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Reflection of feeding rations containing different levels of biological treated corn stalks on blood parameters and caecum microbial count for growing rabbits

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Abstract : This work aimed to investigate the effect of feeding fungal treated corn stalks with Trichoderma ressei on some blood parameters and caecum microbial count for rabbits. Fortytwo weaned New Zealand white rabbits, six weeks ofage, were equally divided into 7 experimental groups (Each group divided into three replicates of two rabbits in each). The first group was fed on the control diet, the other six groups were fed diets containing corn stalks which replaced clover hay at33, 66 and 100% biologically treated with Trichoderma ressei or treated with media only (without T.ressei), the experimental lasted for 13 weeks. At the end of the experiment, the rabbits were slaughtered and blood samples were collected in heparinized tubes for biochemical analysis. Caecal total bacteria, fungi, actinomyces and cellulolytic bacteria microbial counts were estimated. Values of total protein, albumin, AST, ALT, creatinine, urea, cholesterol and triglyceride contents were within the normal range. Rabbits fed treated stalks with T. ressei recorded (P≤0.05)lower values of total protein content than those fed without T. ressei, while no significant differences were recorded between treatments on the other blood parameters. The results indicated that the interaction was significant ($P \le 0.05$) at level of 33%, whereas total protein was decreased with T. ressei. Also, calcium, catalase (CAT) and lipid peroxidase (LPO) were (P≤0.05) decreased with T. resseiin levels of 100, 66 and 100%, respectively. While ALT was significant increased for rabbits fed treated corn stalks with T. ressei at level of 33%. Results indicated that rabbits fed fungal treated corn stalks showed ($P \le 0.05$) higher total bacteria, fungi, actinomyces and cellulolytic bacteria counts than those fed stalks without T. ressei. And the level of 100% recorded the highest values of microorganisms count, but level of 66% recorded the highest value of cellulolytic bacteria. The results shown that the interaction was ($P \le 0.05$) with fungal treated stalks at levels 66 and 100%. It could be concluded that can be used biological treated corn stalks with T. ressein feeding growing rabbi.

Key words : Biological treatment, corn stalks, blood parameters, caecum microbial count and rabbits.

Introduction

In the developing countries, as well as in Egypt, animals suffer from shortages of feed and are continuously increasing in cost. However, many million tons of agricultural residues are produced every year from field and processing of fruits and vegetables. In Egypt, there are about 25 million tons of plants by-products produced annually; wheat straw, rice straw and corn stalks consists the great amounts¹. Such roughages are usually high in lignocelluloses and low in available energy and also are generally low in readily available carbohydrates as well as nitrogen and certain minerals. Their utilization is also limited by the low voluntary intake by theanimals and by their high cost for transport, being bulky².

Owing to the world feed shortage a great deal of research work was direct not only to make full use of the roughages, but also to increase are their feeding value. Intake and utilization of low quality roughages could be increased by proper supplementation or by various pretreatments. Such methods may involve physical, chemical and biological treatments and improve digestibility and nutritive values^{3,4}. Among these methods, biological treatments were shown to be the most effective^{5,6}. In addition to the scientific point stated above, it could be mentioned safely that rabbit production can contribute to solve the problem of meat shortage in most developing countries as well as in Egypt. Since, rabbits have rapid growth rate, high fertility rate , short gestation period, short generation intervals, high feed efficiency, early marketing age, and high muscle bone ratio, also, meat of rabbits has high protein content, low cholesterol and total lipids content⁷.

The objective of the present study was to investigate the effect of feeding biological treated corn stalks with *Trichoderma reesei* or without *T.ressei* (treated with media only) at different levels on some blood parameters and caecum microbial count for growing rabbits.

Materials and Methods

Microorganisms and biological treatment for corn stalks:

Three days old slants cultures of *Trichoderma ressei* was crushed into flasks containing 20 ml of sterilized water. The fungi spores suspension was used as inoculant at 10 % V/W to inoculate 500 ml capacity flasks containing 25 g of ground corn stalks moistened at solid: liquid ratio of 1:2 with basal medium composed (g/ L); 40 sugarcane molasses, 2 urea, 0.2 potassium dihydrogen phosphate and 0.3 magnesium sulfate, the inoculate flasks were incubated at 30 °C for 72 hrs under static solid-state fermentation system. The prepared inoculate was used to inoculate 500 g of moistened stalks by the above basal medium at solid: liquid (1:2) at 10 % V/W and packed in polyethylene bags (50x100 cm). The inoculated bags were incubated at room temperature $(30 \pm 2 \text{ °C})$ for 10 days.

