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Productive Energy Values of some Feedstuffs for Growing Chicks

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THIS WORK was carried out to determine the productive energy (PE) values of some feedstuffs which are commonly used in poultry rations. New hatched chicks of Rhode Island Red (RIR) and Baladi White (BW) were used in this study. Each experiment lasted for 3 weeks.

Fraps procedures, for determining the PE values of the experimental rations, and for calculating the PE values of the tested feedstuffs were followed. The energy values of chicks carcasses were determined directly by the bomb calorimeter and indirectly from the chemical composition and the gross calorie factors.

From the results of this study it can be concluded that the breed has no effect on the PE values of the tested feedstuffs. The average determined PE values of white corn, wheat, barley, wheat bran, rice bran, decorticated (decort.) and undecort. cotton seed cakes, soybeans, beans dried, skimmilk and fish meal with both RIR and BW chicks were 2.370, 2.069, 1.753, 1.288, 1.530, 1.748, 1.209, 1.799, 1.632, 1.210 and 1.908 kcal/g respectively. The corresponding calculated PE values were 2.405, 2.052, 1.954, 8.379, 1.553, 1,868. 1.309, 1.955, 1.614, 1.348 and 1.799 kcal/g respectively.

A large number of PE values of poultry feeds were determined by Fraps between 1928 and 1946. These PE values along with the digestibility data were used to prepare the tables of "energy production coefficients", from which one can predict the PE of any feed when its chemical analysis is known.

Davidson *et al*, 1957 ; tested the algebraic method used by Fraps; results of this method gave highly variable results which were 10-40% below values predicted from Fraps tables of energy production coefficients" . On the other hand Hill and Anderson , 1958, found that the PE values were about 20 % higher than that predicted from Fraps tables.

Furthermore, some of the samples used in early experiments are not representative of present day feeding materials.

In ARE , some investigators had tried to determine the PE values of some feedstuffs used in poultry rations, but results obtained were not completely satisfactory. Therefore, in an attempt to evaluate the feedstuffs used n poultry rations, this work was conducted.

Material and Methods

New hatched chicks of RIR and BW were used in this study. Eleven tested feedstuffs which are commonly used in poultry rations were tested. The feedstuffs under study were white corn, wheat, barley , wheat bran, rice bran, decort. and undecort cotton seed cakes, soybeans, beans, dried skimmilk and fish meal. Tweleve different rations were formulated for feeding chicks. The standard ration was formulated to cover the nutrient requirements of chicks table 1. In all the other tested rations, half the level of the yellow corn in the standard ration (20)% was replaced by 20% of the tested foodstuffs.

TABLE 1. Composition of the standard ration and any experimental one.

Component	Standard ration %	Any experimental ration %
Yellow corn	40.0	20.0
Tested feedstuff	—	20.0
Wheat	25.0	25.0
Fish meal	5.0	5.0
Decort. cotton seed cake	15.0	15.0
Dried skimmilk	12.0	12.0
Calcium Carbonate	1.5	1.5
Mineral mixture[I]	0.5	0.5
Vitamin A and D_3 mixture[II]	0.2	0.2
Cod liver Oil[III]	0.8	0.8

I- The formula of mineral mixture was :
Salt (Na Cl) 41.0%, copper (Cu) 0.098%, dicalcium phoshate 20.5% , manganese (Mn) 0.030%, limestone flour 33.3%, cobalt (Co) 0.007%, and iodine (I) 0.009%.

II- One g of vitamin A and D_3 Pfizer mixture contains :
Vitamin A 5000 I.U., and Vitamin D_3 1000 I.U.

III- One g of cod liver oil contains :
Vitamin A 100 I.U., and vitamin D 100 I.U.

Day old chicks of each breed were fed the standard ration up to 7-10 days old. After this period chicks were weighted, and those with abnormal weights were discarded. The remained number was randomized and divided into groups of 6-10 chicks each.

At the beginning of each experiment, one group or more used as control, were sacrificed to determine the initial body composition.

Four groups of chicks were used for determining the PE of each tested ration, two groups were fed ad-lib. and the other two groups were fed a restricted amount of feed equals to 10% of the average weight of chicks at the previous week, then this amount was raised to about 15% of the same weight from the 4 *th* up to the 7 *th* day of the same week.

Chicks of each group were weighed weekly, and the food consumed per chick was recorded daily. The experiments lasted for 3 weeks. At the end of each experiment, all chicks were fasted for 12 hours, weighed, sacrificed and prepared for the chemical analysis following the methods outlined in the A O A C (1965)

In every experiment, the PE values of the standard ration and the tested ones were derermined following the same technique previously described.

