

Anti - Riboflavin Factor in Tomato Seeds

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INCORPORATION of tomato seed meal in chicken rations was safely done with levels up to 15% of the ration. Higher levels, however, seemed to depress growth due to the high fibre content and the possible presence of a goitrogenic factor (s).

Two feeding experiments were designed using Dokki 4 chicks which were fed two levels of tomato seed meal. The first level was 15% of the ration as partial substitution for cotton seed meal, but the second level was 34% of the ration to supply all the plant protein requirements of the chicks.

While satisfactory growth rates were obtained in the first trial, typical riboflavin deficiency symptoms were observed the second one. The addition of the B-complex group of vitamins with riboflavin in excess amount caused the deficiency symptoms to disappear in few days time, but the growth rate was not improved.

It was concluded that tomato seeds contain an anti-riboflavin factor which is not soluble in organic solvents. The destruction of such factor should be attempted by the application of heat or water extraction. This point of investigation is now under study.

Feeding trials previously applied to chicks by different investigators succeeded in the incorporation of tomato seeds or tomato seed meal with levels below 15% of the ration (Esselen and Fellers, 1939). Higher levels, however, seemed to depress both growth rate of the chicks and feed efficiency of the ration. (Anwar *et al.*, 1977).

This abnormal effect of tomato seeds was partially attributed to their high fiber content and the possibility of the presence of any goitrogenic factor (s) (El-Alaili, 1974).

The present work was designed therefore, to study the use of tomato seed meal in the feeding of starting chicks with levels as high as to contribute all their plant protein requirements without any reciprocal effect on growth.

Experimental

An ample amount of tomato seeds was provided by Kaha Food Processing Plant. It was washed with water, air-dried, ground and extracted with hexane. Two feeding trials were done using Dokki 4 chicks in which partial and complete substitution of cottonseed meal by tomato seed meal was practiced.

In trial A, 20% cottonseed meal (C.S.M.) was used in ration 1, while in ration 2, 15% tomato seed meal (T.S.M.) replaced 10% of the cottonseed meal (Table 1). The rations were standardized according to the calorie : protein ratio maintained between gross protein value units (G.P.V.U.s) and metabolizable energy (M.E.) where more than 35 G.P.V.U.s (Anwar *et al.*, 1977) and 2900 Kcal. M.E. (Ewing, 1963) were provided in each ration (Table 1). In trial B, cottonseed meal was used in ration 3 with the level of 30%, while in ration 4, 34% tomato seed meal was used to replace completely cottonseed meal (Table 1). All the necessary adjustments were taken care of to permit the rations to contain the same standards used in trial A.

An adequate number of day-old Dokki 4 chicks were fed 1:1 mixture of cracked wheat and corn for two days. On the third day, chicks having extreme weights were stratifiedly randomized into groups of 25 chicks each with an average weight differences of not more than ± 0.5 g. They were kept in wire-floor batteries in a heat-controlled room. The experimental rations were fed to 3 groups each up to 4 weeks of age when the chicks were weighed again and growth gains recorded.

TABLE 1. The experimental ration used in trials A and B in which partial and complete substitution of C.S.M. by T.S.M. was applied.

Ingredients	Rations			
	Trial A		Trial B	
	1	2	3	4
Corn	60	60.0	54.0	50.0
Bran	5.0	—	6.0	3.0
Cottonseed meal	20.0	10.0	30.0	—
Tomato seed meal	—	15.0	—	34.0
Clover meal	2.0	2.0	—	—
Meat meal	7.0	7.0	—	—
Fish meal	3.0	3.0	4.5	5.0
Bone meal	1.0	1.0	—	—
Calcium carbonate	1.0	1.0	2.0	2.0
Min. mix.	0.5	0.5	0.5	0.5
Vit. mix. @	0.5	0.5	0.5	0.5
Vegetable oil	—	—	3.0	5.0
Total	100.0	100.0	100.0	100.0
Crude protein %	18.9	19.0	18.2	18.0
G.P.V.U./kg	36.0	37.0	35.75	36.25
K cal. M.E./kg	2.945	2.973	2.828	2.834

@: Vit. Mix. each 1 kg contained 200,000 IU. vit. A, 20,000 I.C.U. Vit. D₃ 600 mg Vit. E, 80 mg Vit. K₃ 80 mg B₁, 200 mg B₂, 100 mg. B₆, 0.4 B₁₂, 100 mg.

