

Evaluation of D-xylose as an energy source for broiler chickens

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A study was conducted to examine the effects of increasing dietary D-xylose levels on energy and nutrient utilization and growth performance of broiler chickens. A total of 480 d old male Ross chicks were allocated to 4 dietary treatments each with 24 replicate cages each containing five chicks. The control diet contained corn-soybean as the main ingredients with 25% inclusion of corn starch. Three additional diets were formulated by substituting corn starch with D-xylose at 20%, 60%, and 100% in such a way that the levels of D-xylose in the diets were 0, 5, 15, and 25%, respectively. The study was conducted for 21 d, and due to the cost of analysis, BWG and feed intake data were collected weekly to calculate FCR only for 12 replicates/diet and the replicates were selected randomly. Excreta were collected on d 18-20 and on d 21, 36 birds/treatment were selected randomly so that they were distributed evenly among the replicates and sacrificed to collect ileal digesta to determine nutrient digestibility using the index method. Data were analyzed using GLM procedure of SAS and Means were declared significant at $P < 0.05$. Replacing corn starch with 25% D-xylose resulted in feed refusal, reduced performance, and a high mortality rate during the first two wk of the experiment and hence birds in this treatment group were removed from the study. Feed intake, BWG, and FCR were reduced ($P < 0.05$) in birds fed a diet with 15% D-xylose compared with those fed diets containing 0 or 5%. Inclusion of dietary D-xylose at 5 and 15% reduced the apparent total tract dry matter ($P < 0.001$), gross energy ($P < 0.001$), and N ($P < 0.05$) digestibility compared with the 0% D-xylose diet. However, apparent ileal digestibility coefficients were not significantly different among treatments. In conclusion, results of this study demonstrate that 5% D-xylose can be tolerated by broiler chickens before adverse effects on growth performance are observed although nutrient digestibility may be impacted. At high dietary inclusion rates (25%), D-xylose was found to detrimentally affect growth and increase mortality rates showing xylose is not an efficient source of energy for broilers.

Introduction: D-xylose has been evaluated as a source of energy in different animal species (Peng et al., 2004; Schutte et al., 1991). Reduced animal performance have been reported in male chicks fed D-xylose at 40% (Wagh and Waibel, 1967). Significant reduction in ileal and fecal dry matter, organic matter, gross energy, and N digestibility and N retention have been reported in pigs fed 200 g D-xylose/kg of diet (Schutte et al., 1991).

Objective: This study was conducted to examine the effects of increasing dietary D-xylose levels on energy and nutrient utilization and growth performance of broiler chickens.

