Journal of Research in Ecology

An International Scientific Research Journal

ISSN No: Print: 2319 –1546; Online: 2319– 1554

Original Research

Effect of feed dilution using date palm seed powder at different ages on some productive and economic traits of broiler in Al-Muthanna province

Authors:
Fatema AA Merdas, Ibrahim FB Al-Zamili, Hayder H Blaw and Jassim KM Al-Gharawi

Institution:
Agriculture College, Al-Muthanna University, Samawah, Iraq.

Corresponding author:
Fatema AA Merdas

ABSTRACT:

This experiment was conducted in the poultry farm of the Research Station and Agricultural Experiments Center of the Agriculture College of Al-Muthanna University from 25.10.2017 to 5.12.2017. Determination of feed dilution using date palm seed powder at different ages on some productive and economic traits of broiler Ross308 was carried out in the Al-Muthanna province at year 2017. 240 one-day-old chickens were used for the analysis, randomly allocated to four feeds. They were restricted by date palm powder 20% [0 day (T_1), 7-14 days (T_2), 14-21 days (T_3) and 21-28 days (T_4)]. The results of the experiments showed that a significant increase ($P \leq 0.05$) in T_2 was seen on the productive traits (weekly body weight, cumulative weight gain, feed conversion and production index), with a significant decrease ($P \leq 0.05$) on feed consumption compared with other treatments. Economic efficiency indicators showed a significant increase ($P \leq 0.05$) in T_2 on the net cash income, economic profit, net farm income, return on labor farm, total added value and profit margin. Analysis of cost items indicated that the feed costs were the largest about 51%, followed by the cost of broiler purchasing and transport which amounted to 21.5% and 10.3%, respectively.

Keywords:

Dilution feed, Date palm seeds powder, Productive and economic traits, Broiler.

Article Citation:
Fatema AA Merdas, Ibrahim FB Al-Zamili, Hayder H Blaw and Jassim KM Al-Gharawi
Effect of feed dilution using date palm seed powder at different ages on some productive and economic traits of broiler in Al-Muthanna province at year 2017
Journal of Research in Ecology (2018) 6(2): 1771-1777

Dates:
Received: 12 May 2018 **Accepted:** 16 June 2018 **Published:** 05 July 2018

Web Address:
http://ecologyresearch.info/documents/EC0561.pdf

Journal of Research in Ecology

INTRODUCTION

Poultry is one of the main sources of animal protein that, provides the consumer with high-value white meat because of high protein content and easy to digest compared to red meat (Naji, 2006). Iraq suffers from a food gap from poultry meat, represented by the difference between local production and consumption. This gap was reduced through imports, and the problem has been further exacerbated by the high costs of poultry feed and other essential supplies to a number of poultry farms in Al-Muthanna province 111 at the year 2015 (PPR, 2015). The great development of selective breeding and feeding operations for the strains of modern broiler produced strains characterized by the fast growth with high conversion efficiency (Xu *et al.*, 2017), but high growth rates have negatively affected the immune response (Ahmed and Butris, 2014), which led to a high rate of death and sudden death, that usually occurs on the three weeks of broiler's life (Youssouf *et al.*, 2017). Recent studies suggested to reduce the growth speed at early ages of broiler, and growth compensation at later ages (Xu *et al.*, 2017). Feed restriction varied include diet dilution, low digestible materials such as wheat bran, or non-digestible materials such as oatmeal husks, rice husks, sand and sawdust (Atapattu and Silva, 2016), to reduce energy and protein in diet and maintenance needs for a short period of early chicken life (Khatib and Chlor, 2013). The aim of this study is to measure the effect of feed dilution by date palm seed powder at different periods of bird life on the productive and economic traits.

