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Productive Impact Of Beta Glucan And Aloe Vera Gel On Growing Rabbits

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ABSTRACT

This research was carried out mainly to investigate the effects of the 0.50g beta glucan and 0.25, 0.50 and 1g\ kg diet aloe vera gel on performance, hematological parameters and economic efficiency. Sixty unsexed New Zealand White rabbits six weeks old were used on a completely randomized design in 5 groups each consisting of 12 rabbits. The groups included the control group (basal diet) and the other group with basal diet and 0.50g beta glucan and 0.25, 0.50 and 1g\ kg diet aloe vera gel supplemented in the diets.

The results obtained regarding final body weight, daily body weight gain and feed conversion which were significantly higher of the rabbits fed 0.50 g\ kg diet aloe vera gel and other 0.50 gm\ kg diet beta glucan compared to the other treatments. Total feed intake did not significantly affected by dietary treatments. Carcass and dressing% was significantly improved with feeding on 0.50 g\ kg diet aloe vera gel diets and the least value was with feeding on 1g\ kg diet aloe vera gel diet. Red blood cell, Hb, MCH and MCHC were significantly affected by 0.50 g\ kg diet aloe vera gel supplementation in the diet. Economic efficiency was increased with feeding the rabbits on 0.50 g\ kg diet aloe vera gel and 0.50 gm\ kg diet beta glucan diet.

Conclusively, it could be recommended that supplemented 0.50 g\ kg diet aloe vera gel and other 0.50 g\ kg diet beta glucan diet improve growth performance traits and economic efficiency of rabbits.

Key words: Productive Impact , Beta Glucan,Aloe Vera Gel, Rabbits

INTRODUCTION

Meat production from rabbits is reasonable solution to the developing countries' rising protein shortages, so the rabbit production is a suitable task

because of its high fertility, low production costs, short generation intervals, and capacity to use a variety of forages. to help in resolving the global protein shortage problem (Ebeid *et al*., 2013). Recently, there has been an increasing interest of using complementary and alternative medicine. Immunomodulatory which have polysaccharide represents one of the many biological response modifiers (BRMs) which can be prepared from bacteria, fungi, β-*Glucan*'s and plants aloe vera. β-*Glucan*'s and Aloe vera act as a biologically active immunomodulator have been well documented for years (Qiu Z *et al.*,2005) In recent years, the usage of herbs as natural supplements in animal feeds have expanded due to the prohibition of antibiotic growth boosters in animal diets. Aloe vera is also a good substitute for antibiotic growth boosters and anticoccidial medicines. Since, aloe vera comes in a variety of forms, including gel, powder, ethanolic extract, aqueous extract and a polysaccharide found in aloe vera gel (Darabighane *et al.,* 2011). Major ingredients of aloe vera include anthraquinones, saccharides, vitamins, enzymes and low molecular weight compounds (Choi and Chung, 2003) which give Aloe vera its anti-inflammatory, immunomodulatory, wound-healing, anti-viral, anti-fungal, anti-tumor, anti-diabetic, and anti-oxidant effects (Christaki and Florou Paneri, 2010). Beta-glucan (BG), has a variety of natural activities, including immune role enhancement, anti-infection, and glucose regulating (Xiong *et al*., 2015).

In earlier researches, Beta-glucan supplementation in the feed has been shown to improve poultry growth and immunity (Soliman *et al*., 2014) and for rabbits, (Abo Ghanima *et al*., 2020). Contrary, Supplementing rabbit diets with yeast-glucans has no effect on growth or digestibility (Guenaoui, 2015).

Therefore, the goal of this research was to investigate the influence of the dietary implementation of two types of polysaccharide (β-glucan and ole vara gel) on growth parameters, blood biochemicals profile of growing NZW rabbits.

MATERIALS AND METHODS

This work was done at Kafr EL-Sheikh station belonging to Animal Production Research Institute, Agricultural Research Center. Beta glucan which was utilized in this research, is a marketable product made by Daigon do Co., Tokyo, Japan. Aloe vera gel which was utilized in this research from Faculty of Agricultural Kafr El-Sheikh University.

Preparation of fresh Aloe Vera gel

The outer layer of spotted Liliaceae Aloe vera was peeled away; the interior gel was collected with a sterile spatula. For immediate usage, the gel was kept in a clean container at room temperature.

