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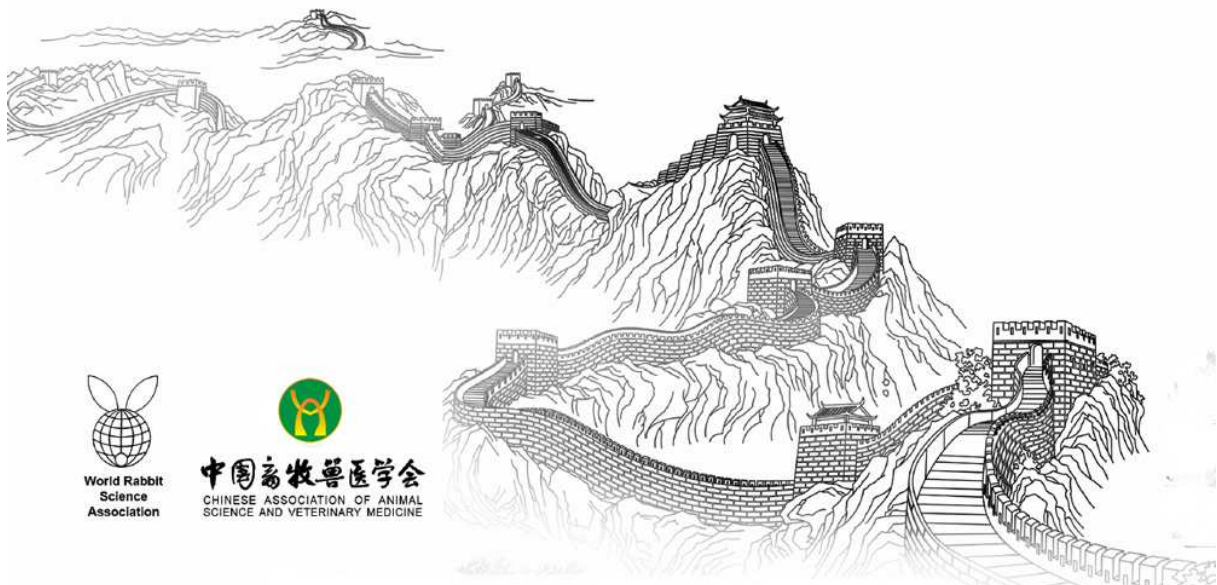
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EFFECT OF USING SUGARCANE BAGASSE WITH OR WITHOUT ENZYMES IN RABBIT DIETS ON GROWTH PERFORMANCE OF GROWING RABBITS

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ABSTRACT

The aim of this study was to evaluate the effect of using different sugarcane bagasse (SCB) levels with or without Kemzyme on performance of growing rabbits. One hundred APRI rabbits were divided randomly into five experimental groups of 20 rabbits each (10 males + 10 females) of 5 weeks of age with an average live body weight of (723 ± 2 gm), were used in this study. The following 5 diets were obtained: control (0% Sugarcane Bagasse), SCB50 diet (Sugarcane Bagasse replace to 50% Berseem hay), SCB100 diet (Sugarcane Bagasse replace to 100% Berseem hay), SCB50E diet (Sugarcane Bagasse replace to 50% Berseem hay with Kemzyme) and SCB100E diet (Sugarcane Bagasse replace to 100% Berseem hay with Kemzyme). All diets were nearly iso-nitrogenous, iso-caloric and contained similar levels of crude fiber and micro elements. Results indicated that Final body weight of rabbits fed diet containing 100% SCB replacement of Berseem hay was the lowest (P < 0.001), while those fed control diet had the highest. Rabbits fed control diet recorded the highest value of daily weight gain. While, the lower value was observed for rabbits fed SCB100 diet as compared with those fed control diet (P < 0.001). The highest value of relative growth rate was found for rabbits fed control diet, followed by those received SCB50E diet, while the lowest value was for those fed SCB100 diet. Feed intake was increased (P < 0.001) with increasing SCB level as compared with control diet. The highest performance index (PI) could be observed with rabbits fed SBC50E diet and control diets without significant differences, while those fed SCB100 diet recorded the lowest value (P < 0.001). Rabbits fed control and SCB50E diets had the best feed conversion ratio, while the worst value was observed with those fed SCB100 diet (P < 0.001). The net revenue showed that rabbits fed control diet recorded the highest net revenue. While, the lower value was observed for rabbits fed SCB100 diet (P < 0.001). There was no significant differences between control diets and SBC50E diet in the relative revenue. While the lowest relative revenue percentage was for rabbits fed SBC100 diet.

