

NOTE

FEEDING VALUE OF DRIED LIME PULP IN BROILER DIETS

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ABSTRACT

In a 2-stage experiment, 144 day-old broiler chicks were equally divided into three groups. During the first 4 wk of life (stage 1) each group was fed with 1 of the 3 diets: 1 (control), 2 (containing 5% lime, *Citrus aurantifolia* Swing., pulp) and 3 (containing 10% lime pulp). During the last 2 wk of the experiment (stage 2) all groups were fed a finisher diet. Growth rate and feed consumption of the chicks fed diets 1 and 2 were not different ($P < 0.01$) during either of the 2 stages. Although the chicks which had previously been fed diet 3 showed tremendous compensatory growth during the second stage of the experiment; overall, they grew the least.

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ارزش غذایی پوست لیموترش شیرازی خشک شده در جیره جوجه های گوشتی

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خلاصه

در یک آزمایش دو مرحله ای ۱۴۴ جوجه گوشتی یکروزه به سه گروه تقسیم گردیدند. در چهار هفته اول زندگی (مرحله اول) به هر یک از گروه های یکی از سه جیره: ۱ (شاهد)، ۲ (شامل ۵ درصد پوست لیمو) و ۳ (شامل ۱۰ درصد پوست لیمو) خوراندند. در دو هفته آخر آزمایش (مرحله دوم) هر سه گروه جیره پایی دریافت نمودند. سرعت رشد، مصرف غذا، ضریب تبدیل غذایی جوجه های تحت جیره های ۱ و ۲ در هر دو مرحله آزمایش از نظر آماری با یکدیگر اختلافی نداشتند ($P < 0.01$). گرچه جوجه های که قبلاً تحت جیره شماره ۳ قرار داشتند در مرحله دوم آزمایش رشد جبرانی نشان دادند، ولی رویهمرفته (در کل دو مرحله) این گروه کمترین رشد را نسبت به دو گروه دیگر داشتند.

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INTRODUCTION

The high cost of poultry diets has resulted in a search for alternative feed ingredients. Use of by-products in poultry diets could decrease production costs. One such product is lime (*Citrus aurantifolia* Swing.) pulp, a by-product of lime processing which is largely discarded, but occasionally used as a fuel.

The effects of addition of citrus sludge on broiler and pullet performance have been reported (1,3,9).

The purpose of the present work was to examine the possible effects of different dietary levels of dried lime pulp on broiler performance.

MATERIALS AND METHODS

Lime pulp was collected from nearby lime juice processors, and spread on the ground in the sunshine. When air-dried, it was ground in a mill and samples collected for proximate analysis (5).

One hundred and forty four day-old chicks were randomly drawn from a population of commercial broiler chicks. The chicks were weighed and wing-banded individually and were equally divided into 3 groups with approximately similar bodyweights. During the first 4 wk of the experiment the groups were randomly fed with one of the three diets: 1 (control), 2 (containing 5% lime pulp), and 3 (containing 10% lime pulp). Chicks on each diet were allotted into three equal subgroups of approximately similar average wt, and feed consumption was recorded for each subgroup, which was used in statistical analysis. The composition of experimental diets and the finisher diet is shown in Table 1.

The chicks were raised in an electrical battery brooder. Water and feed were supplied *adlibitum* and light was provided continuously. The chicks were vaccinated against Newcastle disease at 10 and 30 d. At the end of the 4th wk the chicks were weighed and their feed consumption was determined. During the last 2 wk all chicks were fed with a

Table 1. Composition of the experimental and finisher diets.[†]

Ingredients	Experimental diet No.			Finisher diet
	1	2	3	
Corn, dent yellow	54.86	49.84	5.10	-
Cotton seed meal	10.00	10.00	10.00	15.00
Fish meal	9.50	9.50	9.50	3.00
Soybean meal	12.00	14.00	13.00	7.00
Barley	10.00	5.00	-	45.00
Wheat	-	-	-	25.00
Citrus (sun dried) pulp	-	5.00	10.00	-
Bone meal	1.50	1.50	1.50	1.50
Alfalfa (dehydrated)	1.00	1.00	1.00	2.50
Corn oil	-	3.00	2.80	-
Salt	.20	.20	.20	.20
Methionine	.14	.16	.20	.10
Fermavit [‡]	.80	.80	-	.70

[†]Metabolizable energy 2970 kg⁻¹; crude protein 22.6% for experimental diet and 19% for finisher diet.

[‡]Mineral and vitamin supplement.

finisher diet (Table 1), after which the chicks were weighed and feed consumption determined. Data were subjected to analysis of variance and the means were separated by Tukey's method where appropriate (8).

RESULTS AND DISCUSSION

Table 2 compares the results of chemical analysis of dried citrus pulp with data from other laboratories

Table 2. Chemical analysis (% oven-dried sample) of citrus pulp.

Crude protein	Ether extract	Crude fiber	Ash	NFE [†]	Reference No.
6.4	1.5	13.2	7.1	71.8	5
5.7	2.5	15.5	6.5	68.6	6
6.7	4.1	13.4	5.1	70.7	7
7.2	3.0	8.2	4.2	77.4	Present work

[†]Nitrogen free extract.

The slightly lower crude fiber and higher nitrogen free extract (NFE) found in the present work, compared with published data in the literature, could be due to differences in varieties and processing factors.

During the first 4 wk of the experiment, chicks on diet 3 (10% lime pulp) gained less ($P < 0.01$) weight than did chicks on diets 1 and 2 (Table 3). Inclusion of 10% citrus pulp in the diet resulted in a lower feed consumption, probably due to reduced palatability of the diet and/or increased bulk density. However, the growth response and feed conversion of chicks fed diets 1 and 2 were similar (Table 3).

During the last 2 wk of the experiment the bodyweight of chicks which had previously been on diet 3 was the best compared to other groups. The increase in bodyweight was significantly ($P < 0.01$) greater than the control group (Table 3), indicating that during this period chicks in group 3 could

Table 3. Mean feed consumption, bodyweight gain (BWG) and feed conversion ratio (FCR) during the first 4 wk (stage 1) and the last 2 wk (stage 2) of the experiment.

Diet No.	n	BWG (g/bird/d)		FCR (g feed/g gain)		Feed consumption (g/bird/d)	
		Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
1	48	21.7a [†]	31.1b	1.76ab	2.39b	36.2a	74.7a
2	48	21.9a	31.6ab	1.59b	2.40b	34.7a	75.9a
3	48	16.0b	35.5a	1.79a	3.03a	28.8b	72.0a

[†]Means with common letters are not statistically different ($P > 0.01$).

compensate for their lower growth rate. Buriel *et al.* (2) indicated that high percentages (at least 20%) of citrus meal in the diet of grilling chicken, reduced wt gain and feed efficiency. Inclusion of more than 5% citrus sludge in the starting diet of chicks affected intake adversely (3).

Eldred *et al.* (3) showed that 10% citrus sludge could be included in broiler diets without affecting bodyweight at 56 d compared to the control. Feeding diets containing 7.5% (3) or 10% (9) citrus sludge to pullets did not alter egg production, egg wt, daily feed intake and feed efficiency, but all these response variables were decreased when 20% sludge was included in the diet (3). Angalet *et al.* (1) failed to detect significant differences in carcass wt, percentage cooking loss, shear force, and sensory evaluations in broilers fed 10% citrus sludge.

Overall, the growth rate of chicks on diet 3 was lower than groups 1 and 2. However, addition of 5% lime pulp to the diet of broiler chicks does not seem to have any adverse

effect on the growth and feed utilization (data not shown).

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