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THE EFFECT OF SOME DIETARY FLAVOUR AGENTS ON GROWTH AND FOOD UTILIZATION FOR GROWING CHICKS

By

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Two feeding trials were conducted on 360 Dokky 4 young chicks (180 chicks for each trial) for studying the effect of some dietary flavour agents on growth and feed efficiency In the first experiment five flavour agents were investigated using a commercial diet. Three flavours of unknown character and two commercial flvours of anise and mint extractives were experimented. All the flavour agents were added ranging from 30 to 50g. per ton diet. Some chicks were taken at the end of the experiment for the flavour detection in the fresh meat. In the second experiment a flavoured high energy diet (excluding mint oil) was tested.

The results showed that :

1. No significant difference ($P = 0.05$) was found either for growth or for feed efficiency, though a trend of slight improvement was noted for the flavoured high enery diet.

2. All dietary flavoured agents were not detected in chick fresh meat.

3 Effect of flavoured diets on the live-weight increase and feed efficiency was not of significant importance such as that of the high energy diet.

Numerous references are available on the sences of the fowl (Ewing, 1951; Kare *et al.*, 1957 ; Kare and Pick, 1960) ; and Engleman, 1934, observed that the fowl would discriminate in choice between acids, salts, sweatness and bitterness. Kare *et al.*, 1957, with chicks, used for evaluating 32 flavours in water, concluded that they have a sense of taste. The same authors claimed that the drinking water was considered to be the best medium to permit a greater degree of flavour discrimination. They also, reported that the response to a variety of sweet and bitter flavours suggests that the broad classifications of taste recognized by man are not applicable to the fowl. In this respect, Dukes, 1955, claimed that the fowl keeps food in its mouth a short time and secretes substantially less salive per Kilogram of food consumed than man. Morley and Herbert, 1960, repoted that age was of marginal or no significance in discrimination of flavours.

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Sizemore and Lillie, 1956, with baby chicks. used sythetic poulatry feed flavours contained extractives of anise, rose, cinnamon, lemon and orris with soyameal and corn sugar as carriers, did not find any significant improvement in the body weight. Romesor *et al.*, 1958, found that the addition of imitation strawberry, anise or grape flavours to the diet of growing chicks was without apparent effect on rate of gain in body weight or food conversion. Deyoe *et al.*, 1964, used a commercial flavouring agent containing esters, organic acids and volatile oil, 0.1% of a diet based on maize and soyabean meal. Those workers, however, claimed that the flavours did not improve the body weight, though it significantly improved food conversion. It is worth noting that feeding young calves flavoured diets (Youssef *et al.*, 1969) did not show significant effect on growth and feed utilization.

The present study was carried out to investigate some flavour agents in poultry diets which are suggested for improving growth and feed efficiency.

Experimental

Experiment 1.

Chicks : 180 Dokky 4 young chicks (males and females) were used. The chicks were fed a commercial diet (shown in table 1), for the first week of age. The one-week old chicks were distributed in descending order according to their live-weight in six treatments of three replicates each. The average liveweight was similarly obtained for every ten chicks in each replicate. The chicks were allocated at random up to 8-week old in a commercial battery of five tiers ; each tier was divided into two compartments. The battery was electrically heated for, only, the first 10 days of age ; the room was naturally ventilated and provided with a 200 watt bulb to provide light source at night-time during the experimental period (23.5. 1966-18.7. 1966). The chiks were reared upto 8-week old.

Diet and feeding : The percentage composition and the proximate analysis of the experimental diet is shown in table 1.

Three synthetic flavour agents were partly provided by Firmench Swiss company Geneva. The two other commercial flavours, namely, anise seed and mint extractives were locally produced. The feeding treatments were as follows :

(A) Flavour	51.813	T	30 g. per ton diet
(B) Flavour	52.818	T	50 g. per ton diet
(C) Flavour	52.819	T	50 g. per ton diet
(D) Anise oil			50 g. per ton diet
(E) Mint oil			50 g. per ton diet
(F) Control unflavoured diet			

TABLE 1.—THE PERCENTAGE COMPOSITION AND PROXIMATE ANALYSIS OF THE EXPERIMENTAL DIET, EXP. 1.