Table 1. Composition of basal diet*

S. No	Items	Starter 1-28 d	Finisher 29-42 d
1	Corn	45.90	50.60
2	Wheat	14.50	14.50
3	Soybean meal (45%)	35.00	30.00
4	Mineral and vitamin premix**	1.00	1.00
5	Oil	2.50	3.00
6	Limestone	0.80	0.60
7	Dicalcium phosphate	0.30	0.30
8	Total	100 %	100 %
	Calculated analysis		
1	Crude protein (%)	21.41	19.62
2	Metabolism energy (kilo calorie per kg. Diet)	3104.00	3182.00
3	Calcium (%)	0.90	0.85
4	Phosphorus (%)	0.47	0.44
5	Methionine (%)	0.56	0.51
6	Lysine (%)	1.30	1.20
7	Methionine + Cysteine (%)	0.88	0.83

* Use the feed supplier of Ghadeer company animal and poultry feed. Mash diet was provided to the birds and analysis according to NRC (1996).

** Each 3.0 kg of the vitamins and minerals premix contains: vitamin A, 12000000 IU; vitamin D3 2500000. IU; vitamin E, 10 g; vitamin K, 2.5 g; vitamin B1, 1.5 g; vitamin B2,5 g; vitamin B6, 1.5 g; vitamin B12, 10 mg; choline chloride, 1050 g; biotin, 50 mg; folic acid, 1 g; nicotinic acid, 30 g; calcium pantothenate, 10 g; zinc, 55 g; copper, 10 g; ferrum, 35 g; cobalt, 250 mg; selenium, 150 mg; I, 1 g; manganese, 60 g and anti-oxidant, 10 g.

MATERIALS AND METHODS

This field experiments were conducted at the Agricultural Research and Experiments Station, Agriculture college, Al-Muthanna University from 25.10.2017 to 5.12.2017.

Bird trial

A total of 240 one-day-old Ross308 broiler chickens were randomly assigned to 12 cage pens (1×1.5m). A density of 20 birds/cage was taken into consideration in a randomized complete design. Four treatment diets were used with three pens per treatment, the treatment were as follows:

- First treatment (T_1): control (basal diet).
- Second treatment (T_2): diluted diet with 20% date palm seeds powder for 7-14 days of birds age.
- Third treatment (T_3): diluted diet with 20% date palm seeds powder for 14-21 days of birds age.
- Fourth treatment (T_4): diluted diet with 20% date palm seeds powder for 21-28 days of birds age.

Dietary treatments were formulated to fulfill all nutrient requirements of birds in each phase according to NRC (1996) for starter (d 0 to d 21) and finisher (d 22 to d 42; Table 1 and 2).

Productive performance traits

Weekly Body Weights (BW), Body Weight Gain (BWG), Average Weekly Feed Intake (AWFI) and

Feed Conversion Ratio (FCR) of birds were recorded. As well as Production index was measured according to the formula referred by Naji (2006):

$$\text{Production index} = \frac{\text{Average body weight (g)} \times \text{viability}}{\text{Rearing period} \times \text{feed conversion} \times 10}$$

where, viability: 100-mortality.

Economic traits

The following analysis was conducted to understand the economic traits in this experiment using the formulae recommended by Al-Mashahadani (2002).

Net cash income = Cash income - Cash expenses,

Net farm income = Net cash income + (change in value of farm assets),

Return on labor farm = Net farm income - Interest on capital,

Gross value added = (Profits + Wages + Depreciation + Interest on Capital),

Profit margin = Earnings / revenue,

The percentage of profit per unit of cash is considered as the income,

Production quantity at break point = Fixed cost * Production quantity / production value - variable cost.

Data of productive and economic characteristics studied were obtained from the results of the experiment, prevailing prices for the production components were adopted for the same period. The values of all the variables in the dollar were calculated. The components of production are sold in this currency, selling and buying products in dollars avoids the possibility of low returns due to the fluctuation of the local exchange rate. The yield was calculated by multiplying the number of birds by the average weight per bird per kilogram of production ($ 2.416). In the same way, the values of all the studied variables were calculated by multiplying the values of those variables obtained by the experiment

Table 2. Chemical composition of the starter and dilution diet (by 40% date palm seeds powder)

S. No	Calculated chemical composition	Basal diet	Diluted diet
1	Crude protein (%)	21.41	15.39
2	Metabolism energy (kilo calorie per kg. Diet)	3140	2630
3	Calcium (%)	0.90	0.55
4	Phosphorus (%)	0.47	0.31
5	Methionine (%)	0.56	0.34
6	Lysine (%)	1.30	0.79
7	Methionine + Cysteine (%)	0.88	0.53

