acid and blueberry leaf powders

Item*	CON	T1	T2	T3	T4	T5
Moisture	72.29 ±2.02^{b}	72.52 ±2.72^{ab}	72.53 ±1.81^{ab}	73.06 ±2.31^{ab}	73.89 ±3.09^{a}	72.85 ±2.51^{ab}
Protein	20.58 ±1.39	20.69 ±1.83	20.67 ±0.97	19.87 ±1.77	19.93 ±1.57	20.83 ±0.99
Fat	6.72 ±1.23	6.57 ±2.24	6.43 ±1.36	6.94 ±1.21	6.21 ±0.95	6.98 ±0.57
Ash	1.16 ±0.08^{b}	1.12 ±0.13^{b}	1.11 ±0.08^{b}	1.18 ±0.13^{b}	1.27 ±0.11^{a}	1.32 ±0.13^{a}

*CON: No addition, T1: blueberry leaf powder 0.1%, T2: blueberry leaf powder 0.2%, T3: humic acid 2%, T4: humic acid 2% + blueberry leaf powder 0.1%, T5: humic acid 2% + blueberry leaf powder 0.2%

Labeled means without a common letter differ (p<0.05). These same abbreviations and statistical approaches apply to all data presented in this manuscript (which will not be repeated in subsequent figure legends).

Table 1
Proximate composition of *Longissimus thoracis* from finishing pigs supplemented with humic acid and blueberry leaf powders

Table 3. pH value of storage characteristics of *longissimus thoracis* from finishing pigs supplemented with humic acid and blueberry leaf powders

Item*	Days	CON	T1	T2	T3	T4	T5
pH	0day	5.95 ±0.17^{a}	5.75 ±0.14^{b}	5.70 ±0.09^{b}	5.61 ±0.11^{c}	5.61 ±0.10^{c}	5.59 ±0.12^{c}
	7day	5.77 ±0.19^{a}	5.63 ±0.13^{b}	5.58 ±0.06^{bcd}	5.56 ±0.04^{cd}	5.61 ±0.05^{bc}	5.52 ±0.11^{d}
	14day	5.92 ±0.20^{a}	5.78 ±0.05^{b}	5.65 ±0.01^{c}	5.55 ±0.06^{cd}	5.60 ±0.02^{c}	5.43 ±0.08^{d}

*CON: No addition, T1: blueberry leaf powder 0.1%, T2: blueberry leaf powder 0.2%, T3: humic acid 2%, T4: humic acid 2% + blueberry leaf powder 0.1%, T5: humic acid 2% + blueberry leaf powder 0.2%

Labeled means without a common letter differ (p<0.05). These same abbreviations and statistical approaches apply to all data presented in this manuscript (which will not be repeated in subsequent figure legends).

Table 3
pH value of storage characteristics of *Longissimus thoracis* from finishing pigs supplemented with humic acid and blueberry leaf powders

Table 2. Meat quality characteristics of *longissimus thoracis* from finishing pigs supplemented with humic acid and blueberry leaf powders

Item*		CON	T1	T2	T3	T4	T5
WHC (%)**		63.92 ±9.07	65.99 ±6.35	65.57 ±4.07	62.67 ±9.31	65.29 ±10.24	65.94 ±3.96
Hunter Color	L*	61.01 ±3.95^{a}	61.54 ±4.22^{a}	60.08 ±4.44^{ab}	61.42 ±3.52^{a}	61.85 ±4.61^{a}	58.94 ±3.99^{b}
	a*	5.89 ±1.83^{a}	5.23 ±1.86^{a}	5.16 ±1.48^{a}	5.16 ±1.30^{a}	5.27 ±1.57^{a}	4.11 ±1.39^{b}
	b*	9.86 ±1.12^{a}	9.60 ±1.16^{a}	9.41 ±1.04^{a}	8.92 ±0.96^{bc}	8.51 ±0.86^{cd}	8.30 ±0.94^{d}
Drip loss (%)		2.19 ±0.65	2.26 ±0.92	2.61 ±0.84	2.98 ±0.77	2.43 ±0.7	3.52 ±1.36
Cooking loss (%)		22.53 ±2.51^{ab}	21.44 ±3.33^{ab}	20.36 ±7.51^{b}	23.58 ±2.57^{a}	23.01 ±3.16^{ab}	22.22 ±2.65^{ab}

*CON: No addition, T1: blueberry leaf powder 0.1%, T2: blueberry leaf powder 0.2%, T3: humic acid 2%, T4: humic acid 2% + blueberry leaf powder 0.1%, T5: humic acid 2% + blueberry leaf powder 0.2%

Labeled means without a common letter differ (p<0.05). These same abbreviations and statistical approaches apply to all data presented in this manuscript (which will not be repeated in subsequent figure legends).

Table 2
Meat quality characteristics of *Longissimus thoracis* from finishing pigs supplemented with humic acid and blueberry leaf powders

Notes