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Effect of Tomato Pomace and Fibrolytic Enzyme on Egg Production and Egg Quality

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Abstract**—**This study was designed to determine effect of supplemented tomato pomace and fobrolytic enzyme on egg production and egg quality. A total of 40 CP brown laying hens (95 week old) were used in completely randomized design in 2x2 factorial arrangement with or without enzyme supplementation. Four dietary treatments included: Control (C), Fibrolytic enzyme (FE), 10% Tomato pomace (TP), and Fibrolytic enzyme + 10 % Tomato pomace (FE+TP). Each of the four dietary treatments was fed up to 30 days (10 birds/treatment). Live performance, egg production, egg weight and quality were determined for whole period. Dietary treatments had no effect (P>0.05) on live performance, egg weight, yolk color, and egg production. Therefore, laying hens fed diets with fibrolytic enzyme were significantly (P<0.05) increased yolk weight (17.37 g) as compared to other treatments. Additional of dietary tomato pomace had reduced capital costs for egg production.

Keywords**—**Hen, Tomato Pomace, Fibrolytic Enzyme, Egg Quality.

I. Introduction

THAILAND produces fresh tomato around 145,600 ton per year [1]. Tomato was one of the most popular vegetables used as ingredients in many kind of food and also commercially in form of juice, paste and sauce. Tomato waste products from cannery factories, which producing a considerable large amount of wet tomato pomace as a byproduct, It was consisted of peels, cores, culls, trimmings, and seeds. Tomato pomace was a good source of protein, vitamins and minerals but may be limited in energy due to the high non-starch polysaccharides content. Non-starch polysaccharides are complex sugars such as hemicelluloses and β-glucans. Fibrolytic enzymes have the ability the break down these structural polysaccharides, making the nutrients available to the animal [2], [3]. Previous research conducted on feed enzymes in poultry nutrition focused on non-starch polysaccharide (NSP) degrading enzymes, specifically xylanase and β-glucanase, in diets containing wheat, rye and barley [4].

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Using tomato pomace to formulate more economic diets showed proper performance results in laying hens [8]. Dried tomato pomace was fed to laying hens at an inclusion rate of 12%, which resulted in similar egg production, feed efficiency, egg weight and shell thickness compared with the hens fed upon a corn-soybean meal based diet [5]. Although, tomato by-products have been evaluated in poultry production to a limited extent, little work has been carried out to determine the effects of commercial fibrolytic enzymes and tomato pomace on old laying hen performance and egg traits.

II. Materials and Methods

The experiment was performed at the Experimental Unit of the Rajamangala University of Technology Isan Sakon Nakhon Campus and received prior approval from the Animal Protocol Review Committee of the Institution. A total of 40 hens excluded from receiving feed, 1.81±0.05 kgBW and 95 wk old, were randomly allocated to 40 pens in an environmentally open room conditions throughout the experimental period (30 days).

The enzyme was added directly to the feed, without changing its composition. Feed intake, and body weight gain were measured weekly during experimental period. Diets were presented in mash form and provided daily according to expected intake and hens had free access to water. Experimental diets were formulated to produce various levels of tomato pomace and supplemented with or without fibrolytic enzyme and fed to layer hens (CP-Brown) in a 2x2 factorial arrangement with a completely randomized design. The first factor was tomato pomace with 2 levels (0 and 10%) and second factor was enzyme with 2 levels (0 and 200mg/kg).

TABLE I
Analysed Composition of the Experimental Diets

Ingredients (%)	Treatment			
	C	C+E	T	T+E
DM	83.69	85.19	83.27	84.68
	---------- % DM of basis ----------			
OM	94.68	98.74	97.21	98.96
CP	15.54	15.62	16.19	15.81
EE	3.17	4.32	2.62	4.63
CF	3.39	3.61	6.27	6.03
Ash	11.39	13.54	13.94	14.28
NFE	51.19	49.1	44.25	43.93

Egg production was determined each day and was calculated on a hen day basis. Hens were given ad-libitum of feed per hen per day; unconsumed feed was measured each morning. Feed conversion ratio (FCR) was calculated as the

ratio of grams of feed to grams of egg produced per hen-day. Eggs were saved whole period to measure egg weight. Egg mass was calculated as a factor of egg weight and hen-day egg production. Five eggs were randomly chosen in each replicate from the eggs laid every days whole period to determine eggshell weight and the Haugh unit. The Haugh unit was calculated using the following formula:

Haugh unit = 100 log HA + 7.57 - 1.7WE 0.37

Where, HA is albumen height and WE is egg weight [6]. Yolk color was measured biweekly on one egg per cage (20 eggs/treatment) using a Roche color fan.

The experiment had a complete random design with a 2 × 2 factorial arrangement (analysis of variance (ANOVA), All analyses were performed using the SPSS statistical package (SPSS, 1999). Results are presented as means and a pooled SE.

