

GROWTH PERFORMANCE AND MEAT QUALITY OF BROILERS FED DIETS SUPPLEMENTED WITH *Piper sarmentosum* Roxb. LEAVES

Pastsart U. and Pimpa O.*

Faculty of Science and Industrial Technology, Prince of Songkla University, Surat Thani campus,

Surat Thani, 84000, Thailand

*Corresponding author email: umaporn.p@psu.ac.th

Abstract – A feeding trial was conducted to investigate effects of *Piper Sarmentosum* Roxb. leaves (PSL) on growth performance and meat quality of broilers. The 144 commercial broiler chicks with 1 day old were randomly assigned to 5 experimental groups with three replicate cages. Five treatments were 1) commercial feed (8 chicks/cage), 2) commercial feed (10 chicks/cage), 3) commercial feed supplemented with 1% of PSL (10 chicks/cage), 4) commercial feed supplemented with 2% of PSL (10 chicks/cage) and 5) commercial feed supplemented with 3% of PSL (10 chicks/cage). The results showed that the supplementation of PSL had no significant effect on growth performance but the control group with 8 chickens/cage had more daily feed intake and daily weight gain than groups with 10 chickens/cage ($P < 0.05$). However, feed conversion ratio (FCR) was not different among all groups ($P > 0.05$). For meat quality, the group supplemented with 3% PSL had more redness (a^*) value, yellowness (b^*) value, and %cooking loss than the control with 10 chickens/cage ($P < 0.05$). It was also observed that 3% PSL treatment had significantly a lower lightness (L^*) value ($P < 0.05$) than 0% and 1% PSL groups. Overall, the study indicates that *Piper Sarmentosum* Roxb. leaves may improve meat colour in chickens.

Key Words – Growth Performance, Meat Quality, *Piper Sarmentosum* Roxb.

I. INTRODUCTION

Recently, more attention has been focused on the natural plant compounds that can

substitute the use of antibiotics in animal feed. Wild betel (*Piper sarmentosum* Roxb.) or “Chaphlu” is an edible plant and widely found to inhabit the tropical and subtropical countries including Thailand. Its leaves and roots have been used as a traditional medicine for expectorant and the treatment of toothache, fungoid dermatitis, asthma and pleurisy [1]. Previous studies have demonstrated that extracts of this plant exhibit antimicrobial, antioxidant and antimutagenic activities *in vitro* [1],[2],[3]. From these *in vitro* studies, it was concluded that the *Piper sarmentosum* Roxb. extracts have excellent potential for further study as dietary supplements [2],[3], but their involvement *in vivo* as feed additives is still largely unknown. Therefore, this research is aimed to examine the effect of *Piper sarmentosum* Roxb. leaves in broiler diets on growth performance and meat quality.

II. MATERIALS AND METHODS

Preparation of plant powder

The leaves of *Piper Sarmentosum* Roxb. were collected from Surat Thani province, the south of Thailand. The plants were washed thoroughly with distilled water and dried in hot air oven at 40°C for 12 h. The dried samples were ground into powder.

Animals and experimental design

In the experiment, the 144 commercial broiler chicks with 1 day old were randomly assigned to 5 groups each containing three replicate cages (about 50% male and female mixing). Chickens were given maize-soybean meal based diets with 21% protein for first 3 weeks and then 18% protein after 3 weeks until 6 weeks. The treatment groups were designed as:

- 1) Commercial feed supplemented with *Piper Sarmetosum* Roxb. leaves (PSL) powder 0% (8 animals/cage)
- 2) Commercial feed supplemented with PSL powder 0% (10 animals/cage)
- 3) Commercial feed supplemented with PSL powder 1% (10 animals/cage)
- 4) Commercial feed supplemented with PSL powder 2% (10 animals/cage)
- 5) Commercial feed supplemented with PSL powder 3% (10 animals/cage)

Daily feed intake, average daily growth rate (ADG) and feed conversion ratio (FCR) were estimated weekly for both control and experimental groups. At the end of the rearing period (42 days), 4 birds whose body weights similar to the group average from each replicate were slaughtered and collected breast muscle samples for determining the meat quality.

