INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

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THE EFFECT OF COFFEE PULP FERMENTED BY *ASPERGILLUS NIGER* IN RATION FOR QUAIL LAYER PERFORMANCE AND INCOME OVER FEED COST

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ABSTRACT
The main object of this study was to determine the effects of **C**offee **P**ulp **F**ermented by ***A**spergillus niger* (CPF^{An}) mixed in ration on quail layers *Coturnix coturnix japonica* performance and the income over feed cost. The study was carried out in the animal husbandry faculty-Universitas Padjadjajaran-Indonesia. 240 Quail layers *Coturnix coturnix japonica*s (4week-old) were used as experimental birds; they were distributed to (6x4x10) following the completely randomized design (CRD). Experimental diets were formulated to (0,0%, 3,0%, 6,0%, 9,0%, 12,0% and 15,0% CPF^{An}). Feed and water were provided *ad labitum*, Experimental period lasted for 13 weeks. Results revealed that there was no significant difference (P>0.05) in feed intake between levels, also the result showed that CPF^{An} affected significantly (P<0.05) on, age at first egg (week), body weight at first egg produced (g/day), quail day (%) and FCR. Cost benefit analysis showed that no significant different (P>0.05) between diet (3.0%, 6.0%) and control. In conclusion the study explained that Coffee **P**ulp **F**ermented by ***A**spergillus niger* (CPF^{An}) could be included in quail layers diet until 6.0% without any adverse effects on its performance and benefits.

KEYWORDS: Coffee Pulp, Layer Quail, Performance, *Aspergillus niger*, and Feed Cost.

INTRODUCTION

To reduce competition and cost for feedstuffs in poultry ration, it is wise to seek other alternatives ingredients. Waste and by-products of coffee amount in the millions of tons in the world in terms of productions (Bouafou *et al*., 2011). Coffee pulp is the main by-product in coffee processing industry, two tons of green coffee produces one ton of coffee pulp (dry matter). Coffee pulp contained nutrients which allow it to use in animal feed, but in poultry it need some process, like fermentation to decrease crude fiber. The nutritional value of waste and by-products of coffee has been studied by several researchers. In 1974, Catie has already said that coffee pulp has a promising role in livestock feeding if it can be efficiently and economically dehydrated cited by: (Hambtamu Lemma Didanna, 2014). Fermentation lowering cellulose and hemicellulose content of coffee pulp and a partial utilization of the caffeine, lignin, and components seem to be enough to warrant the inclusion of the material at a 10% level in a growing chicken's diet, ensuring a feed efficiency equal to that of the standard diet (Walter Peñaloza, *et al*, 1985). (CPF^{An}) found to contain: 8.79% crude protein, 10.68% crude fiber, 2.69% crude fat and 1578.93 kcal/kg metabolizeble energy. The Japanese quails have the potential to serve as an excellent and cheap source of animal protein. Quails attain sexual maturity early and come into lay between 5 – 6 weeks of age (Anon, 1991), 200 – 300 eggs in their first year of lay and quail eggs is renowned for their high quality protein, high biological value and low caloric content (Haruna, *et al*., 1997; Olubamiwa, *et al*., 1999). Japanese quail are hardy birds that thrive in small cages and are inexpensive to keep. They are affected by common poultry diseases but are fairly disease resistant.

MATERIALS & METHODS

The present experiment was carried out in the faculty of Animal husbandry universits padjadajaran - Indonesia, (September- December) 2016, a total of two hundred and forty (4 week-old) Japanese quail layers *Coturnex coternex japonica* were used, and it conducted in an open sided cages, and then it divided into (6x4x10 birds/replicates) following the completely randomized design CPF^{An}. Coffee Pulp Fermented by *Aspergillus niger* (CPF^{An}) were subjected to proximate analysis (AOAC, 1980) Table (1).