Niacin, 400 mg Calc. Pantothenate, 40 mg Folic acid, 6 mg Biotin and 300 mg Cholin chloride.

Results and Discussion

The results obtained from trial A (Table 2) showed that the average body weight gains of the Dokki 4 chicks at 4 weeks of age were 169.3 and 163.5g for the rations 1 and 2, respectively. The growth rates were comparable when partial substitution of cottonseed meal by tomato seed meal was practiced. It seems that 15% level of tomato seed meal could safely be feed to chicks as previously mentioned by Esselen and Fellers (1939).

In trial B, where cottonseed meal (ration 3) and tomato seed meal (ration 4) were used with the levels of 30 and 34% of the ration, a typical riboflavin deficiency syndrome was developed among the groups of chicks fed the tomato seed meal ration. With regard to the vit. mix contents used in both trials A and B (Table 1) it could be seen that it contributed the riboflavin requirements of the chicks (Ewing, 1963). However, no deficiency symptoms occurred in the other groups where cottonseed meal was used or tomato seed meal at a 15% level of the ration. This leaves no doubt that the deficiency symptoms which appeared in the chicks fed the 34% level of tomato seed meal were due to the presence of an anti-riboflavin factor which was noticeable when high levels of the meal was incorporated in the ration. The addition of the vit. B-complex group with the amounts given in Table 2 caused the deficiency symptoms to disappear in a few days.

TABLE 2. Body weights of chicks fed the 4 experimental ration @ in both trials A and B at 4 weeks of age.

	Trial A			
	Groups	Initial WT. g	Final WT. g	Body gain g
Ration 1 20% C.S.M.	Av.	32.9	202.2	169.3
Ration 2 10% C.S.M. + 15% T.S.M.	Av.	32.5	196.0	163.5
	Trial B			
	Groups	Initial WT. g	Final WT. g	Body gain g
Ration 3 30% C.S.M.	Av.	32.8	177.6	144.8
Ration 4 34% T.S.M.	Av.	32.4	165.1	132.7

@ : Ration 4 had to be fortified by the addition of 1g of the vit B-Complex group, containing 20 mg B₁ 12 mg B₂ and 8 mg B₆ per each kg of ration.

The average body weight gains of the chicks used in trial B were 144.8 and 132.7 g. at 4 weeks of age for rations 3 and 4, respectively (Table 2). This effect on growth seems to be due to the depression of an unknown factor since the rations were standardized to have the same amounts of nutrients. Such a factor if proved to be present seems to be in soluble in organic solvents (hexane) and could be overcome by increasing the amounts of the B-complex group of vitamins.

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عامل مضاد للريبوفلافين في بذور الطماطم

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استخدم كنسب بذور الطماطم بمستويات أقل من ١٥٪ من العليقة . أما المستويات التي تزيد عن ذلك فانها تسبب نقصا في النمو وكفاءة التحويل الغذائي . ولذلك أجرى البحث على مستويين الأول ١٥٪ والثاني ٣٤٪ لسد جميع الاحتياجات من البروتين النباتي للكتاكيت المستخدمة (دقي ٤) .

دلت النتائج على أن المستوى الأول قد أعطى معدل نمو طبيعي للكتاكيت في حين أن المستوى الثاني قد أدى الى حدوث أعراض نقص الريبوفلافين الا أنه بإضافة مجموعة فيتامين ب المركب محتويا على الريبوفلافين بالكمية المطلوبة أدى الى اختفاء الأعراض السابقة مما يؤكد وجود عامل مضاد للريبوفلافين في بذور الطماطم .

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