Materials and Methods

Experimental Design

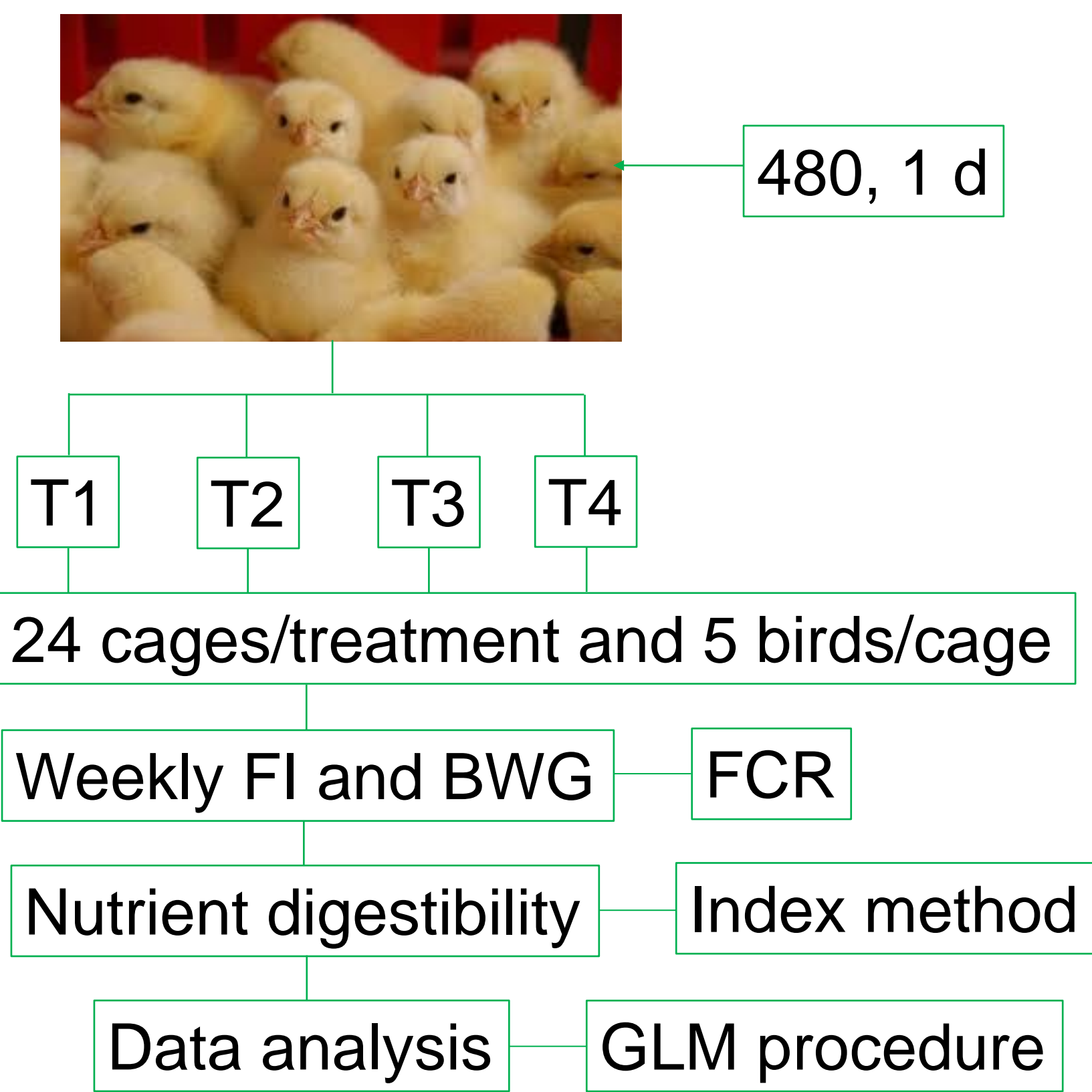


Figure: Experimental design depicting treatment groups and sampling procedures.

T1 = corn-soybean- main ingredients + 25% corn starch + 0% D-xylose
T2 = T1 + 20% corn starch + 5% D-xylose
T3 = T1 + 10% corn starch + 15% D-xylose
T4* = T1 + 25% D-xylose

The study was conducted for 21 days. Excreta were collected on d 18-20 and on d 21, 36 birds/treatment were selected randomly and sacrificed for collection of ileal digesta to determine nutrient digestibility.

Results

*Replacing corn starch with 25% D-xylose reduced feed intake and animal performance, but increased mortality rate during the first two week of the experiment. So, birds in this treatment group were removed from the study. Apparent ileal DM, GE, starch, and nitrogen digestibility coefficients were not significantly different among treatments.

Table 1: Mean weekly feed intake (g) of birds fed increasing levels of D-xylose

Experimental period (days)	T1, 0% D-xylose	T2, 5% D-xylose	T3, 15% D-xylose	PSE	P-value
D0-7	120.3 ^a	116.3 ^{ab}	109.5 ^b	2.84	0.031
D7-14	293.9	292.9	277.3	4.97	0.039
D14-21	461.8 ^a	461.3 ^a	410.8 ^b	8.95	0.003
D0-21	876.2 ^a	870.4 ^a	797.8 ^b	13.43	0.003

Table 2: Mean weekly body weight gain (g) of birds fed increasing levels of D-xylose

Experimental period (days)	T1, 0% D-xylose	T2, 5% D-xylose	T3, 15% D-xylose	PSE	P-value
D0-7	97.0	91.2	89.0	2.84	0.074
D7-14	234.3 ^a	219.9 ^a	206.5 ^b	4.86	0.004
D14-21	353.5 ^a	335.1 ^a	301.8 ^b	9.96	< 0.001
D0-21	682.5 ^a	646.2 ^a	597.3 ^b	11.55	< 0.001

Table 3: Mean weekly feed conversion ratio of birds fed increasing levels of D-xylose

Experimental period (days)	T1, 0% D-xylose	T2, 5% D-xylose	T3, 15% D-xylose	PSE	P-value
D0-7	1.26	1.25	1.23	0.03	0.334
D7-14	1.26 ^a	1.29 ^a	1.35 ^b	0.02	0.003
D14-21	1.31 ^a	1.32 ^a	1.30 ^b	0.02	0.021
D0-21	1.28 ^a	1.30 ^a	1.34 ^b	0.01	0.002

Table 4: Mean apparent total tract dry matter, gross energy and nitrogen digestibility of birds fed increasing levels of D-xylose

Item	T1, 0% D-xylose	T2, 5% D-xylose	T3, 15% D-xylose	PSE	P-value
Dry matter, %	72.4 ^a	68.8 ^b	64.3 ^c	0.690	< 0.001
Gross energy, %	76.7 ^a	73.1 ^b	68.1 ^c	4.97	< 0.001
Nitrogen, %	66.4 ^a	63.5 ^{ab}	62.2 ^b	0.997	0.021

References:

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Conclusion:

The results of this study demonstrate that, although nutrient digestibility may be impacted, 5% D-xylose can be tolerated by broiler chickens before adverse effects on growth performance are observed. At high dietary inclusion rates (25%), D-xylose was found to detrimentally affect growth and increase mortality rates showing xylose is not an efficient source of energy for broilers.

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