TABLE 1. Proximate composition of Non and fermented coffee pulp (CPF^{An})

Parameter	Non Fermented coffee pulp	Fermented coffee pulp (CPF^{An})
Crude protein (%)	5.63	8.79
Crude fibre (%)	26.70	10.68
Fat (%)	3.43	2.69
ME (kcal/kg)*	2233,98	1578.93

Source: Results of laboratory analysis Chemical Feed and Nutrition Ruminant 2016.

Experimental diets (Table 2) were formulated to be isoenergtic and isonitrgenous according to National Research Council (NRC, 1994). These diets include level (0.0% control, 3.0%, 6.0%, 9.0%, 12.0% and 15.0%) of **(**CPF^{An}**)**.

TABLE 2. The ingredients composition of the experiment diet

Nutrients (%)	Ingredients							
	Fish meal	Soybean cake	Rice bran	Corn meal	oil**	$CaCO_3$**	Bone meal**	FCP*
Dry matter (%)	87.3	90.96	92.23	91.22	-	-	-	-
Ash (%)	15.7	6.18	9.20	6.19	-	-	-	-
Crude Protein (%)	53.9	45.28	10.78	8.10	-	-	-	-
Crude fiber (%)	0.9	3.40	12.57	5.36	-	-	-	-
Crude fat (%)	8.9	7.10	5.64	5.80	100	-	-	-
Ca (%)	1.9	0.29	0.11	0.21	-	40	24	-
P (%)	1.2	0.60	0.17	0.17	-	-	12	-
Lysin (%) ***	3.7	2.76	0.51	0.24	-	-	-	-
Metionin (%) ***	1.3	0.63	0.22	0.17	-	-	-	-
Met+Sistin (%) ***	2.9	1.31	0.46	0.35	-	-	-	-
BETN (%)	7.9	29.00	54.04	65.76	-	-	-	-
ME (kcal/kg)***	2972.2	2459.62	2340.15	3239.24	8600	-	-	-

Source: Results of laboratory analysis Chemical Feed and Nutrition Ruminant 2010.
* Results of laboratory analysis Chemical Feed and Nutrition Ruminant 2010.
** Wahju Juju, 1997.
*** Calculation Results with Formula NRC, 1994.

TABLE 3. Composition of experimental diets, nutrient and metabolic energy rations trial

Ingredients	The experimental diets (%)					
	R_0	R_1	R_2	R_3	R_4	R_5
CPF^{An}	0	3	6	9	12	15
Yallow corn	47	47	47	46	45	44,3
Soybean cake	16	16	16	16	16	16
Fish meal	13	13	13	13	13	13
Coconut cake	6.5	5	3	3	2	1
Rice bran	7.3	5.8	4.8	2.8	1.8	0.5
Coconut oil	4	4	4	4	4	4
$CaCO_3$	4	4	4	4	4	4
Premix	0.5	0.5	0.5	0.5	0.5	0.5
Bone meal	1.6	1.6	1.6	1.6	1.6	1.6
Methionin	0.1	0.1	0.1	0.1	0.1	0.1
	100	100	100	100	100	100
ME (kcal/kg)	2916.25	2928.47	2944.77	2935.78	2934.95	2936.81
Protein (%)	20.09	20.11	20.07	20.23	20.31	20.38
Lysin (%)	1.10	1.11	1.11	1.12	1.13	1.14
Methionin (%)	0.48	0.48	0.48	0.48	0.48	0.48
Methionin + Cystin (%)	0.91	0.91	0.91	0.91	0.91	0.90
Ca (%)	2.39	2.40	2.40	2.40	2.40	2.41
P (%)	0.42	0.42	0.42	0.42	0.41	0.41
Crude fat (%)	8.22	7.99	7.82	7.52	7.33	7.11
Crude fiber (%)	4.05	4.10	4.13	4.30	4.46	4.58

Source: Calculations based on NRC (1994) and Table 2.