Key words: Growing rabbits, Sugarcane Bagasse, fiber, growth performance.

INTRODUCTION

In Egypt, there is a wide gap between animal requirements and the available feedstuffs, although, there are about 26 million tons of agricultural plant by-products produced annually in Egypt (Agriculture Economic and Statistics Institute, 2000). Sugarcane bagasse represents about 4.13 million tons per year according to Agriculture Economic and Statistics Institute (1995). There is a possibility of using bagasse in livestock feeding, while the use of by-products in animal nutrition is a necessity, since it may increase the availability of food for mankind as well as avoid accumulation that contributes to environmental problems.

Sugarcane bagasse is the most abundant by-product in Egypt. Poor intake, due to low digestibility and low energetic density, are considered the main reasons for unsatisfactory performance of animals fed such roughage. Even though bagasse and rice straw contain enough cellulose to make them excellent sources of energy for ruminants, they are poor quality feeds due to low digestibility, poor palatability, low protein content and bulkiness. To improve the nutritive value of Sugarcane bagasse, it is important to breakdown the linkages among cellulose, hemicellulose and lignin. The KEMZYME® has a

significant increase in the final body weight, blood levels of glucose, total lipids, total protein, and the activities of amylase, lipase and protease of serum, pancreatic tissues and intestinal contents as showed by Attia K.A. *et al.* (2012).

Therefore, the aim of this study was to evaluate the effect of using different levels of sugarcane bagasse with or without enzyme in diets of kits on the growth performance and the economical efficiency.

MATERIALS AND METHODS

Animals and experimental design:

The experiments of the present study were carried out at Sakha Animal Production Research Station, Animal Production Research Institute (APRI) during the period from September to December 2015. One hundred APRI rabbits were divided randomly into five experimental groups of 20 rabbits (10 males + 10 females) of 5 weeks of age with an average live body weight of (723 ± 2 gm), were used in this study. Rabbits were equal with respect to body weight and sex. Five experimental diets were formulated to cover all essential nutrient requirements for growing rabbits according to According to Villamide *et al.* (2010). The following 5 diets were obtained: control (0% Sugarcane Bagasse), SCB50 diet (Sugarcane Bagasse replace to 50% Berseem hay), SCB100 diet (Sugarcane Bagasse replace to 100% Berseem hay), SCB50E diet (Sugarcane Bagasse replace to 50% Berseem hay with Kemzyme) and SCB100E diet (Sugarcane Bagasse replace to 100% Berseem hay with Kemzyme). All diets were nearly iso-nitrogenous, iso-caloric on the basis of metabolizable energy and contained similar levels of crude fiber and micro elements. Table 1 shows the ingredient and nutrient composition of these diets.

Table1: Ingredient and chemical composition of experimental diets.