Meat quality

Meat pH was measured at 1 and 24 h post-mortem. Water-holding capacity (WHC) was determined based on the %drip loss, thawing loss and cooking loss according to Uytterhaegen *et al.* [4] at 24 h post-mortem. Colour of breast muscles was assessed with a Hunterlab Miniscan color meter (D65 light source, 10° standard observer, 45°/0° geometry) at 24 h post-mortem [5].

Statistical analysis

Data were subjected to a one-way analysis of variance using the general linear models (GLM) procedure of SPSS 16.0 and Post-hoc tests were performed at a significance level of $P < 0.05$ using the Duncan test.

III. RESULTS AND DISCUSSION

Growth performance

To assess the growth performance, the changes in patterns of broilers body weight gain (BWG) and feed intake were determined weekly during the whole production period (42 days). Table 1 shows that the different levels of *Piper Sarmetosum* Roxb had no significant effect on the feed intake, body weight and feed conversion ratio (FCR) of the chicken ($P > 0.05$). However, the control group with 8 chickens/cage had more daily feed intake and daily weight gain than groups with 10 chickens/cage ($P < 0.05$), but FCR also was not different between 8 animals/cage and 10 animals/cage groups ($P > 0.05$).

Meat quality

To accurately assess the meat quality, we compared the pH, colour and water holding capacity (%drip loss, %thawing loss and %cooking loss) of chicken breast fillet between all treatments. Table 2 clearly demonstrates that the values of meat redness (a^*) and yellowness (b^*) for 3% PSL group were higher than two control treatments ($P < 0.05$). It was also observed that 3% PSL treatment was significantly lower in lightness (L^*) value than 0% and 1% PSL groups ($P < 0.05$). No significant difference was observed for the pH at 1 and 24 h post-mortem, %drip loss and %thawing loss among treatments. However, the 3% PSL treatment had more %cooking loss than 0% and 1% PSL groups ($p < 0.05$), this might result from there was a slightly lower in %drip loss and still more water in meat for 3% PSL group led to the meat loose more water after cooking. It could be seen from the study that the supplementation of *Piper Sarmetosum* Roxb leaves in the diets had beneficial effects on broiler meat colour. However, its contribution to the oxidative stability of meat during storage needs to be further investigated.

Table 1 Effect of dietary *Piper Sarmentosum* Roxb. leaves (PSL) on growth performance of broilers during 1 to 42 days of age (mean \pm SD).

Item	% <i>Piper Sarmentosum</i> Roxb. leaves in diets					P-value
	0%	0%	1%	2%	3%	
	8 birds/cage		10 birds/cage			
Daily feed intake (g)	63.50 \pm 0.87 ^a	57.90 \pm 0.70 ^b	57.50 \pm 0.69 ^b	57.50 \pm 0.70 ^b	57.50 \pm 0.70 ^b	0.000
Daily body weight gain (g)	33.75 \pm 1.24 ^a	29.83 \pm 1.31 ^b	28.48 \pm 0.96 ^b	29.74 \pm 0.55 ^b	29.75 \pm 2.25 ^b	0.008
Feed conversion ratio (FCR) (g/g)	1.88 \pm 0.07	1.95 \pm 0.07	2.02 \pm 0.07	1.93 \pm 0.01	1.94 \pm 0.12	0.300

^{a,b,c} Within a row, mean values with different superscripts differ significantly at P<0.05

Table 2 Effect of dietary *Piper Sarmentosum* Roxb. leaves (PSL) on breast meat quality of broilers (mean \pm SD; n=12).