Experimental procedures

Before arrival of birds, the house was prepared and disinfected. Throughout the experimental period, feed and water were supplied *ad libitum*, and the light was provided for 16 hours. The experiment period was 13 weeks. During this period birds received their respective.

Statistics

Data collected were recorded as means ± SEM (Standard Error of Mean) and were subjected to Analysis of Variance (ANOVA) using Statistical Package for the Social Sciences (SPSS version 16). Treatments means were compared by the Duncan multiple range test (Duncan, 1955).

RESULTS & DISCUSSION

Table4. Show the results of overall performance (feed intake, feed conversion ratio FCR, Age at first egg, Body weight (g) at first egg production, Egg weight produced and Quail day). Results revealed that there was no significant difference ($P>0.05$) in feed intake between levels, this in agreement with (Mendes LR *et al*., 2013) who said that; feeding caffeinated coffee to commercial layers does not affect feed intake. The higher feed intake recorded by the quails on the 15% CPF^{An} diet might be as a result of improving palatability by fermentation. Also the result showed that CPF^{An} affected significantly ($P<0.05$) on, (age at first egg (week), body weight at first egg produced (g/day), quail day (%) and FCR). And the control is recorded a better results compared to the other CPF^{An} levels, this may be due to fiber contain. According to J.E. Braham and R. Bressani, 1979, the more fibre a ration contains, the less digestible the ration. This in itself would not be a problem, because what is not digested is excreted, were it not for the fact that fibre contributes volume that helps fill the animal and consequently causes it to eat less of the other nutrients in a given ration. The net result is that the animal will thrive less on a high-fibre diet than on a ration containing an adequate amount of

crude fibre. Cost-benefit analysis showed that no significant different (P<0.05) between diet (3.0%, 6.0%) and control event that control benefit was biggest one. According to the results decrease in egg mass may be is a main reason. In the other hand (J.E. Braham and R. Bressani, 1979), said if coffee pulp was adequately dried and treated, 10% could be included in chick rations without any interference with performance.

TABLE 4. Effect of dietary CPF^{An} on over all quail layers performance

Parameter	Treatment (CPF^{An} %).						
	0.0	3.0	6.0	9.0	12.0	15.0	MSE±
Feed Intake(g/bird/day)	21.25^{a}	20.75^{a}	22.00^{a}	21.25^{a}	21.00^{a}	22.25^{a}	0.36
Age at first egg(weeks)	8.13^{a}	7.95^{a}	8.05^{a}	8.40^{a}	7.88^{a}	9.55^{b}	0.16
Body weight(g) at first egg production	199.25^{c}	169.50^{a}	181.50^{abc}	195.25^{c}	170.50^{ab}	194.25^{bc}	3.73
Egg mass (g/bird/day)	5.08^{b}	4.73^{b}	4.48^{ab}	3.43^{a}	3.58^{a}	3.58^{a}	0.89
Quail day(QD)%	48.88^{c}	46.73^{bc}	43.58^{abc}	34.18^{a}	36.70^{ab}	35.00^{a}	8.34
FCR	4.18^{a}	4.43^{a}	5.03^{ab}	6.65^{b}	5.85^{ab}	6.50^{b}	1.44

TABLE 5. Effect of dietary CPF^{An} on Income over Feed Cost of quail layers

parameter	Treatment (CPF^{An} %).						MSE±
	0.0	3.0	6.0	9.0	12.0	15.0	
IOFC	20.75^{a}	15.25^{a}	4.00^{a}	-19.00^{c}	-11.25^{b}	-14.25^{b}	4.50

CONCLUSION

The result of this investigation showed that inclusion of Coffee **P**ulp **F**ermented by ***A**spergillus **n**iger* (CPF^{An}) up to 6% dietary levels can be used as an alternative ingredient in the layer Japanese quail diets without serious adverse effects on performance and income over feed cost.

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World Science Research Journals Wolaita Sodo University, P. O. Box 128, Wolaita Sodo, Ethiopia.

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