The chemical analysis was carried out in the poultry laboratory at the Faculty of Agriculture, Muthanna University

Table 3. Effect of diet dilution by 20% date palm seed powder on performance of broiler at different ages

S. No	Performance parameters	Dilution diet periods			
		0 (control) (T_1)	7-14 (T_2)	14-21 (T_3)	21-28 (T_4)
	Body weight (g)				
1	21 d	864.2±3.22^{a}	866.3±2.37^{a}	803.1±1.18^{b}	867.2±3.62^{a}
2	42 d	2374.1±5.18^{b}	2582.0±8.45^{a}	2393.3±6.90^{b}	2348.2±5.03^{b}
	Body weight gain (g)				
1	1-21 d	821.2±1.44^{a}	823.3±2.65^{a}	760.1±1.16^{b}	824.2±1.82^{a}
2	21-42 d	1509.9±6.61^{c}	1715.8±5.46^{a}	1590.2±4.83^{b}	1481.0±3.84^{b}
3	1-42 d	2331.1±7.62^{b}	2539.1±5.41^{a}	2350.3±6.54^{b}	2305.2±5.49^{c}
	Feed intake (g/d)				
1	1-21 d	77.3±0.49	78.6±0.54	78.4±0.22	77.4±0.30
2	21-42 d	161.7±0.92^{b}	160.6±0.72^{b}	168.0±0.88^{a}	171.5±0.52^{a}
3	1-42 d	119.5±0.89^{b}	119.6±0.97^{b}	123.2±1.02^{ab}	124.5±0.79^{a}
	Feed conversion ratio (g/g)				
1	1-21 d	1.98±0.002^{a}	2.02±0.002^{a}	2.17±0.001^{b}	1.97±0.002^{a}
2	21-42 d	2.25±0.002^{b}	1.97±0.002^{a}	2.22±0.002^{b}	2.43±0.001^{c}
3	1-42 d	2.15±0.003^{b}	1.98±0.002^{a}	2.20±0.002^{bc}	2.27±0.002^{c}
4	Mortality, %	3.33±0.004^{a}	1.66±0.004^{b}	1.66±0.003^{b}	1.66±0.002^{b}
5	Production index	261.4±1.11^{b}	305.3±1.07^{a}	254.4±1.29^{bc}	250.3±0.92^{c}

a,b: Tukey values in rows with no common superscripts differ significantly (P≤0.05).

Table 4. Effect of diet dilution by 20% date palm seed powder on economic traits of broiler at different ages

S. No	Performance parameters	Dilution diet periods			
		0 (control) (T_1)	7-14 (T_2)	14-21 (T_3)	21-28 (T_4)
		Body weight value ($)			
1	21 d	2.088±0.002[a]	2.093±0.003[a]	1.941±0.002[b]	2.096±0.001[a]
2	42 d	5.737±0.011[b]	6.240±0.009[a]	5.784±0.012[b]	5.674±0.009[b]
		Feed intake value ($)			
3	1-42 d	2.509±0.002[b]	2.474±0.001[c]	2.532±0.003[ab]	2.553±0.002[a]

a,b: Tukey values in rows with no common superscripts differ significantly (P≤0.05)

results in the price per kilogram

Statistical analysis

Data generated from the present experiment was subjected to statistical analysis using the GLM procedure of SAS (2012) statistical software package. When significant differences were noted, mean were compared using Tukey-Kramer method to assess any significant differences at the probability level of P<0.05 among the experimental treatments.

RESULTS AND DISCUSSION

Performance traits

Table 3 shows the effect of feed dilution by 20% date palm seed powder at different ages on some productive performance of broiler, feed dilution with 20% date seed powder at the age of 14-21days (T_3). This resulted in a significantly reduced (P≤0.05) body weight, body weight gain and feed conversion ratio at the age of 21 in broilers. While the final body weight and body weight gain, feed conversion ratio (21-42 and 1-42 days) and production Index significantly increased (P≤0.05) in feed dilution at 7-21 days (T_2) compared to other treatments, feed intake significantly increased (P≤0.05) in T_4 at the age of 21-42 and 1-42 days compared with the other treatments. There were no significant difference among the treatments at the age of 1-21 days.