Ingredients	Percent	Ingredients	Percent
Ground yellow maize . . .	25	N. Free extract	45.65
Dec. cotton seed meal . . .	25	Crude Fibre	6.12
Sesame-meal	6	Ash	11.06
Rice starch residue	10	Calculated Met. Energ (Kcal/g. diet)	2.41
Wheat bran (fine)	10	Fish-meal	3
Rice bran	10	Bone-meal	1
Maize gluten feed	5	Oyster shell(Pulverized) . . .	1
Meat-meal	2	Lime stone (Pulverized) . .	1
Proximate Analysis :		Table Salt	0.5
Moisture	9.52	Mineral mixture*	0.5
Crude protein	22.20	Vitamin mixture†	++
Ether-extract	4.52	Other additives‡	+

* Each Kg. mineral mixture contains (in grams) : — Limestone phosphate 550, Calcium hydroxid. 305, Sodium chloride 100, Ferric oxide 21, Sulphur 6, magenesium sulphate 11, manganese sulphate 5.6, Cobalt oxide 0.18, potassium iodide 0.4, copper sulphate 0.82.

† To each Kg. diet was added a commercial vit. mix. to provide : vitamin A 10,000 I.U., vitamin D_3 1000 I.U., riboflavin 8.8mg., Calcium pantothenate 8.8 mg., niacinamide 52.8 mg., chloine bitartarate 228.8 mg.

‡ Megasol 1 Kg. per ton diet. Megasol is M, m dinitro diphenyl disulfide (nitrophenide).

To facilitate adding the flavour agents with the basal diet, the compounds were primary mixed with absolute ethyl alcohol (95%). The same amont of ethyl alcohol (350 ml. per feeding lot) was mixed with the control diet. The experimental diets were weighed and freshly mixed wih the flavour agents in polyethylene buckets. The residue and scattered food were weighed every three days to get the food intake.

A ckick of each replicate, that recorded the highest live-weight was slaughtered and dressed for the detection of dietary flavours in the fresh meat.

Newcastle vaccin of eye-drops was used when the chicks were 8-day old. At three weeks old (2 weeks on the experimental diet) symptoms of vitamin E deficiency was observed in various groups. A number of 25 tablets of gelatenized DL-Alpha-tochophyrol acetate (vit. E) (containing 50 mg) were ued in the drinking water for 2 to 3 days until the case was over and chicks became normal.

The proximate analysis of the experimental diets were carried out using the conventional methods (A.O.A.C, 1960). The metabolizable energy for each diet was calculated, using the data recorded by Titus, 1955.

The analysis of variance for the final live-weight for each treatment was made according to Snedecor, 1960.

Experiment 2.

All experimental details were as previously described for exp. 1 other than in the following respect :—

Chicks : 180-day old Dokky 4 female chicks were reared up to 6-week old (from 30.4.1967 to 11.6.1967).

Diet : The percentage and proximate analysis of a high energy diet is shown in table 2. The same previous flavour agents were used excluding the mint oil. A reference group was fed on the commercial diet (table3.) additives free; while only ethyl alcohol was added to the high energy control diet. The experimental flavoured diets were stored in thick polythen bags and ready for use.

Results and Discussion

Table 4. shows the average live-weights of the experimental chicks for both experiments. It could be seen that the high energy diet gave a similar average live-weight at 6-week old to that recorded at the eighth week for experimet 1. The average live-weight for the unflavoured control diet, treatment F, in experiment 1. was higher (468 g) than for some other flavoured diets. Mint flavoured diet gave the lowest average live-weight (424 g.). Anise oil flavoured diet, treatment D, experiment 1., gave higher value for the final average live-weight of 426g. than for treatment E.

TABLE 2.—THE PERCENTAGE COMPOSITION AND PROXIMATE ANALYSIS OF THE EXPERIMENTAL DIET, EXP. 2

Ingredients	Percent	Ingredients	Percent
Ground white maize	60	N. Free extract	49.41
Soybean meal	25	Crude fibre	5.02
Maize oil	5	Ash	6.14
Fish-meal	5	Calculated M. Energy Kcal/g. diet	3.3
		Bone-meal	2.5
Proximate Analysis:		Lime-stone (pulverized) . . .	1.5
Moisture	10.52	Table Salt	0.5
Crude protein	23.42	Mineral mixture*	0.5
Ether-extract	5.49	Vitamin mixture†	++

* *See footnote table* I.

† To each kg. diet was added a commercial vit. mix. to provide : vitamin A 7500 I.U., vitamin D_3 1500 I.U., Vit. B_1 0.75 mg., vit. B_2 6.41 mg., Calcium pantothemate 9.91 mg., nicotenic acid 42.96 mg., Choline 178.91 mg., Vit. B_6 0.375 mg., vit. B_{12} 0.003 mg., vit. E. 1.875 I.U., vit. K_3 1.5 mg., Proc. penicillin 6.0 mg.