Sixty healthy growing white New Zealand rabbits six weeks old weighing a mean of (726.1±16.61 gm) were used in this study. Animals were randomly divided into 5 groups each containing 12 rabbits in 4 replicates 3 rabbits each. The animals were allocated to 5 diets treatments for 8 weeks. Group 1 was fed basal diet. While, group 2 was fed diets supplemented beta glucan 0.50g \ kg diet, groups 3.4 and 5 were fed diets supplemented aloe vera gel at the rate of 0.25, 0.50 and 1g\ kg diet. All diets were nearly iso-nutrigenous and *iso-caloritic* which covered the requirement of growing rabbits according to Agriculture Ministry Decree (1996). Ingredients and chemical composition of the experimental pelleted diets (Table1).

Live body weight was recorded weekly throughout the experimental period, and weight gain was calculated. Feed consumption was recorded. At the end of the experimental period (14 weeks of age), the 4 animal were randomly taken from each group and fasted for 12 hours before slaughtering to determined carcass characteristics according to Steven *et al*., (1981).

Blood samples were taken from the same animal of each treatment after slaughter and collected in 5 ml. test tubes to determine Hemoglobin (Hb, g/dl), Hematocrit (Ht %), and Red Blood Cells ((RBCs, 10^6 / mm3). The parameters which calculated are Mean Corpuscular Volume (MCV) = Ht × 10/ RBC's (μm3), Mean Corpuscular Hemoglobin (MCH) = Hb × 10/ RBC's (Pg), and Mean Corpuscular Hemoglobin Concentration (MCHC) = Hb×100/ Ht (g/dl).White Blood Cells (WBCs×10^3/μl) and its differentiation (WBC, neutrophil, lymphocyte, and MID). All measurements performed according to Clark *et al*., (2009). The economic efficiency (EEF) was calculated according to the following equation:

EEF = Net revenue / total costs

Where the total cost calculated by Egyptian pound (L.E) in the local market at the time of experiment.

All data were subjected to analysis of variance using the General Linear Models (GLM) Procedure of SAS (2004).

$$Yij = \mu + Ti + e_{ij},$$

Where: μ= Overall mean of Yij, Ti = Effect of treatment and e_{ij}= experimental error.

The Significant differences between treatment means were separated using Duncan's multiple range test (Duncan, 1955).

Table 1. Feed ingredients and calculated analysis of the experimental diets

Ingredients	**Control**	**Beta glycan**	**Aloe vera gel (** g\ kg diet)		
		0.50 g\ kg	**0.25**	**0.50**	**1.00**
Clover hay (12%)	29.30	29.30	29.30	29.30	29.30
Wheat bran	22.00	22.00	21.50	22.00	21.50
Yellow corn	22.00	22.00	22.00	22.00	22.00
Soybean meal (44%)	20.00	20.00	20.50	20.00	20.50
Vitamin and Mineral mix.*	0.30	0.30	0.30	0.30	0.30
Di calcium phosphate	2.00	2.00	2.00	2.00	2.20
Sodium Chloride	0.30	0.30	0.30	0.30	0.30
Limestone	0.70	0.70	0.70	0.70	0.70
DL-Methionine	0.35	0.35	0.35	0.35	0.35
Anticoccidia(Diclazuril)	0.05	0.05	0.05	0.05	0.05
Molasses	3.00	3.00	3.00	3.00	3.00
Aloe vera	------		0.25	0.50	1.00
Beta glucan		---0.50--	-----	----	------
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis % **					
Organic matter	90.28	90.28	90.28	90.28	90.28
Crude protein	17.55	17.55	17.55	17.55	17.55
Crude fiber	13.20	13.20	13.20	13.20	13.20
Ether extract	2.64	2.64	2.64	2.64	2.64
Nitrogen free extract	56.89	56.89	56.89	56.89	56.89
Ash	9.72	9.72	9.72	9.72	9.72
DE(kcal/kg)	2550	2550	2550	2550	2550
Calcium	1.22	1.22	1.22	1.22	1.22
Total phosphorus	0.84	0.84	0.84	0.84	0.84
Lysine	0.94	0.94	0.94	0.94	0.94
Methionine	0.62	0.62	0.62	0.62	0.62

*Each 1kg of feed contains:-Vit. A, 6000IU; Vit. D_3, 900 IU; Vit. E, 40mg; Vit. B_1, 2mg; Vit. B_2, 4mg; Vit. B_6, 2mg; Vit. B_{12}, 10mg; Niacin, 50mg; Pantothenic acid, 10mg; Biotin, 50mg; Folic acid, 3mg; Choline, 250 mg; Zn, 50mg; Mn, 85mg; Fe, 50 mg; Cu, 5mg; I, 0.2 mg; Se, 0.1mg and Co, 0.1mg.

