

Effect Of Different Levels Of Sweet Orange (*Citrus sinensis*) Fruit Peel On Performance Of Broiler Chickens

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ABSTRACT

The present study was conducted to study the effect of substituting corn by 0, 5, 10, 20 or 30% sweet orange peel meal on: 1) Growth performance of broiler chickens (feed intake, body weight, body weight gain and feed conversion ratio. 2) Carcass quality traits were done at the end of the trial. A total of 150 day-old (Ross) broiler chicks were used in this experiment. Broiler chickens in this study were allotted into five groups (30 birds/ group) with 3 replicates of 10 birds in each, they were fed on isocaloric , isonitrogenous diets and the feed and water were provided ad-libitum along the duration of the trial. The experimental design was as the following in different groups: Group 1: Fed on basal control diet without any substitution, Group 2: Fed on basal diet with 5% replacement of corn by sweet fruit orange peel, Group 3: Fed on basal diet with 10% replacement of corn by sweet fruit orange peel, Group 4: Fed on basal diet with 20% replacement of corn by sweet fruit orange peel and Group 5: Fed on basal diet with 30% replacement of corn by sweet fruit orange peel. Results revealed that substitution of corn by sweet orange peel meal had no effect on broiler chicken performance in all treatment except group 5: Fed on a diet containing 30% sweet orange peel meal. The results of the present study related that carcass cuts (breast, neck, thigh and wing), and visceral organ(liver, heart, spleen and gall bladder) were non-significant differences while proventriculus and gizzard weight were significantly increased among experimental groups compared to the control group. Generally, it could be concluded that in broiler chicken diets corn could be substituted by 5, 10 and 20% sweet orange peel without any adverse effect on growth performance and carcass traits of broiler chickens.

INTRODUCTION

Concerns over preserving the welfare and health of nonruminant livestock in modern, commercial production systems and tight profit margins have prompted livestock producers to search for alternative approaches for feeding their animals. The shortage of good quality feeds needed to sustain livestock growth, especially during the dry season has been a major challenge to the industry in the developing countries. Thus crop residues, agro-industrial by products and non conventional feed resources which abound during the dry season are being evaluated to access their nutritive potential to support livestock productivity. Several factors have been generally identified as limiting to the utilization or high incorporation of non conventional feedstuffs in livestock feed. These include low protein content (1), high fiber (2), amino acid imbalance and presence of anti-nutritional factors (3). Anti-nutritional factors have significant negative effects on livestock

production. These effects include reduction in palatability, digestibility and utilization of ration, intoxication of different classes of livestock, resulting in mortality or decreased animal production and reduction in the quality of meat, egg, and milk products due to the presence of hazardous residues (4).

Broiler birds are probably the most universal and important of all poultry as producers of meat for human consumption. It has been reported that sweet orange (*Citrus sinensis*) peel meal obtained from ground sun dried peels can replace dietary maize in broiler chicken diet at 20% level without any adverse effect on performance (5).

In a recent study (6), the presence of saponin in sweet orange peel has been reported, and this compound has been observed to has hypocholesteremic action. It is known that high carcass fat reduces the economic value of animal meat. It thus appear that if adequate processing techniques to enhance the nutritive value of

sweet orange fruit peel can be involved to enable it to promote fast broiler growth rate, and can be a viable dietary energy substitute for maize in feeding with a view to reducing the cholesterol content of meat.

The crude fiber (CF) in the peels which was in the ranged from 12.87 to 14.63% DM was comparatively higher than 2.20% CF reported for maize (6). The CF obtained in this study agrees with CF content of 13.66 to 14.99% DM in the peels of some citrus fruit varieties (7). This high peel CF may reduce its feeding value compared to dietary maize in non-ruminant nutrition. This study was aimed to investigate the effect of replacing maize in the starter and finishing stages of broiler diet by different levels of sweet orange fruit peel on broiler performance.