Ingredient	Diets				
	Control	SCB50	SCB100	SCB50E	SCB100E
Berseem hay	32.00	16.00	0	16.00	0
barley	31.00	31.00	31.40	31.00	31.40
soybean meal 44%	20.90	23.90	27.00	23.90	27.00
wheat bran	9.30	12.96	16.02	12.96	16.02
Sugarcane bagasse	0	9.54	19.08	9.54	19.08
Molasses	3.00	3.00	3.00	3.00	3.00
Limestone	0.60	1.00	1.40	1.00	1.40
Di-Calcuim	2.20	1.60	1.10	1.60	1.10
methionine	0.20	0.20	0.20	0.20	0.20
salt	0.30	0.30	0.30	0.30	0.30
Premix ⁽¹⁾	0.30	0.30	0.30	0.30	0.30
Anti-Fungi ⁽²⁾	0.10	0.10	0.10	0.10	0.10
Anti-oxidant ⁽³⁾	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Chemical Analysis:					
DM (%)	85.50	85.86	86.13	85.86	86.13
Ash (%)	5.74	5.25	4.75	5.25	4.75
CP (%)	17.90	17.90	17.90	17.90	17.90
EE (%)	1.39	1.59	1.77	1.59	1.77
CF (%)	13.42	13.42	13.38	13.42	13.38
NDF (%)	27.76	30.12	32.32	30.12	32.32
ADF (%)	16.76	16.76	16.72	16.76	16.72
ADL (%)	3.43	3.26	3.09	3.26	3.09
Hemicellulose (%)	10.99	13.36	15.60	13.36	15.60
Methionine (%) ⁽⁴⁾	0.459	0.456	0.452	0.456	0.452
Calcium (%) ⁽⁴⁾	1.26	1.25	1.25	1.25	1.25
Phosphorus (%) ⁽⁴⁾	0.833	0.815	0.811	0.815	0.811
DE (kcal)	2448	2447	2446	2447	2447

(1) PESTMIX produced by Pestar Company, China.

(2) Mycostat, Agil, England.

(3) FEEDOX®dry, IMP EXTRACO (Belgium).

(4) Calculated according to Villamide *et al.* (2010)

KEMZYME® is a multi-enzyme blend of *Kemin Agrifoods Europe*, containing 3000 µg beta-glucanase, 5000 µg cellulase, 450µg alfa-amylase and 450µg protease and lipase was used. Rabbits were housed in individual galvanized wire pyramidal batteries (30 x 25 x 35 cm) with feeder and automatic nipple drinkers. The batteries were arranged in rows in a windowed house naturally ventilated. A cycle of 16 hours of light and 8 hours of dark were used throughout the experiment. All rabbits were kept under the same management conditions. Feed and water were supplied *ad libitum*. Individual body weight and feed intake were taken weekly from 5 weeks until 13 weeks of age. Mortality and the clinical health status of all rabbits were monitored daily.

Statistical analysis:

Data were subjected to analysis of variance, using the general linear GLM procedure (SAS, 1998). The application of the least significant ranges among the different treatment means was done according to Duncan (1955).

RESULTS

Results concerning the effect of using different sugarcane bagasse (SCB) level with or without Kemzyme on performance of growing rabbits are presented in Table 2. Final body weight of rabbits fed diet containing 100% SCB replacement of Berseem hay was the lowest ($P < 0.001$), while those fed control diet had the highest. Rabbits fed control diet recorded the highest value of daily weight gain, followed by those received SCB50E and SCB50 diets. While, the lower value was observed for rabbits fed SCB100 diet as compared with those fed control diet (21.98 vs. 25.41 g, $P < 0.001$ respectively).

Table2: Effect of experimental diets on growth performance and economical traits of growing APRI rabbits from 5 to 13 weeks of age.