Methods used for determining the PE values of the experimental rations were similar to those of Fraps, (1946). The PE value of each ration was calculated on dry matter basis from the data given by the 4 groups fed on that ration.

The determined and calculated PE values of the tested feedstuffs were computed from the PE of the experimental rations with both RIR and BW chicks, as described by Fraps and Carlyle, (1942).

The determined PE of any tested feedstuff was computed as follows :

1. The determined PE of each experimental ration carried out with both RIR and B W chicks was subtracted from the determined PE of the standard ration carried out at the same experiment to give the "effect of substitution". Therefore the effect of replacing 20 % yellow corn of the standard ration by the same amount of the tested feedstuff=the determined PE of the standard ration- the determined PE of the experimental ration.

2. The effect of substitution of each experimental ration was subtracted from the determined PE of 0.20 gm yellow corn to give the determined PE of 0.20 g of the tested feedstuff, accordingly the determined PE of one gram the tested feedstuff can be calculated.

The calculated PE of any tested feedstuff was calculated by using the previously mentioned method, but the calculated PE values of the experimental rations, standard ration, and 0.20 g yellow corn were used in the calculations instead of using the determined PE values of those respective items.

Predicted PE values were obtained by using Fraps tables of "energy production coefficients" 1946, along with the chemical analyses of the feedstuffs used, or by using the local digestion coefficients along with the chemical analysis and Fraps tables.

Results and Discussion

Table 2, summarises the calculated and determined PE values of the tested feedstuffs for both RIR and BW chicks. From this table it appears that the PE values either calculated or determined for the two breeds were nearly similar. In this connection Davidson *et al*, 1957; reported that breed have little effect on the PE values obtained.

Data persented , in Table 2, showed that the determined PE values of cereals used in this study (White corn, wheat, and barley) were nearly similar to those calculated ones except for barley. All the predicted values (1,2 and 3 Table 3) for cereals used were in general higher than the determined PE ones, except that figure predicted from Tawakol's data for barley which was less than that expected.

TABLE 2. **Calculated and determined productive energy values of the tested feedstuffs (with both RIR and B W chicks).**

Feedstuffs	Calculated PE			Determined PF		
	RIR	B W	Average	RIR	B W	Average
White corn	2.310	2.500	2.405	2.360	2.380	2.370
Wheat	2.073	2.030	2.052	2.128	2.010	2.069
Barley	1.813	2.095	1.954	1.760	1.745	1.753
Wheat bran	1.288	1.470	1.379	1.300	1.275	1.288
Rice bran.	1.465	1.640	1.553	1 525	1.535	1.530
Decort cotton seed cake . .	1.730	2.005	1.868	1.745	1.750	1.748
Undecort. cotton seed cake .	1.173	1.445	1.309	1 258	1.160	1.209
Soybeans	1.920	1.990	1.955	1 783	1.815	1.799
Beans	1.548	1.680	1.614	1 578	1.685	1.632
Dried skimmilk	1.400	1.295	1.348	1 290	1.130	1.210
Fish meal	1.768	1.830	1.799	1.940	1.875	1.908

For cereal by- products : wheat bran and rice bran, both the calculated and determined PE values were nearly equal. The determined PE value of wheat bran was higher than all the predicted values. On the other hand the determined PE value obtained for rice bran was less than those predicted ones, except that calculated from Tawakol's data 1969, which agreed with the obtained determined PE values,.

TABLE 3. **Productive energy values predicted from Fraps Tables and those predicted from the data of other workers***

Feedtuff	Predicated PE values Kcal/g		
	1	2	3
White corn	2.813	—	—
Wheat	2.462	2.173	2.073
Barley	1.907	1.889	1.527
Wheat bran	1.088	1.139	0.822
Rice bran	1.913	1.715	1.482
Decort. cotton seed cake	1.595	1.715	1.639
Undecort. cotton seed cake	—	—	—
Soybeans	2.621	—	—
Beans	—	—	—
Dried skimmilk	1.199	—	1.581
Fish meal	1.745	—	1.823

* All values are expressed on dry matter basis.

1. Calculated from the chemical analysis of the tested feedstuff using Fraps Tables of "energy production coefficients".

2, 3. Calculated from the chemical analysis of the tested feedstuff and the digestion coeffients of Galal 2 and Tawakol 3, using Fraps Tables.

For decort cotton seed cake, values obtained from the data of Galal 1969 and Tawakol 1969, were nearly equal and being also similar to the determined PE values. The figures predicted from Fraps "energy production coefficients" tables were less than those determined ones. However, Titus 1961,reported that Fraps values for the digestiblility of the protein in high protein feedstaffs were in geneval less than those found in his experiments.