MATERIALS AND METHODS

The study was conducted at the Nutrition and Clinical Nutrition Department, Faculty of Veterinary Medicine Zagazig University, Sharkia, Egypt. A total of one hundred and fifty, one-day-old un-sexed broiler chickens (Ross) was used in this experiment. On arrival they were leg banded, weighed and randomly divided into five equal groups each contained three replicates, each replicate contains ten chicks. Five experimental diets were studied, where corn was substituted by sweet orange fruit peel meal at 0, 5, 10, 20, 30% respectively both at starter and finisher diet. The composition of the experimental diets is debicated in Table 1 and analysis of experimental diet is shown in Table 2.

Table1. Composition of the experimental diets starter and Finisher diets

Ingredient	Starter diet					Finisher diet				
	Group and % of replacement of corn by sweet orange fruit peel									
	1	2	3	4	5	1	2	3	4	5
	CD	5%O.P	10%OP	20%OP	30%OP	CD	5%O.P	10% OP	20% OP	30%OP
Yellow corn	51.2	48.64	46.08	40.96	35.84	59.9	56.91	53.91	47.92	41.93
Soybean meal	29.6	29.6	29.6	29.6	29.6	28	28	28	28	28
Fish meal	6	6	6	6	6	1.2	1.2	1.2	1.2	1.2
Corn gluten	3.5	3.5	3.5	3.5	3.5	1.9	1.9	1.9	1.9	1.9
oil	6	6	6	6	6	5.2	5.2	5.2	5.2	5.2
Orange peel(op)	0	2.56	5.12	10.24	15.36	0	2.99	5.99	11.98	17.97
Lysine	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Methionine	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Calciumcarbonate	1.7	1.7	1.7	1.7	1.7	1.5	1.5	1.5	1.5	1.5
Calcium dibasic phosphate	1.4	1.4	1.4	1.4	1.4	1.6	1.6	1.6	1.6	1.6
premix	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Nacl	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Toxinil	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

CD: Control diet

% means the % : substitution of corn by orange peel meal

Table 2. Calculated analysis of the experimental diet in the starter stage

parameter	Starter diet					Finisher diet				
	Group and % of replacement of corn by sweet orange fruit peel									
	1	2	3	4	5	1	2	3	4	5
	CD	5%O.P	10%OP	20%OP	30%OP	CD	5%O.P	10% OP	20% OP	30%OP
ME.Kcal/kg	3200.08	3153.496	3106.87	3013.644	2920.408	3205.72	3151.27	3096.64	2986.56	2878.48
Crude Protien%	23.154	23.138	23.122	23.089	23.0565	19.1241	19.1049	19.0857	19.047	19.009
Ether. Extract%	8.411	8.4419	8.4726	8.534	8.5955	7.634	7.669	7.7059	7.777	7.8497
Crude Fiber%	3.393	3.6666	3.9405	4.488	5.0362	3.598	3.7184	4.0394	4.68	5.321
* Ca.%	1.2996	1.298	1.297	1.2945	1.2919	1.08484	1.08334	1.08184	1.07885	1.07585
* Available phosphorous %	0.5408	0.5383	0.535	0.5305	0.5254	0.4633	0.46033	0.45733	0.4513	0.445
* Lysine%	1.4245	1.4179	1.411	1.397	1.3846	1.14015	1.1337	1.1245	1.109	1.093
* Methionine%	0.6598	0.65525	0.6506	0.6414	0.6322	0.64104	0.6356	0.63025	0.6194	0.6086
* Methionine + Cystine%	1.51488	1.48057	1.4462	1.3776	1.30905	1.58666	1.54659	1.5064	1.426	1.3458

CD: Control diet % means the % : substitution of corn by orange peel meal
 * indicate calculated value of chemical analysis

The sweet orange fruit peel was collected fresh from orange sellers and sun dried immediately, then grounded it and analysed for its nutritent composition (Table 3).

Table 3. Nutrient composition in sweet orange peel meal

Crude protein (%)	Crude fiber (%)	Ether extract (%)	Metabolisble energy (kcal/kg)
7.26	12.9	4.7	1529

Birds were weighed individually every week till the end of experiment ,also the daily feed intake per each group was calculated by subtracting the weight of the remained feed from the weight of the offered feed, then divided by the number of birds in each group to find out the average feed intake per bird per day. all the performance, carcass quality and visceral organs obtained in the trial were statistically analyzed by one –way analysis of variance procedure.