Parameter	Experimental Diets					MSE	Sig.
	Control	SBC50	SBC100	SBC50E	SBC100E		
No. of Animals	20	20	19	20	19	-	-
Initial Body Weight(g)	721.56	721.88	724.67	723.75	724.06	11.59	NS
Final Body Weight (g)	2144.7 ^a	2058.1 ^{bc}	1955.3 ^d	2120.3 ^{ab}	2038.4 ^c	24.87	***
Daily Weight Gain (g)	25.41 ^a	23.86 ^{bc}	21.98 ^d	24.94 ^{ab}	23.47 ^c	0.46	***
Feed Intake (g/d)	81.89 ^c	84.93 ^{ab}	87.15 ^a	82.73 ^{bc}	86.22 ^a	0.82	***
Feed Conversion Ratio	3.25 ^c	3.58 ^b	3.99 ^a	3.33 ^c	3.68 ^b	0.07	***
Relative Growth Rate	99.13 ^a	96.12 ^a	91.80 ^b	98.2 ^a	95.2 ^{ab}	1.41	**
Performance Index (%) ⁽²⁾	67.30 ^a	57.99 ^b	49.54 ^c	64.03 ^a	55.56 ^b	1.82	***
Mortality (%) ⁽¹⁾	0	0	5	0	5	-	-
Total Feed Intake (kg /head)	4.59 ^c	4.76 ^{ab}	4.88 ^a	4.63 ^{bc}	4.83 ^a	0.05	***
Price /kg Diet (L.E.)	2.94	2.86	2.79	2.88	2.82	-	-
Total Feed Cost (L.E.)	13.48	13.60	13.62	13.34	13.62	0.13	NS
Average weight gain (kg/head)	1.423 ^a	1.336 ^{bc}	1.230 ^d	1.396 ^{ab}	1.314 ^c	0.03	***
Selling Price (L.E.)	35.578 ^a	33.406 ^{bc}	30.766 ^d	34.914 ^{ab}	32.859 ^c	0.64	***
Net Revenue (L.E.)⁽³⁾	22.095 ^a	19.803 ^{bc}	17.150 ^d	21.572 ^{ab}	19.243 ^c	0.64	***
Relative Revenue (%)	100.00 ^a	89.63 ^b	77.618 ^c	97.63 ^a	87.09 ^b	1.99	***

MSE = Means of Standard Error, Sig= significance *: Significant at 5% level of probability; **: Significant at 1% level of probability; ***: Significant at 0.1% level of probability; NS: Non-significant.

a, b, c Means in the same row the different superscripts are significantly different ($P < 0.05$).

(1) Relative growth rate = [(Final body weight- Initial weight) / (Final body weight+ Initial weight)/2] x100

(2) Performance index = (Final live body weight (kg)/ Feed conversion ratio) x100, according to North (1981)

(3)Net revenue= Selling price – total feed cost.

Ingredients price (L.E. per ton) at 2015 were: 2500 barley; 2000 yellow corn; 1500 berseem hay; 1800 wheat bran ; 3800 soybean meal (44%) ; 8000 soybean oil ; 25 limestone ; 9000 premix ; 60000 methionine ; 500 bone meal ; 12000 anti-fungi; 9500 anti-oxidant; 1000 salt.

- Adding 200 L.E. /ton for pelleting.

Price of kg live body weight was 25 L.E.

The highest value of relative growth rate was found for rabbits fed control diet, followed by those received SCB50E diet, followed by those received SCB50 and SCB100E diets, while the lowest value was for those fed SCB100 diet. Feed intake was increased ($P<0.001$) with increasing SCB level as compared with control diet. The highest performance index (PI) could be observed with rabbits fed SBC50E diet and control diets without significant differences, while those fed SCB100 diet recorded the lowest value (67.30 and 64.03 vs. 49.54%, $P<0.001$, respectively). The depression in performance index (PI) in rabbits fed diet containing 100% SCB may be due to decrease in final body weight. Rabbits fed control and SCB50E diets had the best feed conversion ratio, while the worst value was observed with those fed SCB100 diet (3.25 and 3.33 vs. 3.99; $P<0.001$ respectively).

Results reported here agree with those reported by Nahla Abdel-Aziz *et al.* (2015), who found that biologically treated SCB lead to an improvement ($P<0.05$) in FCR and also showed that there were insignificant ($P>0.05$) differences among the FCR of groups fed control, ZAD and LZ. The net revenue showed that rabbits fed control diet recorded the highest net revenue. While, the lower value was observed for rabbits fed SCB100 diet (22.095 vs. 17.150 $P<0.001$ respectively). There was no significant differences between control diets and SBC50E diet in the relative revenue. While the lowest relative revenue percentage was for rabbits fed SBC100 diet.

CONCLUSIONS

It could be concluded that it is possible to replacement Sugarcane Bagasse with Kemzyme in rabbit's diet instead of Berseem hay up to 50% without any significant differences.

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