***According to Feed composition for animal and poultry feed stuff used in Egypt (2001).*

RESULTS AND DISCUSSION

Growth performance

Results of growth performance are illustrated in Table 2. It could be noticed that significant differences in final body weight, daily body weight gain and feed conversion between treatments. It showed that rabbits received 0.50 g\ kg

Table 2. Growth performance of growing rabbits fed on experimental diets.

Items	Control	Beta glycan 0.50g\ kg	Aloe vera gel (g\ kg diet)			±SEM
			0.25	0.50	1.00	
Initial body weight(g)	740	728.3	705.6	735	721.6	16.61
Final body weight**(g)**	1948.3[b]	2143.6[a]	2058.3[ab]	2178[a]	1933.3[ab]	28.49
Daily body weight gain**(g)**	21.57[b]	25.27[a]	24.15[ab]	25.76[a]	21.63[b]	0.80
Daily feed intake**(g)**	77.00	77.66	79.90	76.40	75.93	77.32
Feed conversion ratio (g feed/ g gain)	3.57[a]	3.07[b]	3.30[ab]	2.96[b]	3.51[a]	0. 10

a, and b Means in the same row with different superscripts are significantly different (P≤0.05).

diet aloe vera gel and 0.50 g\ kg diet beta glucan supplemented in the diet had significantly (P<0.01) higher final body weight, daily body weight gain and feed conversion compared to the other treatments. However, there were insignificant improved in final body weight, daily body weight gain and feed conversion with 0.25 g\ kg diet aloe vera gel compared to control group. While, rabbits fed diet supplemented with 1.0 g\ kg diet aloe vera gel recorded significantly lowest values of final body weight and the worst feed conversion compared to the other treatments. Although, there is no significant difference in feed intake between treatments. The improvement in growth performance with supplemented two types of polysaccharides β-glycan and aloe vera gel may be due to β-glucan considered as an alternative to antibiotics and improves the survival and performance of broilers (Moon, *et al*., 2016). Aloe vera gel act as antibacterial because it contain fumaric acid (He *et al*., 2011) In these respect, Abo Ghanima *et al*. (2020) found that significantly accelerated body weight gain (BWG), reduced total feed consumption and reduced feed conversion ratio with oral administration of β-glucan with doses 0.25 and 0.5 ml per one-liter of drinking water. And also, Jafarzadeh *et al. (*2014) found that aloe vera can reduce *E. coli* count while increasing the number of *Lactobacillus* in intestinal microflora. And Ahmed and Hussain (2013) found that aloe vera contains enzymes such as bradykinase, carboxypeptidase which have analgesic and anti-inflammatory effects.

In aloe vera some polysaccharides, notably pectic acid or glucomannans are found to have wound healing properties, immuno-stimulatory, antimicrobial

and antioxidant activities therefore, it is widely used for therapeutic purposes. Also, Dai *et al*. (2007) who found that herbs and polysaccharide contained in aloe vera can reduce *E. coli* count while increasing the number of *Lactobacillus* and *Bifidobacteria.* Darabighane *et al*. (2012) indicated that increase in aloe vera gel in broiler feeds (1.5%, 2%, and 2.5%) leads to increased *Lactobacillus* count and decreased *E. coli* count. Darabighane and Zarei (2011) showed that adding 1.5%, 2% and 2.5% aloe vera gel to the feed of broilers improved FCR for these broilers compared to the control group.

Carcass characteristics

The carcass characteristics of rabbits fed diets presented in Table 3 did not affect by the treatments, with the exception of the carcass and dressing percentage, where groups fed diet supplemented 0.50g\ kg aloe vera gel had significantly higher carcass and dressing percentage values than the control group and 1%aloe vera gel.

Abo Ghanima *et al*. (2020) found that non-significant differences in all carcass traits of rabbits received β-glucan with doses 0.25 and 0.5 ml per one-liter of drinking water, except the dressing percentages were observed high value at dose 0.5 ml per one-liter of drinking water compared with control Bhargande *et al*., (2022) found that non-significant effect on dressing percentage, weight of heart, liver and gizzard with broiler fed basal diet with 0.5%, 1.0% and 1.5% aloe vera powder.