Item	% <i>Piper Sarmentosum</i> Roxb. leaves in diets					P-value
	0%	0%	1%	2%	3%	
	8 birds/cage		10 birds/cage			
pH _{1h}	6.00 \pm 0.22	6.15 \pm 0.23	5.97 \pm 0.02	5.94 \pm 0.14	6.01 \pm 0.05	0.735
pH _{24h}	5.72 \pm 0.09	5.71 \pm 0.14	5.79 \pm 0.12	5.78 \pm 0.13	5.76 \pm 0.16	0.843
L*	59.72 \pm 3.15 ^{abc}	61.16 \pm 1.92 ^a	60.41 \pm 1.68 ^{ab}	58.47 \pm 2.69 ^{cb}	58.18 \pm 2.43 ^c	0.018
a*	6.81 \pm 0.99 ^{ab}	5.63 \pm 1.09 ^c	6.06 \pm 0.61 ^b	6.94 \pm 0.93 ^a	7.04 \pm 1.30 ^a	0.003
b*	21.73 \pm 1.57 ^c	21.59 \pm 1.10 ^c	23.17 \pm 1.37 ^b	22.41 \pm 0.94 ^b	25.43 \pm 1.83 ^a	0.000
%Drip loss	5.22 \pm 1.10	4.35 \pm 0.45	4.21 \pm 0.66	4.6 \pm 0.94	4.1 \pm 2.05	0.163
%Thawing loss	8.16 \pm 2.07	7.95 \pm 2.71	6.52 \pm 2.27	6.88 \pm 2.05	7.32 \pm 2.12	0.368
%Cooking loss	27.58 \pm 1.66 ^c	29.10 \pm 2.04 ^b	29.73 \pm 6.94 ^{bc}	31.74 \pm 2.65 ^{ab}	33.15 \pm 2.16 ^a	0.009

^{a,b,c} Within a row, mean values with different superscripts differ significantly at P<0.05

IV. CONCLUSION

In conclusion, the supplementation of *Piper sarmentosum* Roxb. leaves up to 3% in broiler diets has a remarkable potential in improving poultry meat quality by increasing in yellowness and redness colour, additionally, decreasing paleness in chicken breast. However, *Piper sarmentosum* Roxb. leaves supplement has no effect on a growth performance in broilers.

ACKNOWLEDGEMENTS

The authors acknowledge the financial

support for this study from the Research and Development Office, Prince of Songkla University, Thailand.

REFERENCES

1. Hafizah, A. H., Zaiton, Z., Zulkhairi, A., Ilham, A. M., Anita, M. M. N., & Zaleha, A. M. (2010). *Piper sarmentosum* as an antioxidant on oxidative stress in human umbilical vein endothelial cells induced by hydrogen peroxide. Journal of Zhejiang University SCIENCE B (Biomedicine & Biotechnology) 11(5):357-365.

2. Lee, J. H., Cho, S., Paik, H. D., Choi, C. W., Nam, K. T., Hwang, S. G. & Kim, S. K. (2014). Investigation on antibacterial and antioxidant activities, phenolic and flavonoid contents of some Thai edible plants as an alternative for antibiotics. *Asian-Australasian Journal of Animal Sciences* 27: 1461-1468.
3. Boonla, P., Phadungkit, M., Mahaweerawat, U. & Somdee, T. (2014). Antioxidant and antimutagenic activities of *Piper sarmentosum* Roxb. leaf extracts. *Isan Journal of Pharmaceutical Sciences* 10: 283-294.
4. Uytterhaegen, L., Claeys, E., Demeyer, D., Lippens, M., Fiems, L. O., Boucque, C. Y., Van de Voorde, G., & Bastiaens, A. (1994). Effects of double-muscling on carcass quality, beef tenderness and myofibrillar protein degradation in Belgian Blue White bulls. *Meat Science* 38: 255-267.
5. AMSA. (2012). Meat colour measurement guidelines. 201 West Springfield Avenue, Suite 1202, Champaign, Illinois, USA.