RESULTS AND DISCUSSION

The results of this study revealed that there was significant decrease in mean body weight. This result agreed with(5),reported that maize

can be replaced by sun dried sweet range peel in broiler starter diet at level 20% for optimal performance and nutrient utilization, but agreed with (8),they observed significant decreased in body weight in inclusion levels up to 15% dried sweet orange fruit peel.

There was no significant effect on body weight gain ,but significant decreased in feed intake in group fed 30%replacement of corn by sweet fruit orange peel. there is a reduction in energy intake due to reduced fiber utilization (9) , no effect observed at body weight gain in starter stage but decreased in all levels of treatment than control in finisher stage this agrees with (10) feed intake significant decreased at 10%and 30%levels at starter stage, but in finisher stage significant decreased at 30% level, also this agree with (7) , there was no significant effect (p<0.05) in visceral organ except gizzard weight has significant increase at 20,30% level , also there was no significant effect in organs cut except decreased in thigh, breast and wing in group fed 30% replacement of corn by sweet fruit orange peel . All organ cuts and visceral organs were expressed as % of live weight

Table 4. Effect of dietary treatment on performance

Parameter	Starter diet					Finisher diet				
	Group and % of replacement of corn by sweet orange fruit peel									
	1	2	3	4	5	1	2	3	4	5
	CD	5%O.P	10%OP	20%OP	30%OP	CD	5%O.P	10% OP	20% OP	30%OP
Body weight	999.847 ± 4.86a	1003.647 ± 3.495a	992.36 ± 4.32ab	1004.403 ± 9.8003a	974.723 ± 7.214b	2224.773 ± 2.09a	2219.557 ± 12.277a	2203.8± 9.036a	2195.72 ± 9.835a	1981.38 ± 7.46b
Body weight gain	916.15 ± 10.745a	963.91± 4.173 a	946.56 ± 5.45a	958.68 ± 9.68a	930.39 ± 7.16a	1224.93 ± 4.46b	1215.66± 10.66a	1212.61 ± 11.42a	1196.95 ± 14.17a	1006.66 ± 3.79a
Feed intake	1885.85 ± 3.35a	1883.6 ± 4.83a	1866.56 ± 1.78b	1871.47 ± 3.94ab	1861.67± 6.98b	3169.81 ± 4.64a	3198.64 ± 21.79a	3176.41 ± 31.66a	3184.88 ± 6.29a	3022.83± 8.66b
Feed conversion ratio	1.963 ± 0.0019a	1.954 ± 0.0013a	1.97 ± 0.0011a	1.95 ± 0.0016a	2.001 ± 0.002a	2.59 ± 0.0011b	2.63 ± 0.004b	2.63 ± 0.004b	2.66± 0.0006b	3.002 ± 0.004a

CD: Control diet

% means the % : substitution of corn by orange peel meal

Means within the same column carrying different superscripts are significantly different at (p<0.05).

± stander error (SE)

Table 5. Effect of dietary treatment on visceral organs (M (% of live weight) +SE)

Group and replacing % of corn by s.f.o.p.	Gizzard	preventrulus	liver	heart	Gall bladder	spleen	GHT
Control	2.213± 0.0012c	0.46 ± 0.00058c	2.58 ± 0.0005a	0.47± 0.0004a	0.15 ± 0.0003a	0.12 ± 0.0003a	5.42 ± 0.009c
5%orange	2.19 ± 0.0008c	0.45 ± 0.00066c	2.57 ± 0.002a	0.46 ± 0.0011a	0.16± 0.001a	0.13 ± 0.0008a	5.43 ± 0.136c
10%orange	2.2 ± 0.000bc	0.44 ± 0.0008c	2.59 ± 0.003a	0.48 ± 0.0008a	0.17± 0.0012	0.13± 0.001a	5.95 ± 0.007b
20%orange	2.25 ± 0.0005b	0.49 ± 0.0008b	2.6 ± 0.002a	0.49 ± 0.0008a	0.15 ± 0.0008a	0.11 ± 0.001a	6.25 ± 0.1007b
30%orange	2.33 ± 0.0028a	0.53 ± 0.00067a	2.69± 0.1054a	0.49 ± 0.0012a	0.16 ± 0.009a	0.12 ± 0.0006a	6.73 ± 0.009a

Means within the same column carrying different superscripts are significantly different at (p<0.05).