Blood parameters

Results in Table 4 indicated that white blood cells and their fractions were no significant affected by different treatments except, neutrophil cells were significantly decreased for rabbits fed fed diet supplemented with 0.50, 1.00 g\ kg aloe vera gel and 0.50 g\ kg beta glycan compared to other treatments.

On the other hand, red blood cell fractions, Hb, MCH and MCHC were significantly affected by 0.50g\ kg aloe vera gel and Ht %, Red blood cell and Hb significantly affected by beta glycan 0.50 g\ kg . These results agreed with Darabighane *et al*. (2011a) who reported an increase in total white blood cell count of broilers as a result of adding aloe vera gel to broiler feeds.

Mahdavi *et al*. (2012) showed that used 1% aloe vera gel powder in broiler feeds, a significant increase in total white blood cell count, red blood cell count, and hemoglobin compared to the control. Channa *et al*. (2014) revealed that oral supplementation of 400, 500 and 600 mg/ kg of aloe vera extract, significantly increase mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV) and lymphocytes.

Table 3. Carcass traits of growing rabbits fed on experimental diets.

Items	**Control**	***beta* glycan 0.50 g\ kg**	**Aloe vera gel (g\ kg diet)**			**±SEM**
			0.25	**0.50**	**1.00**	
Carcass%	50.80^{b}	53.40^{ab}	52.81^{ab}	56.50^{a}	51.11^{b}	0.72
Dressing %	54.19^{b}	57.14^{ab}	56.34^{ab}	59.96^{a}	54.25^{b}	3.35
Liver%	2.50	2.75	2.75	2.49	2.41	0.06
Kidney%	0.549	0.624	0.540	0.556	0.537	0.012
Heart %	0.281	0.307	0.380	0.375	0.291	0.017
Spleen%	0.060	0.064	0.065	0.043	0.053	0.006
Giblets%	3.39	3.74	3.73	3.46	3.29	0.100
Cecum%	4.37	3.91	4.08	4.65	4.12	0.131
Abdominal fat%	0.974	0.999	1.05	0.964	1.106	0.65
Gastrointestinal tract%	16.18	14.14	15.74	15.12	16.15	0.40

a ,and b Means in the same row with different superscripts are significantly different (P≤0.05).

Table 4. Blood constitutes of growing rabbits fed on experimental diets.

Items	**Control**	**beta glycan** 0.50 g\ kg	**Aloe vera gel (g\ kg diet)**			**SEM**
			0.25	**0.50**	**1.00**	
WBC (×103/ µl)	8.16	8.56	9.30	9.80	8.46	0.58
Neutrophile (%)	51.40^{a}	34.40^{b}	48.63^{a}	34.10^{b}	37.30^{b}	2.13
Lymphocyte (%)	31.66	41.06	37.70	41.76	39.70	2.39
Monocyte (%)	6.02	8.73	6.13	7.43	7.80	0.87
RBC (10^{6} / mm3)	5.23^{c}	6.70^{a}	5.80^{abc}	6.30^{ab}	5.56^{bc}	0.17
Ht (%)	35.85^{b}	46.81^{a}	38.20^{ab}	44.18^{ab}	38.20^{ab}	1.57
Hb (g/dl)	9.20^{c}	12.30^{ab}	10.96^{bc}	13.50^{a}	10.40^{c}	0.40
MCV (µm3)	68.54	69.86	65.86	70.12	68.70	1.27
MCHC	25.66^{b}	26.28^{ab}	28.69^{ab}	30.55^{a}	27.22^{ab}	0.07
MCH (Pg)	17.35^{b}	18.35^{ab}	17.39^{b}	21.42^{a}	18.70^{ab}	0.57

a ,b and c Means in the same row with different superscripts are significantly different (P≤0.05).
.Mean Corpuscular Volume (MCV) = Ht × 10/ RBC's (µm3), Mean Corpuscular Hemoglobin (MCH) = Hb × 10/ RBC's (Pg) Mean Corpuscular Hemoglobin Concentration (MCHC) = Hb×100/ Ht (g/dl).

However, decrease neutrophils in normal domestic rabbits. Zayeda *et al*. (2020) found that supplemented 15 ml/liter aloe vera gel in poultry drinking water no significant effect in white blood cells, Lymphocyte (%), Monocyte percentage, Heterophils Percentage, MCHC and MCH, while better

hemoglobin concentration and significantly higher red blood cells counts than the control group . Tayyab *et al*., (2019) found that fed Labeo rohita fish on diets containing 0.1% of beta glucan significantly decreased RBC and hemoglobin (Hb) contents than fed control diet.