Performance traits

The reason for the low body weight at the feed dilution period is because of the lower level of energy and protein in the diet, which were needed for the basic growth of birds and are necessary for their maintenance (Al-Gharawi *et al.*, 2018). A significant increase in the body weight of T_2 at the end of feed restriction period, was at the compensatory growth due to the short duration of dietary rationing (Al-Zamili *et al.*, 2018). Some

Table 5. Effect of diet dilution by 20% date palm seed powder on the total cost items for each bird

S. No	Performance parameters	Dilution diet periods			
		0 (control) (T_1)	7-14 (T_2)	14-21 (T_3)	21-28 (T_4)
1	Leased work ($)	0.083±0.0001	0.083±0.0002	0.083±0.0002	0.083±0.0002
2	Vaccines ($)	0.056±0.0001	0.056±0.0001	0.056±0.0001	0.056±0.0001
3	Heating ($)	0.208±0.0004	0.208±0.0004	0.208±0.0004	0.208±0.0004
4	Vitamins ($)	0.028±0.0001	0.028±0.0001	0.028±0.0001	0.028±0.0001
5	Antibiotics ($)	0.052±0.0002[a]	0.020±0.0002[b]	0.020±0.0002[b]	0.020±0.0002[b]
6	Hall rent ($)	0.139±0.0003	0.139±0.0003	0.139±0.0003	0.139±0.0003
7	Electricity and water ($)	0.104±0.0002	0.104±0.0002	0.104±0.0002	0.104±0.0002
8	Transportation cost ($)	0.104±0.0002	0.104±0.0002	0.104±0.0002	0.104±0.0002
9	Chicks cost ($)	0.465±0.0011	0.465±0.0011	0.465±0.0011	0.465±0.0011
10	Feed cost ($)	2.499±0.002[b]	2.472±0.002[c]	2.528±0.002[a]	2.542±0.002[a]
11	Interest ($)	0.139±0.001	0.139±0.001	0.139±0.001	0.139±0.001
12	Total cost ($)	3.877±0.003[a]	3.818±0.002[b]	3.874±0.002[a]	3.888±0.003[a]

a,b: Tukey values in rows with no common superscripts differ significantly (P≤0.05)

Table 6. Effect of diet dilution by 20% date palm seed powder on total return per treatment

S. No	Performance parameters	Dilution diet periods			
		0 (control) (T_1)	7-14 (T_2)	14-21 (T_3)	21-28 (T_4)
1	Birds number sold	58±0.23	58±0.31	59±0.29	59±0.15
2	Weight sale (g)	2374.08±9.55	2582.03±7.29	2393.32±10.01	2348.16±6.62
3	Production (kg)	137.697±1.14	152.340±1.22	141.206±1.06	138.541±1.27
4	Selling price ($)	2.417±0.002	2.417±0.002	2.417±0.002	2.417±0.002
5	Total return ($)	332.754±2.30	368.140±1.27	341.234±1.47	334.800±1.92

Table 7. Effect of diet dilution by 20% date palm seed powder on net income and economic profit per treatment

S. No	Performance parameters	Dilution diet periods			
		0 (control) (T_1)	7-14 (T_2)	14-21 (T_3)	21-28 (T_4)
1	Total return ($)	332.754±2.58	368.140±2.78	341.234±2.66	334.800±2.29
2	Total cost ($)	291.766±1.85	289.521±1.77	293.170±1.49	294.464±1.71
3	Interest ($)	8.500±0.051	8.432±0.039	8.539±0.044	8.577±0.028
4	Net income ($)	40.988±0.171	78.619±0.126	48.065±0.133	40.331±0.152
5	Economic profit ($)	32.490±0.111	70.187±0.145	39.526±0.082	31.754±0.074