III. Results and Discussion

This research was to determine the effect of tomato pomace (TP) in laying hen diets and monitor the effects of commercial sources of fibrolitic enzymes (FE) in diets containing TP. The results of performance traits are presented in Table II. Interactions of TP and FE did not affect on egg production and egg quality. FCR of hen fed diet with FE was tend to lower than hen fed diet without FE (P=0.067). Inclusion of TP into the diet 10% in this study was similar results with that of the previous study on TP [6], [7].

TABLE II
Effect of Tomato Pomace on Feed Intake and Egg Production

Items	C	T	SE	P-value
Initial Wt. (kg)	1.81	1.81	0.05	1.000
Final Wt. (kg)	1.83	1.91	0.08	0.333
DMI (g)	97.79	96.01	1.29	0.176
Egg wt. (g)	63.51	63.73	1.25	0.862
Egg prod. (%)	69.13	70.36	4.39	0.781
FCR	2.34	2.19	0.13	0.274

C = Control diet, T = Control diet + 10% Tomato pomace, NE = Diet no enzymes, E = diet with fibrolytic enzymes (200 mg/1000 g), SE= Standard error, DMI = Dry matter intake,

TABLE III
Effect of Fibrolitic Enzyme on Feed Intake and Egg Production

Items	NE	E	SE	P-value
Initial Wt. (kg)	1.82	1.80	0.05	0.694
Final Wt. (kg)	1.89	1.85	0.08	0.649
DMI (g)	96.44	97.37	1.29	0.476
Egg wt. (g)	62.74	64.51	1.25	0.166
Egg prod. (%)	66.81	72.68	4.39	0.189
FCR	2.39	2.14	0.13	0.067

[a,b] Means within column with difference superscripts differ significantly (P<0.05)

TABLE IV
Effect of Tomato Pomace on Egg Quality

Items	C	T	SE	P-value
Yolk color	10.40	10.68	0.30	0.353
Yolk index(%)	31.80	31.25	0.49	0.267
Yolk wt.(g)	17.20	16.96	0.17	0.337
Alb wt.(g)	39.67	39.78	0.59	0.857
Alb index(%)	8.88	8.72	0.24	0.513
Hough unit (%)	91.71	91.71	0.73	0.461
Egg shell wt.(g)	6.48	6.45	0.09	0.777

[a,b] Means within column with difference superscripts differ significantly (P<0.05)

TABLE V
Effect of Fibrolitic Enzyme on Egg Quality

Items	NE	E	SE	P-value
Yolk color	10.27	10.81	0.30	0.074
Yolk index(%)	31.27	31.78	0.49	0.301
Yolk wt.(g)	16.79[a]	17.37[b]	0.17	0.020
Alb wt.(g)	39.20	40.26	0.59	0.074
Alb index(%)	8.96	8.64	0.24	0.183
Hough unit (%)	91.81	91.08	0.73	0.323
Egg shell wt.(g)	6.40	6.53	0.09	0.163

[a,b] Means within column with difference superscripts differ significantly (P<0.05)

All parameters were not significant between treatment except yolk weight. Laying hens fed diet with FE was higher yolk weight than hens fed diet without FE (P<0.05). Yolk color become darker in hen fed TP. It might be that TP contains natural pigments such as ß-carotene and lycopene, which in combination with commercially available pigments [7].

IV. Conclusion

This experiment has been concluded that feeding laying hens diets containing TP at inclusion 10% did not affect egg production, egg weight, feed consumption and efficiency of the hens. Fibrolytic enzymes supplementation in laying hen diet was increase yolk weight. Dietary inclusion of TP had reduced capital costs for egg production.

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References

[1] Agricultural Statistic of Thailand, 2009. Office of Agricultural Economics, Ministry of Agriculture and Cooperatives, Bangkok, Thailand. (http://www.oae.go.th)
[2] Bedford, M. R., 2000. Exogenous enzymes in monogastric nutrition--their current value and future benefits. Anim. Feed Sci. Technol. 86(1-2): 1-13.
[3] Botha, C., 2011. The use of fibrolytic enzymes in maize-soya based broiler diets. Thesis of Master of Science in Agriculture, Stellenbosch University. 62 p.
[4] Choct, M., 2006. Enzymes for the feed industry: Past, present and future. Worlds Poult. Sci. J. 62(01): 5-16.
[5] Dotas, D., S. Zamandis, and J. Balios., 1999. Effect of dried tomato pulp on the performance and egg traits of laying hens. Br. Poult. Sci. 40: 695-697.

[6] Doyon, G., M. Bernier-Cardou, R. M. G. Hamilton, F. Eastaigns, and C. T. Ramdald, 1986. Egg quality. 2. Albumen quality of egg from five commercial strains of White Leghorn hens during one year of lay. Poult. Sci., 65: 63-66.
[7] Mansoori, B., M. Modirsanei, and M. M. Kiaei. 2008. Influence of dried tomato pomace as an alternative to wheat bran in maize or wheat based diets, on the performance of laying hens and traits of produced eggs. Iranian Journal of Veterinary Research, Vol. 9 (4) : 341-346.
[8] Persia, M.E., C.M. Parsons, M. Schang, and J. Azconat., 2003. Nutritional evaluation of dried tomato seeds. Poultry Sci. 82: 141-6.