TABLE 3.—THE PERCENTAGE COMPOSITION AND PROXIMATE ANALYSIS OF THE COMMERCIAL DIET, EXP. 2

Ingredients	Per-cent	Ingredients	Per-cent
Ground white maize	25	Ether extract	4.05
Doc. Cotton seed meal	25	N. free extract	51.12
Sesame meal	6	Crude fibre	6.07
Rice starch residue	10	Ash	7.24
Wheat bran (fine)	10	Calculated M. energy Kcal/g. diet	2.41
Rice bran	10	Fish meal	3
Maize gluten feed	5	Bone-meal	1
Meat-meal	2	Oyster-shell (pulverized)	1
		Lime-stone	1
Proximate Analysis :		Table salt	0.5
Moisture	9.75	Mineral mixture*	0.5
Crude protein	21.77	Vitamin mixture†	++

* *See footnote table* 1.

† To each kg. diet was added a commercial vit. mix. to provide : vitamin A 8752 I.U., vitamin D_3 1000 I.U., vit. B_1 0.13 mg., riboflavin 2.4 mg., Calcium pantothenate 13.6 mg., nicotenic acid 14.8 mg., Choline 51 mg., vit. B_6 0.06 mg., vit. B_{12} 0.012 mg., vit. E. 0.51 I.U., vit. K_3 0.75 mg., Proc. penicillin 1.0 mg., Oxytetra cycline 7.0 mg.

TABLE 4.—EFFECT OF FLAVOUR AGENTS ON LIVE-WEIGHT OF CHICKS

Age in weeks	Live weight in grams							
	1	2	3	4	5	6	7	8
Treatment:								
A. Flavour 52.813 T								
Exp. 1	46	68	111	154	228	295	372	466
Exp. 2	55	109	189	281	357	452	—	—
B. Flavour 52.818 T								
Exp. 1	46	66	97	152	207	266	346	440
Exp. 2	55	106	187	289	366	461	—	—
C. Flavour 52.819 T								
Exp. 1	45	66	101	145	216	273	370	478
Exp. 2	54	106	183	276	347	440	—	—
D. Anise oil:								
Exp. 1	46	70	104	149	213	287	363	462
Exp. 2	53	103	180	277	349	438	—	—
E. Mint oil:								
Exp. 1	45	62	96	136	195	259	340	424
Exp. 2	53	103	178	268	377	425	—	—
Control (H. energy) F. Control (comm. diet)								
Exp. 1	46	68	100	149	229	294	387	468
Exp. 2	53	90	136	197	232	306	—	—

Ewing, 1951, suggested that anise oil has been the main flavouring agent in calf meals and in mineral feeds for both livestock and poultry. The synthetic flavour, treatment C, experiment 1 recorded the highest final average live-weight of 478 g. corresponding to an increase of about 2 percent than the control. However, statistical data for the analyses of variance for the final average live-weights, experiment 1, showed no significant difference ($P = 0.05$) between all treatments.

The flavoured high-energy diet, experiment 2, showed higher final average live-weight than for unflavoured control diet. The maximum value was for treatment B, of 461 g. while the minimum value was for the control, treatment E, of 425 g. with an increase of 36 g. corresponding to about 8.5 percent. When a commercial diet, treatment F, experiment 2 was fed, an average final live-weight of 306 g. was obtaiend. The difference between the average final live-weight in treatment F, of 306 g. and the control of high-energy diet, treatment E, of 425 g. was 119 g. corresponding to about 39 percent. It means that the effect of the unflavoured high-energy diet when compared with the unflavoured commercial diet was nearly three times (119/36) that produced by flavouring the high-energy diet. Statistical data for the analysis of variance of the final live-weight, experiment 2, showed no signifcant difference ($P=0.05$) between flavoured high energy diet and their control. While a highly significant difference ($P=0.01$) was noted between the commercial diet, treatment F, and those for the high energy diet.

Obviously, a slight increase in food intake of the high-energy diet may have a marked influence in growth than for the lower energy diet (commercial diet).

The detection of flavour agents in fresh meat, experiment 1 was negative. However, Lewis *et al*, 1956, claimed that purified diets consistently and significantly improved the flavour and aroma of light and dark meat, broth and juice of broiler. Newman *et al.*, 1958, with large amounts of various spices in poultry food, claimed that garlic (lb per 5lb food) during 4-day feeding impiared the flavour of the cooked flesh. The other spices (celery seed, allspice, sage and clover) or monosodium glutamate did not significanttly affect flavour. Similarly, Yosida *et al.*, 1964, found no diflerences attributable to diet in flavour of cooked meat.