Concerning the dried skimmilk, Fraps predicted values were nearly equal to the determined PE ones, while those obtained from the data of Tawakol, 1969, were somewhat higher. For fish meal, Fraps predicted values were less than those obtained, while the PE values predicted from the data of Tawakol; 1969, agreed with the determined ones.

Conclusion

From the previous study it can be concluded that :

1. The breed has no effect on the P E values of the tested feedstuffs.

2. For predicting the P E values of poultry feedstuffs at a high degree of accuracy the local digestion coefficients would be used along with the chemical analysis of the feedstuffs and Fraps (P E Kcal /g digestibile nutrients).

References

Davidson, J., McDonald, I. and Williams, R.B. (1957) Utilization of dietary energy by poultry. A study of the algebraic method for determining the productive energy of poultry feeds. *J. Sci. Food & Agric.* 8, *173*.

Fraps, G.S. (1946) Composition and productive energy of poultry feeds and rations. *Texas Agric. Exp. Stat. Bull.* 678.

Fraps, G.S. and Carlyle, E. C. (1942) Productive energy of some feeds as measured by gains of energy of growing chickens. *Texas Agric Exp. Stat. Bull.* 625.

Hill, F.W. and Anderson, D.L. (1958) Composition of metabolizable energy and productive energy detarminations with growing chicks. *J. Nutrit.* **64**, 58 .

Galal, A. Gh. (1969) *A study of some carbohydrate components of poultry feeds and their relation to the feeding value with reference to lignin fraction.* Ph. D. Thesis : Cairo Univ. Fac. Agric.

Tawakol, M.F. (1969) *Determination of the nutritive value of some feedstuffs by digestion trials on poultry.* M.Sc. Thesis, Cairo Univ. Fac. Agric.

Titus, H.W. (1961) "*The Scientific Feeding of Chickens*". The Interstate, Danvill, Illinois.

الطاقة الانتاجية لبعض مواد العلف المســـتخدمة فى علائق الكتاكيت

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أجرى هذا البحث بغرض تقدير الطاقة الانتاجية لبعض مواد العلفالمستخدمة فى تغذية الدواجن لأجل الاستفادة بها فى تكوين علائق الدواجن على أساس قيمتها من الطاقة الانتاجية .

وقد شمل هذا البحث تقييم ١١ مادة علف هى الذرة البيضاء ، القمح ، الشعير ، الردة ، رجيع الكون ، كسب القطن المقشور وغير المقشور ، فول الصويا ، فول الحقل ، اللبن الفرز المجفف ومسحوق السمك .

ولتقدير الطاقة الانتاجية للعلائق المستخدمة ومواد العلف المختبرة اتبعت طريقة Fraps ١٩٤٦ وقد أجريت التجارب على كتاكيت حديثة الفقس من نوعى الرود أيلاندرد والبلدى أبيض واستمرت كل تجربة منها مدة ٣أسابيع. وقد قدرت الطاقة الكلية للحوم الكتاكيت المستخدمة بطريقتين مباشر بواسطة المسعر وغير مباشرة عن طريق اجراء التحاليل الكيماوية واستخدام الثوابت الحرارية التحويلية الخاصة لكل مركب غذائى .

وقد وجد أن نوع الكتاكيت المستخدمة فى التجارب كان لا تأثير لها علىقيم الطاقة الانتاجية المحسوبةأوالمقدرة وقد وجدأن متوسط قيم الطاقةالانتاجية المقدرة لكل من الذرة البيضاء،القمح الشعير،الردة ، الرجيع ،كسبالقطن المقشور وغير المقشور،فول الصويا،فول الحقل ، اللبن الفرز المجففوالسمك المجفف كانت ٢ر٣٧٠ ، ٢ر٠٦٩ ، ١ر٧٥٢ ، ١ر٢٨٨ ، ١ر٥٣٠ ، ١ر٧٤٨ ، ١ر٢٠٩ ، ١ر٧٩٩ ، ١ر٦٣٢ ، ١ر٢١٠ ، ١ر٩٠٨ سعرا لكل جم على التوالى وكانت الارقام المقابلة لقيم الطاقة الانتاجية المحسوبة هى ٢ر٤٠٥ ، ٢ر٠٥٢ ، ١ر٩٥٤ ، ١ر٣٧٩ ، ١ر٥٥٣ ، ١ر٨٦٨ ، ١ر٤٠٩ ، ١ر٩٥٥ ، ١ر٦١٤ ١ر٣٤٨ ١ر٧٩٩ سعرا لكل جم على التوالى .