

The Use of Sweet Potato in Chickens Rations for Growth and Egg Production

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200 ONE week old chicks were divided into equal 4 groups. One group fed white corn as carbohydrate source plus 1100 LU/kg unit vitamin A, the second fed yellow corn only as carbohydrate source, the third fed half of carbohydrate source as white corn and the other half as fresh sweet potato added daily. The fourth was supplied by $\frac{2}{3}$ of its carbohydrate source by fresh sweet potato and the remainder as white corn. The same basis of ration was used for another 4 groups of laying hens. The hens were fed for 3 weeks on a diet deficient in vitamin A.

The supplementation of rations with synthetic vitamin A and using the white corn for the main source for carbohydrates gave the best growth egg production and hatching results. Vitamin A in yellow corn may replace most of the requirements of this vitamin in growing chicks, egg producing hens and in hatching results. Using low level of sweet potato do not give satisfactory results. However, the increase of sweet potato percentage gave results that approach that of the white corn and synthetic rations, except that of hatching results. Good meat taste was obtained by feeding boilers with sweet potatoes.

It is known that sweet potato is rich in carbohydrate and high in carotene especially the deeper colored varieties. Ewing (1951) stated that sweet potato when sliced and then dried gave a product of high carotene content that retains its vitamin A potency even when stored for relatively long periods.

Sweet potato flour incorporated in laying hen rations at the level of 25% was found to increase vitamin A in the yolk (Ewing, 1951). However, Ewing (1951) found that adding dehydrated sweet potato at higher levels was associated with lower egg production. The chemical composition of the dried sweet potato is : 4.9 % crude protein, 0.9 % ether extract, 3.3% crude fiber and 77.0% NFE. Its vitamin A activity averages 53667

IU/lb (Norrison, 1959). Tillmann and Davis (1943) found that sweet potato meal could be used as 20 to 25 % of the mash mixture and replace carbohydrate feeds in chick rations.

It was thought that sweet potatoes can be used as a source of carbohydrates ready to use, which may be of benefit for broiler production especially in the finishing stage. The sugars in it may give a good taste for the broiler meat. In the present work, sweet potato was added to the ration at 2 levels at the expense of corn. The effects of adding sweet potato on the growth of chicks, feed efficiency egg production and general performance of chicks was studied.

Experimental Procedure

Experiment 1

Two hundred 1-week-old Fayoumi chicks were used in this experiment. Chicks were randomly divided into 4 groups, each group was reared and raised in a separate room fitted with electric heaters. Chicks were individually weighed at biweekly intervals. Experimental diets (Table 1) were offered at 1-week old and throughout the experimental period. The variation in composition of the diet shown in Table 1 are indicated as follows :

Group 1 : White corn was used as the source of carbohydrate ; vit A was supplied in the synthetic form at the level of 1100 I.U./kg diet.

Group 2 : Yellow corn was used as a source of both carbohydrates and vit A activity.

Group 3 : half the amount of the white corn was replaced, on dry matter basis, by fresh sweet potato added to the diet daily.

In this group sweet potato was used as source of carbohydrate as well as carotene.

Group 4 : Three-fourth the amount of white corn was replaced by fresh sweet potato.

The replacement of corn by fresh sweet potato was made on dry-matter basis. According to Norrison (1959) total dry matter of fresh sweet potato

and corn is 31.8 and 87.0% respectively. Therefore when sweet potatoes replaced 22.5 % of the formula or (50 % of the corn) it was added as $22.5 \times \frac{87}{31.8} = 61.5$ g to each 100 g of the ration 3. Similarly, 117.5 g of fresh sweet potato was added the ration 4 where sweet potato replaced 75 % of the corn (or 33 % of the formula).

Feed and water were offered *ad libitum*. Records were kept of mortality rate and feed consumption. Data of body weight were subjected to analysis of variance and according to Snedecor (1959). Organoleptic tests were done on the meat of the 13 weeks old chicks.