studies indicated that feed consumption increases during the feed dilution period, the high fiber in bird food leads to more feed intake during the reduction of feed to compete energy and protein needs, which were usually low at the feed restriction periods (Atapattu and Silva, 2016). A significant improvement was seen in the T_2 of feed conversion at the end of the feed dilution period. Birds returns to free nutrition *ad libitum* and access to the compensatory growth (Saleh *et al.*, 2004), due to the time available after the rationing period, longer than the other treatments. A high compensatory growth rate and the positive effect on the conversion efficiency was also recorded by Al-Gharawi *et al.* (2008). Mortality decline of feed dilution treatment due to the slow growth at the feed restriction period led to the immune response increase in birds, which reduced the chance of bird disease (Naji *et al.*, 2003). Highly production index in T_2 compared to other experimental treatments, depends on body weight, mortality and feed conversion coefficient, when while these three traits improve and increase the production index values (Khudair and Ibrahim, 2010).

Economics traits

Table 4 shows that T_2 gave the significant ($P \leq 0.05$) high value in the final body weight, while the rate was 6.240 dollars. The same treatment showed the significant ($P \leq 0.05$) lowest value in total consumer feed, which amounted to 2.474 dollars compared to the other treatments.

Economic efficiency is defined as the ratio between the results achieved for the means used. Efficiency is to maximize the proportion of farm products and productive resources used in their production (Najafi, 1982). It can achieve greater agricultural output in the same amount of resources with optimal allocation and efficient use of available resources for maximum production (Al-Okeili, 2006). Economic efficiency involves both technical efficiency and price efficiency (Al-Ruwais, 2005) It is also assumed that the technical efficiency reflects the productivity ratio to produce a certain level of output that the price efficiency reflects

Table 8. Effect of diet dilution by 20% date palm seed powder on evaluate some economic efficiency criteria per treatment

S. No	Performance parameters	Dilution diet periods			
		0 (control) (T_1)	7-14 (T_2)	14-21 (T_3)	21-28 (T_4)
1	Net cash income ($)	0.147±40.99	0.175±78.622	0.122±48.065	0.121±40.332
2	Net farm income ($)	29.513±0.095	72.379±0.117	42.281±0.106	34.656±0.088
3	Return on labour farm ($)	21.015±0.036	63.947±0.055	33.742±0.021	26.080±0.043
4	Gross value added ($)	54.489±0.022	92.080±0.044	61.606±0.059	53.906±0.016
5	Profit margin/profit ratio per dollar	0.123±0.001	0.214±0.001	0.141±0.001	0.120±0.001

the great profit-generating combination (Nuthall, 2016). Economic efficiency is the result of both technical efficiency and price efficiency (El-Mallah, 1991). Table 5. shows the cost items for the research treatment (each bird), whereas, the total cost items were the lowest in T_2 with about 3.818 dollars followed by the control, T_3 and T_4 respectively. Feed costs were the most cost items, accounting for about 51.6% of the total cost, reflecting the importance of dilution feed treatment.

Table 6 shows the revenue obtained from each treatment after considering the mortality. The highest income was recorded in T_2, amounting to approximately 368.140 dollars and ranked second, third and fourth the treatments T_3,T_4 and T_1 respectively.

Table 7 shows the amount of profit achieved for each treatment. All treatments achieved net income and positive economic profit, T_2 achieved the highest net income of about 78.619 dollars. Highest economic profit 70.187 dollars, which is the most efficient treatment among the experimental treatments.

Table 8 shows that T_2 exceeds all the criteria of economic efficiency studied (price efficiency), which enhances their superiority in productive traits (technical competence). Economic efficiency is completed after the technical and price efficiency of this treatment has been achieved.

CONCLUSION

Feed costs accounted for 51% of total costs, low feed consumption for the feed dilution treatments compared to control, increase of final body weight in T_2. Lower feed costs are due to lower consumption of dilution treatments, decrease in mortality as well as the superiority of the production index. T_2 exceeds the standards of net and agricultural net income, farm labour returns, total value added and profit margin comparing with the remaining three transactions.

REFERENCES

Ahmed SKh and Butris GY. 2014. The off feeding intervals effect on some performance traits of broilers. *The Iraqi Journal of Veterinary Medicine*, 38(1): 48-55.

