Effect of Some Dietary Supplementation on Economic efficiency of growing Japanese Quails

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A B S T R A C T

This work was conducted to study the effect of sun dried tomato pomace (SDTP) with or without enzymes supplementation economic efficiency of Japanese quail. A total number of 306 seven-days-old quail chicks were used. The quail chicks were randomly allocated into 6 groups (51 unsexed chicks per group). Group 1 was fed on the basal diet (BD) without enzymes supplementation (control), quail chicks of group 2 were fed on the BD containing AveMix® 02 CS enzyme 0.02g/kg diet. While quail chicks of group 3 were fed BD containing 2.5% DTP). Group 4 received BD containing with 2.5% SDTP with Ave Mix® 02 CS enzyme. Group 5 received BD containing 5% SDTP. Group 6 received BD containing 5% SDTP with Ave Mix® 02 CS enzyme. Our results clarified that, the increasing (5%) SDTP to diet resulted in an increase of final weight by 29.36%. Also, increasing body weight resulted in an increase of total cost by 0.55% in case of 2.5% SDTP group.

Keywords: Japanese quail, dried tomato pomace and Economic efficiency.

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1. INTRODUCTION

Today, the world is suffering from a serious shortage of livestock feed ingredients because of the rapid increase in human population. So using alternative feed ingredients in poultry ration is a key determinant of successful poultry production (*Habanabashaka et al., 2014).Giovanelli et al., (2002)* said that rising costs of cereals and imported feedstuffs for poultry diets have resulted in a search for alternative ingredients that would be available as by-products from local agricultural industries. Also, *Ayaşan, (2013)* mentioned that the Japanese quail had attained economic importance as the smallest avian species which produce eggs and meat that enjoyed for their unique flavor. Also, Japanese quails cheracterized by low maintenance cost associated with its small body size (80-300 g) plus its and short generation interval.Raising Japanese quail for food was regardedas another dimension of poultry farming as a result of increase demand foranimal protein in developing countries.Quail are more tolerant to poor conditions of management than the chicken and resistant to common poultry diseases *(Owen and Dike, 2013). Mirzaei-Aghsaghali et al., (2011)*defined that tomato is one of the most widely cultivated vegetable crops in Mediterranean countries and consumed in the form of different products such as tomato juice, paste, pur´ee, ketchup, sauce, and salsa. During processing, a by-product, known as tomato pomace, is generated and consists of peel, cores, culls, trimmings and unprocessed green tomatoes. The proposal of recovery agricultural wastes is rapidly spreading around the world with an increasing demand for their converting into useful by-products that help the environmental balance. Despite many investigations regarding unconventional poultry feeds, the effect of diet containing of SDTP on growing quail economic parameters is enigmatic. Therefore, this study was carried out to investigate the effect of diets containing two levels (2.5 and 5%) of SDTP with or without AveMix® 02 CS enzyme on economic efficiency of growing Japanese quail.

2. MATERIALS AND METHODS

2.1. Experimental chicks:

Our study was carried out at the quail production unit of the faculty of veterinary medicine Moshtohor, Benha University. Department of Animal Wealth Development,at the period extended from 7th March 2015 to 11th April 2015. A total of 306 seven-day-old Japanese quail chicks were used in this study.

2.2. Management & Housing

Chicks were weighed, wing-banded for identification. A total of 306 seven-day-old quail chicks randomly divided into (6) groups (51 bird/ group). Each group with (3) replicates, each replicate contained 17 birds housed in 2 battery cages; each cageconsisted of 10 departments.

2.2. Accommodation and management:

The quail chicks were housed in a clean well-ventilated room, previously disinfected with formalin. Brooding temperature started at 30ºC for the 2nd week; 29ºC throughout the 3rd week till the end of experiment. Natural and artificial lighting was provided for 24 hours over the experimental period. Feeds and water were supplied ad-libitum.

2.3. Experimental diets:

2.3.1. Tomato pomaceobtained from commercial processors (Hienzcompany, 6th October City, Egypt). It was dried by spreading on a plastic sheet with exposing to sunlight. The particle size of pomace reduced by beating using stick and hand crushing according to *Yitbarek, (2013).* It was turned up 2-3 times daily, after drying it was crushed according to *Melkamu et al., (2011).*

2.3.2. Enzyme description:

AveMix® 02 CS enzyme, a commercial multi enzyme containing glucanase, endo-1,4-β-xylanase and pectinase added to enzyme supplemented diet at the rate of 0.2g/kg diet.