TABLE. Composition of the experimental rations (Exp. 1 & 2).

Ingredient	Experiment 1				Experiment 2			
	%	%	%	%	%	%	%	%
White corn	45	—	22.5	12	55	—	27.5	13.5
Yellow corn	—	45	—	—	—	55	—	—
Fresh sweet potato	—	—	22.5	33	—	—	27.5	41.5
Horse beans	14	14	14	14	14	14	14	14
Decorticated cotton-seed meal .	20	20	20	20	10	10	10	10
Wheat bran	10	10	10	10	10	10	10	10
Dried skim milk	4	4	4	4	2	2	2	2
Fish meal	4	4	4	4	4	4	4	4
CaCO ₃	1	1	1	1	2	2	2	2
Bone meal	1	1	1	1	12	2	2	2
Na Cl	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Mineral mixture	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Vit A (I.U./kg)	2000	—	—	—	5000	—	—	—
Vit D ₃ (ICU/kg)	1000	1000	1000	1000	2000	2000	2000	2000
Dried yeast	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Experiment 2

In this experiment, the effect of adding fresh sweet potato on egg production, fertility and hatchability was investigated. Forty eight Fayoumi hens at the second year of laying were used. Four cocks were kept with the hens. All birds were fed for 3 weeks on a diet deficient in vitamin A to exhaust the vitamin A storage of the experimental birds. Birds were then divided into 4 experimental groups as shown in Table 1. Records were kept for egg production during the experimented period (70 days). Fertility and hatchability of eggs was determined by incubating the eggs produced every week. Analysis of variance was performed in data of egg numbers and egg weight.

Results and Discussion

Average body weight at the end of the experiment was 803.3 ± 171.2 , 779.7 ± 174.6 , 686.4 ± 176.4 and 780.0 ± 109.5 g for group 1 (synthetic vit. A), group 2 (yellow corn), group 3 (22.5% sweet potato) and group 4 (33% sweet potato) (Table 2). Considering the average body weight of group 3 (22.5% sweet potato) as 100 the other three groups would be (117.03, 113.59) and 113.64 respectively. Yellow corn can provide the chick with enough vitamin A activity to support growth up to 13 weeks of age. Although the chicks fed yellow corn were 3% less in their final body weight than group fed synthetic vitamin A, this difference was not clear. Also, it may be noted that yellow corn supplies the ration with vit A activity comparable to that of ration 1 (1100 LU/kg ration).

TABLE 2. Average body weight of the four groups of chicks.

Age in weeks		Group I		Group II		Group III		Group IV	
0	1	33.09±	5.9	34.93±	3.7	33.92±	4.9	34.94±	3.6
2	3	104.07±	22.1	96.56±	15.9	91.58±	21.1	103.76±	15.1
4	5	234.17±	37.1	217.44±	50.2	192.58±	49.6	242.00±	35.6
6	7	393.96±	64.6	360.83±	59.6	324.19±	70.4	383.00±	54.4
8	9	534.91±	85.6	508.69±	83.1	399.35±	128.8	499.80±	73.4
10	11	665.50±	150.8	620.40±	146.7	589.35±	106.8	660.08±	93.1
12	13	803.26±	171.2	779.72±	174.6	686.45±	176.4	780.00±	109.5

± Standard deviation

value : between groups = 3.22* (Significant).

Table 2 shows that the average body weight of group 3 (22.5% sweet potato) was lower than that of group 1 (synthetic vit A), this difference being 14% is a quite great difference. On the other hand average body weight of group 4 (33% sweet potato) was only 3% lower than that of group I which indicates that sweet potato could substitute the corn for energy as well as to provide enough vit. A activity to maintain growth of Fayoumi chicks up to 13 weeks of age.