Al-Gharawi JKM, Al-Mosawi IF, Al-Jayashi HB and Al-Jarisi AR. 2008. Effect of two methods of early feed restriction on the productive performance of broilers. *Journal of Thi-Qar*, 11(1): 122-129.

Al-Gharawi JKM., Al-Zamili IFB, and Al-Hilali AHKh. 2018. Effect of diet dilution by dried green peas husks powder on some productive and carcass traits of broiler chickens. *Plant Archives*, 18(1): 785-791.

Al-Mashahadani AM. 2002. Financial calendar for poultry projects (broiler production farms). *Journal of Iraqi Agricultural Sciences*, 33(4): 213-22.

Al-Okeili OK. 2006. Estimation of Cost Functions and Economies of Size for broiler Projects in Baghdad Governorate. *Journal of Iraqi Agricultural Sciences*, 37(2): 43-52.

Al-Ruwais KN. 2005. Agricultural Production Economics. King Saud University, Faculty of Food and Agricultural Sciences, Department of Agricultural Economics. 476 p.

Al-Zamili IFB, Al-Gharawi JKM, Al-Hilali AHK and Merdas FA. 2018. Effect of different periods of early fasting on compensatory growth and carcass traits of broiler. *Biochemical and Cellular Archives,* 20:18(2) expected.

Atapattu NS and Silva LM. 2016. Effects of gradual feed dilution with inert or less nutritive materials on growth performance, feed cost and meat organoleptic properties of broiler chicken. *Brazilian Journal of Poultry Science*, 18(3): 427-434.

Chenxi Xu, Yang H, Wang Z, Wan Y, Hou B and Ling C. 2017. The effects of early feed restriction on

growth performance, internal organs and blood biochemical indicators of broilers. *Animal and Veterinary Sciences*, 5(6): 121-125.

El-Mallah J. 1991. Planning and Evaluation of Agricultural Projects. Dar Al-Marikh for Publishing, Riyadh, Saudi Arabia. 366 p.

Khatib SW and Chlor IS. 2013. The response of broiler to the phenomenon of compensatory growth using the early qualitative food rationing program. *Journal of Mesopotamia*, 41(3): 271-275.

Khudair SF and Ibrahim BM. 2010. Effect of different level of feed restriction by wood powder on production performance and some blood characteristics of Cobb 300 broiler. *Journal of Iraqi Agricultural Scienc*es, 41(2): 1-15.

Najafi ST. 1982. Animal Production Economics. University of Al Mosul. Iraq. 435 p.

Naji SA. 2006. Commercial broiler guide. Iraqi Union of Poultry Production, Poultry Science Organization. Special publish (12).176 p.

Naji SAH, Al-Ani EA, Menati JKM and Mukhlas SA. 2003. Effect of early feed restriction on body weight, food conversion efficiency and mortality of broiler. *Journal of Iraqi Agricultural Sciences*, 8(1): 23-30.

[NRC] National Research Council. 1996. Committee on Protection and Management of Pacific Northwest Anadromous Salmonids, Board on Environmental Studies and Toxicology, Commission on Life Sciences. Upstream: salmon and society in the Pacific Northwest. Washington: National Academy Press. 452 p.

Nuthall P. 2016. Farm business management: the fundamentals of good practice. Lincoln University, New Zealand. 374 p.

[PPR] Poultry Production Report. 2015. Poultry Production Report in Al-Muthanna Governorate. Al-Muthanna Agriculture Directorate- Ministry of Agriculture- Iraq. 366 p.

Saleh EA, Watkins SE, Waldroup AL and Waldroup PW. 2004. Comparison of energy feeding programs and early feed restriction on live performance and carcass quality of large male broiler grown for further processing at 9 to 12 weeks of age. *International Journal of Poultry Science*, 3(1): 61-69.

SAS. 2012. SAS users guide. Statistics version 6.12 . SAS institute, Inc, Cary, NC.

Youssouf T, Issifou DS, Alkoiret IT, Paraiso A and Mensah GA. 2017. The effect of feeding restriction with cassava flour on carcass composition of broilers. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, 118(2): 259-267.