Quail chicks were randomly sorted into six experimental groups and were fed ad libitum on the 6 different experimental diets until the end of the experiment (42 d of age).

2.4. Studied traits:

2.4.1. Economic efficiency measurements:

The most important economic efficiency parameters studied include the following:

2.4.1.1. Total costs (TC): were estimated by summation of total fixed cost and total variable cost according to *(Mohamed, 2015).*

2.4.1.2. Returns parameters which include

- Total returns = Litter sale + quail sale. It was calculated according to *El-Sheikh et al., (2013)*.

2.4.2. Production and cost function:

2.4.2. 1.Production function:

Logarithmic form was the best for determination the production model to estimate the effect of dietary supplement cost on body weight of growing quail for each group according to *Atallah (1997).*

2.4.2.4. Costs function: Logarithmic form was carried out to estimate

2.4.2.4.1. Effect of body weight on total cost

The body weight used as (independent variable) and total cost used as (dependant variable).

2.4.2.4.2. Effect of total return on total costs

The total return used as (independent variable) and total cost used as (dependant variable) according to *Fardos (2009).*

3. RESULTS

3.1. Effect of dietary supplement cost on final body weight

There was a significant ($p \leq 0.05$) of the production function and positive relationship between final body weight and dietary supplement cost for growing quail in control group supplemented with enzymes, group containing (2.5%) SDTP, group containing (2.5%) SDTP with enzymes, group containing (5%) SDTP and group containing (5%) SDTP with enzymes group.

3.2. Cost functions which include:

3.2.1. The relationship between body weight and total costs.

There was a significant ($p \leq 0.05$) of the production function and positive relationship between body weight and total cost weight for growing quail in control supplemented with enzymes group, (2.5%) SDTP, (2.5%) SDTP with enzymes, (5%) SDTP and (5%) SDTP with enzymes group.

3.2.2. The relationship between the Total Returns and Total Costs of growing quail:

There was a significant ($p \leq 0.05$) of the production function and positive relationship between total return and total cost weight for growing quail in control supplemented with enzymes group, (2.5%) SDTP, (2.5%) SDTP with enzymes, (5%) SDTP and (5%) SDTP with enzymes group.

Table (1): Experimental design for all treated groups.

Group	Number of birds	Diets
1	51	Control- Basal diet only
2	51	D1- Basal diet containing AveMix® 02 CS enzyme
3	51	D2 - Basal diet containing (2.5% SDTP)
4	51	D3 - Basal diet containing (2.5% SDTP + AveMix® 02 CS enzyme).
5	51	D4 - Basal diet containing (5%) SDTP.
6	51	D5 - Basal diet containing (5%) SDTP +AveMix® 02 CS enzyme.

Table (2): Production Function of total weight and dietary supplement for Control with Enzyme

Function	Log weight = 2.723 + 0. 493 log dietary supplement
t	(15.658) * (2.289) *
F	(5.237) *
R^{-2}	(0. 8)

** Significant at ($P \leq 0.05$).

Table (3): Production Function of total weight and dietary supplement for (2.5%) SDTP.

Function	Log weight = 2.225 + 0. 465 log dietary supplement
t	(37.567) * (1.807) *
F	(3.265) *
R^{-2}	(0. 045)

** Significant at ($P \leq 0.05$).

Table (4): Production Function of total weight and dietary supplement for (2.5%) SDTP with Enzymes.

Function	Log weight = 0.515 + 1.346 log dietary supplement
t	(1.085) * (3.828) *
F	
R^{-2}	(14.657) *
	(0.218)

** Significant at ($P\leq$ 0.05).

Table (5): Production Function of total weight and dietary supplement of (5%) SDTP.

Function	Log weight = 2.119 + 0. 391 log dietary supplement
t	(25.718) * (2.538) *
F	
R^{-2}	(6.443) *
	(0. 100)

** Significant at ($P\leq$ 0.05).

Table (6): Production Function of total weight and dietary supplement of (5%) SDTP with Enzymes.