Table 5 shows the food cnoversion data for both experiments. It could be noticed that in general, feed efficiency values (units food/unit gain) tended to increase with the increase of age.

Expermient 1 gave the highest values at 8-week old reaching 2.91 in anise oil, treatment D, and the lowest value of 2.8 in the control diet. These data indicated that flavour agents did not improve food conversion in the practical diet.

Experiment 2 gave feed efficiency values ranging from 1.96, in treatment C, to 2.01 in the control diet, treatment E. These data may suggest a slight improvement in the feed efficiency by flavouring the high energy diet.

The present data may suggest that adding flavour agents, in general, to chick diet has to be investigated preferably, with high quality diets.

TABLE 5.—EFFECT OF FLAVOUR AGENTS ON FEED EFFICIENCY

Age in weeks	Feed Efficiency (food/unit gain)						
	2	3	4	5	6	7	8
Treatment :							
A. Flavour 52.813 T							
Exp. 1	1.48	1.92	2.19	2.49	2.73	2.82	2.83
Exp. 2	0.92	1.30	1.58	1.87	1.99	—	—
B. Flavour 52.818 T							
Exp. 1	1.46	2.00	2.10	2.53	2.81	2.86	2.90
Exp. 2	0.89	1.29	1.54	1.87	2.00	—	—
C. Flavour 52.819 T							
Exp. 1	1.41	2.02	2.28	2.52	2.76	2.82	2.87
Exp. 2	0.89	1.31	1.57	1.82	1.96	—	—
D. Anise oil :							
Exp. 1	1.54	1.85	2.24	2.55	2.68	2.88	2.91
Exp. 2	0.89	1.29	1.57	1.86	2.00	—	—
E. Mint oil :							
Exp. 1	1.45	1.96	2.18	2.52	2.65	2.72	2.80
Exp. 2	0.92	1.32	1.59	1.83	2.01	—	—
Control (H. energy)							
F. Control (comm. diet)							
Exp. 1	1.42	1.90	2.19	2.43	2.66	2.82	2.85
Exp. 2	1.03	1.68	2.14	2.59	2.68	—	—

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تأثير بعض مصادر مكسبات الطعم والرائحة على النمو والاستفادة الغذائية فى الكتاكيت

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الملخص

أجريت تجربتان استعمل فيهما خمسة أنواع من مصادر مكسبات الطعم والرائحة حيث استوردت ثلاثة منها غير معروف تركيبها والباقى من مصادر محلية تجارية وهى زيت الينسون والنعناع .

أخذ ٣٦٠ كتكوت دقى ٤ حديثة الفقس (١٨٠ كتكوت لكل تجربة) . فى التجربة الأولى أضيفت مصادر الطعم والرائحة الى عليقة المزرعة العادية بنسب تتراوح بين ٣٠ ، ٥٠ جرام لكل طن عليقة . فى نهاية التجربة فحصت بعض الكتاكيت المذبوحة لمعرفة تأثير رائحة تلك المواد على اللحم الطازج . وفى التجربة الثانية استعملت نفس المواد السابقة ـ بعد استبعاد زيت النعناع ـ وبنفس النسب حيث تم خلطها بعليقة ذات طاقة حرارية عالية .

وقد دلت النتائج على ما يلى :

١ ـ ليس هناك تأثير معنوى احصائيا (على مستوى ٠.٠٥) لاضافة هذه المواد المكسبة للطعم والرائحة الى علائق الكتاكيت النامية على النمو والكفاءة التحويلية للغذاء ، غير أنه تبين اتجاه لتحسين طفيف فى الكفاءة التحويلية عند استعمال العليقة ذات الطاقة الحرارية العالية .

٢ ـ لم ينتج عند اضافة تلك المواد أى آثار أمكن التعرف عليها فى لحم الكتاكيت المذبوحة .

٣ ـ كان التأثير الناتج من اضافة مكسبات الطعم والرائحة على الوزن الحى والكفاءة التحويلية أقل بكثير جدا بالنسبة للعليقتين على عكس التأثير الواضح الناتج من استعمال العليقة ذات الطاقة الحرارية العالية حيث وصل الوزن الحى للكتاكيت عند عمر ٦ أسابيع ما وصلت اليه الكتاكيت عند عمر ٨ أسابيع فى حالة عليقة المزرعة العادية .

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