± stander error (SE)

Table 6. Effect of dietary treatment on organ cuts

Group and replacing % of corn by s.f.o.p.	Neck	Thigh	Breast	Wings	Abdominal fat	Dressing %
Control	8.5 ± 0.009a	11.87 ± 0.17a	23.51 ± 0.21a	3.52 ± 0.003a	3.25 ± 0.0001a	83.75 ± 0.49a
5%orange	8.98 ± 0.005a	11.24 ± 0.29ab	22.24 ± 0.49ab	3.31± 0.007a	3.2 ± 0.003ab	81.47± 0.69a
10%orange	7.99± 0.22a	11.98 ± 0.28a	22.58 ± 0.65ab	3.55± 0.14a	3.24 ± 0.0046a	79.73 ± 0.5a
20%orange	8.97 ± 0.004	11.67 ± 0.67a	23.58 ± 0.24a	3.27 ± 0.29a	3.09± 0.006b	80.93± 1.21a
30%orange	7.83± 0.79a	10.21± 0.006b	21.48± 0.24b	2.67 ± 0.24b	3.07± 0.004b	81.4 ± 1.29a

Means within the same column carrying different superscripts are significantly different at (p<0.05).

± stander error (SE)

Conclusion

In this study, the performance data has evidently showed that feeding sweet orange peel

depressed broiler performance up to 20% replacement of corn by sweet fruit orange peel .with exception of gizzard and proventriculus weight, substituting dietary corn with sweet

orange peel meal did not produce any significant effect in visceral organs weight and cuts.

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الملخص العربي

تأثير إضافة مستويات مختلفة من قشر البرتقال السكري على الاداء في بدارى التسمين

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اجريت هذه الدراسة لدراسة تأثير استبدال الذرة بنسب مختلفة من قشر البرتقال السكري (5 و 10 و 20 و 30 %) على الاداء وصفات الذبيحة في بدارى التسمين.
استخدام لهذا الغرض عدد 150 كتكوت عمر يوم واحد (روس) موزعة بالتساوى على خمس مجاميع بشكل عشوائى ، المجموعة الضابطة و 4 مجموعات اخرى ، عدد كلا منها ثلاثون كتكوت. غذيت المجموعة الاولى علي عليقة ضابطة. اما المجموعة الثانية غذيت علي العليقة الضابطة مع استبدال 5% من الذرة بقشر البرتقال السكري . اما المجموعة الثالثة غذيت علي العليقة الضابطة مع استبدال 10% من الذرة بقشر البرتقال السكري. اما المجموعة الرابعة غذيت علي العليقة الضابطة مع استبدال 20% من الذرة بقشر البرتقال السكري. اما المجموعة الخامسة غذيت علي العليقة الضابطة مع استبدال 30% من الذرة بقشر البرتقال السكري.
وكشفت النتائج الى ان استبدال الذرة بقشر البرتقال السكري بالنسب المختلفة (5 و 10 و 20 %) ليس لها تأثير معنوي على الاداء في بدارى التسمين ماعدا المجموعة التي غذيت علي العليقة الضابطة مع استبدال 30% من الذرة بقشر البرتقال السكري. استبدال الذرة من قشر البرتقال السكري بالنسب المختلفة ليس لها تأثير معنوي على صفات الذبيحة في بدارى التسمين. تشير النتائج الى ان استبدال الذرة بقشر البرتقال السكري بالنسب المختلفة (5 و 10 و 20 %) ليس لها تأثير سلبي على الاداء وصفات الذبيحة في بدارى التسمين.