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Evaluation of local feedstuff-based diets for Pekin ducks

(Penilaian jenis-jenis makanan berasaskan bahan makanan tempatan untuk itik Pekin)

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Key words: Pekin ducks, corn-based diet, rice-based diet, tapioca-based diet, energy source

Abstrak

Dua ujikaji telah dijalankan untuk menentukan prestasi itik jenis Pekin yang dipelihara secara intensif dan diberi makan tiga jenis makanan yang berasaskan jagung, ubi kayu atau beras. Makanan-makanan tersebut telah dirumus supaya mengandungi jumlah protein dan tenaga yang sama. Bahan-bahan tambahan metionina, kolina klorida serta campuran mineral dan vitamin telah dimasukkan ke dalam setiap makanan. Keputusan tidak menunjukkan perbezaan dalam pertumbuhan, prestasi pengeluaran atau kadar kematian itik akibat daripada jenis-jenis makanan yang digunakan. Penghasilan karkas juga tidak dipengaruhi oleh jenis-jenis makanan. Walau bagaimanapun, warna kaki, betis, paruh dan kulit itik yang diberi makanan berasaskan beras dan ubi kayu adalah kuning pucat, manakala itik yang diberi makanan yang berasaskan jagung berwarna kuning terang. Kesimpulannya, jenis makanan yang berasaskan beras dan ubi kayu boleh menggantikan sebahagian jumlah jagung di dalam makanan sebagai sumber tenaga untuk itik Pekin yang dipelihara secara intensif.

Abstract

Two experiments were conducted to determine the relative performance of intensively-reared Pekin ducks fed three diets based on corn, tapioca or rice products. These diets were formulated to contain approximately equal amounts of protein and energy. The diets were supplemented with methionine, choline chloride and mineral and vitamin mixture. Results indicated that there were no significant differences due to diets on growth, productive performance or mortality. Similarly, carcass yields were not affected by differences in diets. However, the colour of feet, shanks, bills and skin of birds from the rice and tapioca-based groups was distinctly pale yellow in contrast to the bright yellow exhibited by ducks fed the corn-based diet. It was concluded that both rice and tapioca products could partially replace corn as an energy source for Pekin ducks reared intensively.

Introduction

In Malaysia, the main feedstuff used as an energy source in commercial poultry feeds is corn and some US$90 million is spent annually to import this feed ingredient (Anon. 1988). During the last 15 years, a lot of effort has been given to the search for a corn substitute to reduce the dependence on imported corn. In the forefront amongst the local energy feed resources are the tapioca (cassava) and rice products. Much of the work on these feedstuffs have been

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conducted using chickens (Syed Ali et al. 1973, 1975; Yeong and Syed Ali 1976, 1977, 1978; Ramlah and Jalaludin 1987). Recently, broken rice has also been tested on Siamese layer ducks and Muscovy ducks (Yeong and Faizah 1985; Yeong and Azizah 1989).

The intensive rearing of Pekin ducks under full confinement has been shown to be suitable for the Malaysian conditions (Engku Azahan and Noraziah 1984), and the performance obtained was comparable to the relatively popular semi-intensive management system. Under the intensive system, where the source of feed is solely from the feed provided, the performance of Pekin ducks fed diets based on locally-available feedstuffs such as rice and tapioca products is not known. In view of the need to find a suitable feedstuff to substitute corn, a study on the relative performance of intensively-reared Pekin ducks fed diets based on corn, tapioca and rice products was conducted.

Materials and methods

Two separate experiments were carried out. Experiment I was conducted at the MARDI Research Station in Serdang while smallholder farms were chosen as sites for Experiment II.

Experiment I

Six hundred mixed sex day-old Pekin ducklings were used. They were randomly divided into three treatment groups of 200 birds each. Each treatment was replicated four times to give 50 birds in each replicate. The completely randomised design was used in allocating treatment replicates. The three treatment groups were corn-based, rice-based and tapioca-based diets (*Table 1*). These birds were reared in a wire-floored house. A floor space of 0.26 m^2 was

Table 1. Experimental rations for Pekin ducks

Composition (%)	Corn-based		Rice-based		Tapioca-based	
	Starter	Finisher	Starter	Finisher	Starter	Finisher
Corn	52.9	54.25	10.0	10.0	10.0	10.0
Rice bran	-	-	10.0	10.0	-	-
Broken rice	-	-	30.0	30.0	12.0	20.0
Tapioca	-	-	6.5	12.0	30.0	30.3
Wheat pollard	10.0	15.5	-	-	-	-
Soy bean meal	28.0	21.0	25.5	20.0	26.5	20.0
Groundnut meal	-	-	5.0	5.0	8.5	7.0
Fish meal	6.5	6.0	8.0	8.0	8.0	8.0
Palm oil	1.0	1.5	3.3	3.3	3.3	3.0
Tricalcium phosphate	0.9	1.1	1.0	1.0	1.0	1.0
Salt	0.25	0.25	0.2	0.2	0.2	0.2
Choline chloride 50%	0.2	0.2	0.2	0.2	0.2	0.2
Trimix[+]	0.1	0.1	0.1	0.1	0.1	0.1
DL-methionine	0.15	0.1	0.2	0.2	0.2	0.2
Crude protein (%)	22.1	19.7	22.0	19.7	22.0	19.1
Metabolisable energy (kcal/kg)	2 939	2 983	2 927	2 970	2 970	2 972
Lysine (%)	1.26	1.09	1.31	1.16	1.32	1.13
Methionine + cystine (%)	0.88	0.78	0.87	0.79	0.87	0.78
Calcium (%)	0.75	0.77	0.89	0.89	0.95	0.94
Phosphorus (%)	0.73	0.76	0.87	0.86	0.75	0.75