Function	Log weight = -2.529 + 2.936 log dietary supplement
t	(-3.594) * (6.910) *
F	
R^{-2}	(47.745) *
	(0. 488)

** Significant at ($P\leq$ 0.05).

Table (7): Cost Function of total weight and total cost of control group

Function	Log total costs = 2.422 +0 .114 log weight
t	(31.323) ** (3.413) **
F	(11.650) **
R^{-2}	(0.179)

** Significant at ($P \leq 0.05$).

Table (8): Cost Function of total weight and total cost of Control with Enzyme Groups:

Function	Log total costs = 2.446 +0 .089 log weight
t	(27.021) ** (2.293) **
F	(11.650) **
R^{-2}	(0.80)

** Significant at ($P \leq 0.05$).

Table (9): Cost Function of total weight and total cost of (2.5%) SDTP groups

Function	Log total costs = 2.526 +0 .055 log weight
t	(28.089) * (1.425) *
F	(2.032) *
R^{-2}	(0. 21)

** Significant at ($P \leq 0.05$).

Table (10): Cost Function of total weight and total cost (2.5%) SDTP with enzymes group:

Function	Log total costs = 2.491 +0 .081 log weight
t	(49.631) *** (3.786) ***
F	(14.336) ***
R^{-2}	(0. 217)

** Significant at ($P\leq$ 0.05).

Table (11): Cost Function of total weight and total cost of (5%) SDTP group

Function	Log total costs = 2.344+0 .134 log weight
t	(19.192) * (2.551) *
F	(6.505) *
R^{-2}	(0.101)

** Significant at ($P\leq$ 0.05).

Table (12): Cost Function of total weight and total cost of (5%) SDTP with Enzymes group

Function	Log total costs = 2.503+0 .086 log weight
t	(86.687) ** * (6.924) ***
F	(47.946) ***
R^{-2}	(0.489)

** Significant at ($P\leq$ 0.05).

Table (13): Cost Function of total weight and total cost of Control group.

Function	Log total costs = 2.572+0 .040 log total returns
t	
F	(124.807) ** * (5.502) ***
R^{-2}	(30.274) ***
	(0.369)

** Significant at ($P \leq 0.05$).

Table (14): Cost Function of total cost and total return of Control with Enzymes group

Function	Log total costs = 2.212+0 .153 log total returns
t	
F	(145.167) ** * (28.790) ***
R^{-2}	(828.863) ***
	(0.943)

** Significant at ($P \leq 0.05$).

Table (15): Cost Function of total cost and total return of (2.5) SDTP group.

Function	Log total costs = 2.234+0 .145 log total returns
t	
F	(131.137) ** * (24.478) ***
R^{-2}	(599.174) ***
	(0.923)

** Significant at ($P \leq 0.05$).

Table (16): Cost Function of total cost and total return of (2.5%) SDTP with enzymes group.

Function	Log total costs = 2.211+0 .163 log total returns
t	
F	(295.018) *** (61.782) ***
R^{-2}	(3817.003) ***
	(0.987)

Table (17): Cost Function of total cost and total return of (5%) SDTP group.

Function	Log total costs = 2.224+0 .149 log total returns
t	
F	(111.339) *** (21.397) ***
R^{-2}	(457.839) ***
	(0.901)

** Significant at ($P \leq 0.05$).

Table (18): Cost Function of total cost and total return (5%) SDTP with Enzymes group.

Function	Log total costs = 2.480+0 .077 log total returns
t	
F	(432.749) *** (38.461) ***
R^{-2}	(1479.256) ***
	(0.967)

** Significant at ($P \leq 0.05$).

4. DISCUSSION:

The table (2) indicated that the significant ($p \leq 0.05$) of the production function and positive relationship between dietary supplement cost and body weight. the average elasticity of dietary supplement cost was about (+0. 493), meaning that the increasing dietary supplement cost by 10 % resulted in an increase of final weight by 4.93% and dietary supplement explained about 8% from changes in final body weight.

Concerning table (3), there is the significant ($p \leq 0.05$) of the production function and positive relationship between dietary supplement cost and body weight. The average elasticity of dietary supplement cost was about (+0. 465), meaning that the increasing dietary supplement cost by 10 % resulted in an increase of final weight by 4.65% and the dietary supplement explained about 4% from changes in final body weight. Our finding is in agreement with *Rezaeipour et al., (2012).*

In regard to table (4) we found a significant ($p \leq 0.05$) of the production function and positive relationship between dietary supplement cost and body weight. The average elasticity of dietary supplement cost was about (+1.346), meaning that the increasing dietary supplement cost by 10 % resulted in an increase of final weight by 13.46% and dietary supplement explained about 21% from changes in final body weight. This result is in the same line with *Pourreza et al., (2007) and Midau et al., (2011)* who found that enzyme supplementation improved body weight and birds have higher weights than the control group.