Therefore, it may be concluded that freshsweet potato can be added to rations of Fayoumi chicks at the level of 33% (replacing 75% of the dietary corn) but lower level of 25.5 % was not satisfactory. In this connection, Tillman and Davis (1943) found that sweet potato meal could be used to 20—25% in chick rations. The meat of chicks at 13 weeks of age was used for organoleptic tests. The group that fed 33 % sweet potato showed the best taste. This may suggest the using sweet potatoes may favourate meat quality of broilers meat.

Experiment 3

As shown in Table 3, egg production was the highest in group I (Synthetic Vit A indicating that yellow corn group 2) and 27.5 % sweet potato (group 3) are inadequate in supplying the ration with enough vitamin A to maintain satisfactory egg production. Increasing the sweet potato in the ration from 27.5 the 41.5 %. Increased egg production from 54.4 to 66.71 %. This is in contradiction to findings of Bell (1949) who reported decrease egg production with increasing dehydrated sweet potato in the ration. However, this can be explained on the basis that Bell used dehydrated sweet potato while in this work fresh sweet potato was used.

TABLE 3. Egg production of the four groups of hens.

Items	Treatments			
	1	2	3	4
Egg No. in 70 days	49.5	41.2	37.9	46.7
% Production	70.71	58.86	54.14	66.71
Av. Egg wt/period	45.9	47.2	46.7	46.7
Mass egg/production/period	2272.1	1944.6	1769.9	2180.9

F value : Between treatments for egg number = 2.88* (Significant).

Between treatments for egg weight = 2.94* (Significant).

Average egg weight slightly lower in the group fed synthetic vitamin A. Total egg mass (egg number in 70 days x average egg weight in g) was the highest in group 1 (synthetic vit a) followed by gp. 4 (541.5 % sweet potato). This indicates that sweet potato can substitute 25% of the corn in the ration as well as supply it with enough vit A activity.

Fertility was high in groups fed synthetic vit A or yellow corn while was lower in the groups fed sweet potato. Hatchability was the highest in group 2 (yellow corn) while it was reduced by 11.3% in group 1 (Synthetic vit A). A further reduction of 25.4 % was evident in group 3 (27.5% sweet half that of the yellow corn group. This noticeable reduction in hatchability and fertility percentages may be caused by a factor in fresh sweet potato which warrant further research.

TABLE 4. Fertility and hatchability as affected by the treatment.

Items	Treatments			
	1	2	3	4
Fertility %	83.0	85.5	74.1	67.6
Hatchability % from fertile eggs	71.0	82.3	56.9	43.3
Hatchability % from total eggs	58.7	70.4	42.2	33.1
Chick wt. at hatch	29.8	30.3	30.5	29.4

In general, it is suggested that sweet potatoes can be used as one third to the hatching results. The levels at which the sweet potatoes can be used of the carbohydrate source at the rations without any harmful effects, irrespective to and the form it can be fed on it is a matter of question.

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استعمال البطاطا في تغذية الكناكيت في مرحلة النمو وانتاج البيض .

صاحبه عز الدين ، عصمت عمر وجمال قمر

استعمل في هذه التجربة ٢٠٠ كوكوت سن يوم وقسمت الى ٤ مجاميع غذيت الاولى على ذرة بيضاء بالاضافة الى فيتامين ١ والثانية غذيت على ذرة صفراء والثالثة أعطيت بطاطا كمصدر للنشويات بنسبة نصف الاحتياجات والثالثة أعطيت بطاطا كمصدر للنشويات بنسبة الاحتياجات . وكانت احسن النتائج بالنسبة للنمو هي المجمع التي غذيت على ذرة شامية وفيتامين ١ أن الذرة الصفراء يمكن أن تحل محل مصدر فيتامين ١ النقي . واستعمال المستوى المنخفض من البطاطا لم يعط نتائج مشجعة بينما كان المستوى العالي من البطاطا يقرب في النتائج المستوى الذي حصلنا عليه من التغذية على الذرة .