Economic efficiency

Results illustrated in Table 5 showed that diets supplemented 0.50g\ kg aloe vera gel , 0.50 g\ kg beta glucan and 0.25g\ kg aloe vera gel groups were achieved the highest economic efficiency (65.53, 54.06 and 52.03). While, economic efficiency was decreased in 1.00g\ kg aloe vera gel (35.47) group and

Table (5). Economic efficiency of growing rabbits fed experimental diets.

Items	**Control**	**beta glucan**	**Aloe vera gel (g\ kg diet)**		
		0.50 g\ kg	0.25	0.50	1.00
Total weight gain (kg)	1.207	1.415	1.352	1.442	1.211
Price of 1kg body weight	55	55	55	55	55
Selling price/rabbit (LE) (A)	66.38	77.82	74.36	79.31	66.60
Total feed intake	7.700	7.766	7.790	7.593	7.730
Price/kg feed(LE)	6.26	6.51	6.29	6.31	6.36
Total feed cost/rabbit (LE)(B)	48.20	50.51	48.91	47.91	49.16
Net revenue(LE)[1]	18.18	27.31	25.45	31.40	17.44
Economic efficiency[2]	37.71	54.06	52.03	65.53	35.47
Relative Econ. Eff.[3]	100	143.35	137.97	173.77	940.59

(1) Net revenue = A – B.
(2) Economic efficiency = (A-B/B x 100).
(3) Relative Economic Efficiency= Economic efficiency of treatments other than the control/ Economic efficiency of the control group.

control group (37.71). The relative economic efficiency was 173.77, 143.35 and 137.97 and the least one was the group fed diet supplemented 1.00g\ kg aloe vera gel (940.59). Generally, it can be noticed that rabbits fed on the diets supplemented 0.5% aloe vera and 0.5% beta glucan had the best economic return with compared to the other treatments. Saini *et al*., (2021) found that aloe vera supplementation 4 g/kg body weight as herbal feed additive for buffalo calves diets increase the economic return.

Conclusively, it is recommended that supplemented 0.5% aloe vera and 0.5% beta glucan /kg rabbit diet improve growth performance traits and economic efficiency, without harmful effect of growing rabbits.

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التأثير الأنتاحى للبيتا جلوكان وجل الصبار على اللأرانب النامية

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**قسم الأنتاج الحيوانى والدواجن- كلية التكنولجيا والتنمية- جامعة الزقازيق - مصر

تم إجراء هذا البحث لدراسة تأثيرأضافة 0.50 جم بيتا جلوكان و 0.25، 0.50 و ١جم جل صبار لكل كيلو علف على الأداء الأنتاجى , خصائص الدم و الكفاءة الأقتصادية . تم إستخدام ٦٠ أرنب غير مجنس أبيض نيوزيلاندى عمر 6 أسابيع وقسمت عشوائيا الى خمس مجاميع (١٢ أرنب لكل مجموعة) .أشتملت المجاميع على مجموعة الكنترول والمجاميع الأخري مجموعة كنترول مضاف لها 0.50 جم بيتا جلوكان و 0.25، 0.50 و ١جم جل صبار لكل كيلو علف فى العليقة . أظهرت النتائج وجود زيادة معنوية فى وزن الجسم النهائى ,الزيادة اليومية للجسم و كفاءة التحويل الغذائى مع الأرانب التى غذيت على علائق مضاف لها 0.50 جم جل صبار و الأخرى 0.50 جم بيتا جلوكان لكل كيلوجم علف مقارنة بالمعاملات الأخرى . لايوجد أى تأثير معنوى فى المأكول الكلى بين المعاملات . وجد تحسن معنوى فى نسبة الذبيحة ونسبة التصافى مع التغذية

على 0.50 جم جل صبار وكانت أقل قيمة مع المجموعة التى غذيت على ١جم جل صبار لكل كيلو علف. تأثرت معنويا كرات الدم الحمراء ,الهيجلوبين , MCHو MCHCبأضافة 0.50 جم جل صبار للعليقة . وجد زيادة فى الكفاءة الأقتصادية مع التغذية الأرانب على 0.50 جم جل صبار و0.50 جم بيتا جلوكان لكل كيلوجم .

التوصية : يمكن التوصية :أضافة 0. 50 جم جل صبار و0.50 جم بيتا جلوكان لكل كيلو جم علف أدى الى تحسن الأداء الأنتاجى والكفاءة الأقتصادية للأرانب