As shown in table (5), we observed the significant ($p \leq 0.05$) of the production function and positive relationship between dietary supplement cost and body weight. The average elasticity of dietary supplement cost was about (+0. 391), meaning that the increasing dietary supplement cost by 10 % resulted in an increase of final weight by 3.91%. This result agrees with *Yitbarek (2013)* showed that the diet containing 5% DTP led to significantly higher body weight gain.

The table (6) indicated the significant ($p \leq 0.05$) of the production function and positive relationship between dietary supplement cost and body weight. The average elasticity of dietary supplement cost was about (+2.936), meaning that the increasing dietary supplement by 10 % resulted in an increase of final weight by 29.36% and the dietarysupplement explained about 48% from changes in final body weight. This result is in the same line with *Kilany and Mahmoud (2014)* who concluded that enzyme supplementation led to significant increase in body weight due to it increases the nutrient digestibility.

Regarding table (7), The average elasticity of final BW was about (+0 .114), meaning that the increasing BW by 10 % resulted in an increase of TC by 1.14% and the value of feed substitution explained about 17% from changes in final body weight.

Table (8) showed that a significant ($p \leq 0.05$) of the production function and positive relationship final body weight and total cost. The average elasticity of final BW was about (+0.89), meaning that the increasing BW by 10 % resulted in an increase of TC by 1.14% and the value of dietary supplement explained about 8% from changes in final body weight.

Concerning table (9), there was a significant ($p \leq 0.05$) of the production function and positive relationship final body weight and total cost. The average elasticity of final BW was about (+0 .055), meaning that the increasing BW by 10 % resulted in an increase of TC by 0.55% and the value of dietary supplement explained about 21% from changes in final body weight.

In table (10), there was a significant ($p \leq 0.05$) of the production function and positive relationship final body weight and total cost. The average elasticity of final BW was about (+0 .081), meaning that the increasing BW by 10 % resulted in an increase of TC by 0.8% and the value of dietary supplement explained about 21.7% from changes in final body weight.

In regard to table (11), there was a significant ($p \leq 0.05$) of the production function and positive relationship final body weight and total cost. The average elasticity of final BW was about (+0 .134), meaning that the increasing BW by 10 % resulted in an increase of TC by 1.34% and the value of dietary supplement explained about 10.1% from changes in final body weight.

Table (12) showed that there was a significant ($p \leq 0.05$) of the production function and positive relationship final body weight and total cost. The average elasticity of final BW was about (+0 .086), meaning that the increasing BW by 10 % resulted in an increase of TC by 0.86% and the value of dietary supplement explained about 48.9% from changes in final body weight.

As shown in table (13), the results indicated that total return had a significant effect ($p \leq 0.05$) on total cost and about 36% from the changes in total costs attributed to the variations in the total return. The average elasticity of total return was about (+0 .040), meaning that the increasing total returns values by 10 % resulted in an increasein total costs by 0.40 %.

Regarding table (14), the average elasticity of total return was about (+0 .153), meaning that the increasing total returns values by 10 % resulted in an increasein total costs by 1.53%. This result is in the same line with *Benţea et al., (2010)* and *Perić et al., (2011)* concluded that addition of enzymes improves the profitability of hens.

In regard to table (15), the average elasticity of total return was about (+0 .145), meaning that the increasing total returns values by 10 % resulted in an increasein total costs by 1.45%. This result is in accordance by *Yitbarek (2013)* said that there is an inverse relationship between DTP inclusion in growers ration and feed cost per kg feed so that the total return will increase.

Concerning table (16), the results indicated that total return had a significant effect ($P<0.05$) on total cost and about 98% from the changes in total costs attributed to the shifts in the total return. The average elasticity of total return was about (+0 .163), meaning that the increasing total returns values by 10 % resulted in an increasein total costs by 1.63%. This result agrees with *Perić et al., (2011).*

Table (17) indicated that, that total return had a significant effect ($P<0.05$) on total cost and about 90% from the changes in total costs attributed to the variations in the total return. The average elasticity of total return was about (+0 .149), meaning that the increasing total returns values by 10 % resulted in an increasein total costs by 1.49%.

As shown in table (18), total return had a significant effect ($P<0.05$) on total cost and about 96% from the changes in total costs attributed to the shifts in the total return. The average elasticity of total return was about (+0 .077), meaning that the increasing total returns values by 10 % resulted in an increasein total costs by 0.77%. This result is in accordance by *Benţea et al., (2010) and Yitbarek (2013).*

From our study, we conclude that the increasing (5%) SDTP to diet resulted in an increase of final weight by 29.36%. Also, increasing body weight resulted in an increase of total cost by 0.55% in case of 2.5% SDTP group

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