[+] a brand name of a mixture of vitamins and minerals;
Note: Elancoban and terramycin-100 at 0.1% and 0.05% respectively, were added to all diets

provided to each bird.

Feed and water were provided ad libitum. For each treatment, a starter mash diet was provided for 3 weeks followed by a finisher mash feed until the completion of the experiment (8 weeks).

Birds were brooded for 2 weeks, during which time heat was provided by carbon-heated bulbs for 24 h daily.

Body weights and feed consumptions were recorded weekly by replicate for all treatments. Mortalities were recorded as they occurred and the weights of the dead birds were taken. Feed efficiency for each replicate was then calculated after corrections were made for the estimated amount of feed consumed earlier by the dead birds.

At the end of the experiment, four male birds and four female birds were sampled for carcass analyses. The carcass traits investigated were eviscerated weight; cooked weight of meat, skin and bone; and meat-to-bone ratio. The colour of feet, shanks, bills and skin of birds was noted and subjectively compared between treatments.

Experiment II

Four smallholder farms were chosen to verify the on-station results obtained in Experiment I. At each farm, 150 day-old Pekin ducklings were used. The treatments given, the number of replicates used and the floor space provided per bird were as in Experiment I. The experimental design was a randomised complete block design, where each farm constituted a block. At each farm, there was a replicate for each of the three treatments. The housing system was a slatted raised floor.

The provision of feed and water, performance data recording, carcass analysis and general observation were as in Experiment I. During brooding, the heat source used was 'hurricane' lamps instead of carbon-heated bulbs.

Results

In view of the non-homogeneity of the various experimental factors pertaining to the two experiments, results were analysed separately. All statistical analyses were carried out using the analysis of variance.

Experiment I

The dietary treatments had no significant effects on each of the productive and carcass parameters recorded (*Table 2* and *Table 3*). Over 8 weeks, the experimental birds had an average weight of 2.76 kg, consumed about 10 kg feed and recorded feed conversion efficiency figures between 3.63 and 3.85.

The dressing percentage values were between 66.5 and 68.1. Meat accounted for about 50% of the eviscerated cooked carcass while the average amount of skin and bone was 24.3% and 25.8% respectively. The average meat to bone ratio obtained was 1.94.

Experiment II

The results of Experiment II were similar to those of Experiment I as far as the response between the three treatments was concerned

Table 2. Productive performance of Pekin ducks reared intensively at MARDI farms and fed local feedstuff-based diets over 8 weeks (Experiment I)

Parameter	Corn-based	Rice-based	Tapioca-based
Body weight (kg/bird)	2.68 ± 0.032	2.88 ± 0.063	2.73 ± 0.050
Feed intake (kg/bird)	10.17 ± 0.028	10.30 ± 0.171	10.37 ± 0.124
Feed conversion efficiency	3.85 ± 0.037	3.63 ± 0.135	3.84 ± 0.032
Mortality (%)	0.0	1.5	2.9

Note: Differences between treatments were not statistically significant at 5% level
Results are means ± standard errors of the means
Mortality rate was not subjected to statistical analysis

Table 3. Carcass yields of Pekin ducks reared intensively at MARDI farms and fed local feedstuff-based diets over 8 weeks (Experiment I)

Parameter	Corn-based	Rice-based	Tapioca-based
Dressing percentage	66.5 ± 0.52	68.1 ± 0.83	67.3 ± 0.79
Amount of meat (%)	49.7 ± 0.75	49.8 ± 0.36	50.4 ± 0.99
Amount of skin (%)	24.0 ± 0.50	24.9 ± 0.77	23.9 ± 0.48
Amount of bone (%)	26.3 ± 0.78	25.3 ± 0.73	25.7 ± 0.69
Meat:bone	1.90 ± 0.082	1.97 ± 0.059	1.97 ± 0.090

Note: Differences between treatments were not statistically significant at 5% level
Results are means ± standard errors of the means

Table 4. Productive performance of Pekin ducks reared intensively at smallholder farms and fed local feedstuff-based diets over 8 weeks (Experiment II)

Parameter	Corn-based	Rice-based	Tapioca-based
Body weight (kg/bird)	2.38 ± 0.129	2.363 ± 0.091	2.447 ± 0.140
Feed intake (kg/bird)	11.021 ± 0.263	10.920 ± 0.082	11.049 ± 0.079
Feed conversion efficiency	4.76 ± 0.376	4.73 ± 0.229	4.63 ± 0.301
Mortality (%)	0.7	0.0	1.9

Note: Differences between treatments were not statistically significant at 5% level
Results are means ± standard errors of the means
Mortality rates were not subjected to statistical analysis

Table 5. Carcass yields of Pekin ducks reared intensively at smallholder farms and fed local feedstuff-based diets over 8 weeks (Experiment II)

Parameter	Corn-based	Rice-based	Tapioca-based
Dressing percentage	65.3 ± 0.73	66.9 ± 0.58	66.1 ± 0.61
Amount of meat (%)	50.0 ± 1.47	50.2 ± 0.75	50.6 ± 0.84
Amount of skin (%)	22.0 ± 1.01	22.6 ± 0.53	20.5 ± 1.14
Amount of bone (%)	28.1 ± 0.88	27.3 ± 1.16	28.9 ± 0.52
Meat:bone	1.79 ± 0.098	1.86 ± 0.105	1.75 ± 0.038

Note: Differences between treatments were not statistically significant at 5% level
Results are means ± standard errors of the means

(*Table 4* and *Table 5*). However, birds in Experiment I generally performed better than those in Experiment II.

In both experiments, one notable difference observed between the treatment groups was in the colour of the birds' feet, shanks, bills and skin. In the rice-based and tapioca-based groups, the colour observed was distinctly pale yellow while the ducks fed corn-based diets exhibited a bright yellow colour.

Discussion

In both experiments, the standard errors of the means for the productive and carcass parameters were generally low and ranged between 0.3% and 8.0% of the means. This would suggest relative homogeneity of the treatment replicates or experimental units. Therefore, the absence of any significant difference between treatments in the parameters studied, could not be attributed to variation within treatment. These diets were isocaloric, isonitrogenous and well-balanced in nutrients. The similar performance of birds on any of these diets under the conditions and precision of this study would suggest that the nutrients from the various feedstuffs in the experimental diets were equally available to the birds.

Tapioca contains hydrocyanide (HCN) at a concentration of about 60 ppm (Tan, S. L., MARDI, Serdang, pers. comm. 1990). At high levels of inclusion in feeds, it would tend to depress growth and egg production of chickens, and a similar response would be expected from ducks. This adverse effect could be overcome by incorporating 0.1–0.2% DL-methionine into the feed or by pelletization of the feed. The methionine would convert the toxic HCN into non-toxic thiocyanate, assisted by the enzyme rhodanase.

Broken rice has been shown to be a good source of energy (Syed Ali et al. 1973, 1975). Good quality broken rice contains very low fibre and is highly digestible. It is, therefore, not surprising that the experimental diet based on this feedstuff was as effective as the conventional corn-based feed.

Although broken rice and methionine-supplemented tapioca have both been shown to be able to replace corn fully as energy sources for chicken (Syed Ali et al. 1973; Yeong and Syed Ali 1976, 1977), such a practice may not be practicable in Malaysia as these two feedstuffs, although cheaper than corn, are not always available in abundance. Partial substitution of corn with locally-available energy sources such as rice and tapioca products at levels of about 40% of the diet should be a better proposition. With chickens, such diets which incorporated both corn and local feedstuffs have proved to be as effective as the corn-based feed (Syed Ali et al. 1973, 1975; Yeong and Syed Ali 1976, 1977). Results from a recent study by Yeong and Azizah (1989) have shown that Muscovy ducks reared on rice-based diets performed just as well, if not better than, birds on corn-based feed.

Results obtained under the two systems in this study differed markedly. Despite the similarity in the duck strain, diets, floor space and housing system (raised-floor system), birds at Serdang farm appeared to perform better than those in smallholdings. The farm environment could be an important factor accounting for this difference. The duck shed at Serdang was located on a well-ventilated elevated land as opposed to the crowded conditions in the smallholdings where the duck houses were located among orchards and tall bushes. Probably of more significance was the difference in the level of management in the two systems. Experienced poultry personnel took care of the ducks daily at Serdang while the feeding, drinking and brooding equipment used were established commercial ones. In contrast, the smallholders were part-time poultry farmers. Home-made feeders and drinkers and the less efficient hurricane lamps were used for brooding. The use of home-made bamboo feeders had resulted in relatively high wastage of feed. This partially explained the higher feed consumption and lower feed conversion efficiency recorded in smallholdings than at the farm in Serdang.

Notwithstanding the indication of apparent superiority of the Serdang system over that of the smallholders', under the conditions of this study the similar response among the three treatment diets in both systems reasserts the observation that both tapioca and broken rice could partially substitute corn as an energy source for ducks reared intensively.

Further testimony on the equivalence of the three diets in eliciting productive responses to Pekin ducks reared intensively was provided by the similar results in carcass yields among the three treatment groups. The only detrimental factor as far as the physical characteristics are concerned, was the observation of the relative paleness in the colour of the feet, shanks, bills and skin of birds fed with the tapioca and rice-based diets. This was probably due to the apparent lower amount of pigment xanthophyll in these diets than in the corn-based feed.

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