The 160 kg of chopped cornstalks wasequally divided into two heaps. The first heap was moistened with medium contained; 2.5% molasses, 2.5% urea, 1.5% ammonium sulphate, 1.00% supper phosphate and 0.5% magnesium sulphate at solid: liquid (1:2), mixed well and spread on plastic sheet without *Trichoderma reesei*. And the second heap wasmoistened with the above medium and inoculated with the previous prepared *T.reesei* inoculant at 10%, mixed well and spread on plastic sheet. The two heaps were shuffled upside down daily for the proper treatment period (14 day). At the end of treatment period, the treated stalks was collected and exposed to sun- dry until the moisture content reached less than 10%, then packed and storeduntil used in manufacturing the pelleted diets.

Experimental diets:

The air dried treated corn stalks without and with *Trichoderma reesei* used to formulate the experimental pelleted diets by substituting of clover hay at the levels of (0, 33 and 66 and 100%). Seven diets were formulated to be iso-nitrogenous and iso-caloric, and to meet the nutrients requirements of growing rabbits according to recommendation of s show in Table (1).

Experimental animals and Feeding trials:

A total number of 42 weaned New-Zealand white rabbits, 6 weeks of age and weighted 500 g \pm 90 g were randomly divided into 7 experimental groups (6 rabbits in each), each group divided into three replicates.

The animal groups were fed on the pervious diets for 13 weeks (91 days). All animals were kept under the same managerial and hygienic conditions and housed in metal battery cages (two rabbits in each). Diets and water were offered *ad-libitum*. At the end of experimental period, the rabbits were slaughtered and blood samples were collected in heparinized tubes for biochemical analysis. Caecum samples were taken to determine caecal microbial counts

	Experimental diets									
Ingradianta	Control		Without		With					
Ingredients		Tri	choderma r	essei	Trichoderma ressei					
	0%	33%	66%	100%	33%	66%	100%			
Clovr hay	33.00	22.00	11.00	-	22.00	11.00	-			
Yellow corn	15.75	31.00	93.35	38.75	31.00	93.35	38.75			
Barley	14.50	2.00	1.50	1.50	2.00	1.50	1.50			
Soybean meal	17.40	19.65	21.65	21.65	19.65	18.00	17.0			
Wheat bran	16.50	11.00	0.60	0.60	11.00	4.25	5.25			
Corn stalks	-	11.00	22.00	33.00	11.00	22.00	33.00			
Calcium Di-phos.	2.05	2.40	2.85	3.05	2.40	2.85	3.05			
Lime stone	0.10	0.20	0.25	0.60	0.20	0.25	0.60			
NaCl	0.40	0.40	0.40	0.40	0.40	0.40	0.40			
Premix *	0.30	0.30	0.30	0.30	0.30	0.30	0.30			
L.Meth.	0.04	0.05	0.10	0.15	0.05	0.10	0.15			
Calculated**										
DE	2513	2503	2895	2412	2518	2501	2425			
Са	1.08	1.04	1.01	1.03	0.970	0.92	0.96			
T.ph	0.80	0.80	0.79	0.80	0.82	0.79	0.83			
Lysine	0.89	0.85	0.80	0.74	0.85	0.71	0.63			
Meth.	0.55	0.57	0.57	0.58	0.56	0.46	0.54			
Sodium	0.20	0.19	0.18	0.17	0.17	0.18	0.17			

 Table (1): The experimental diets formulation.

*Each kg of Vitamine and Minerals mixture contains; Vit.A 2.000 IU, Vit. B_1 0.33g, Vit B_2 1.09; Vit B_3 150.00 IU, Vit E 8.33 g, Vit K 0.33 g, pantothemic acid, 3.33 g; Nicatonic acid 30.g; Vit B_6 2.00 g; Vit. B_{12} 1.7 mg, Folic acid 0.039, Biotin 33 mg. Cu 0.50 g cholin chloride 200 mg, Mn 5.0 g; Fe 12.5 g, Mg 66.7 mg; Co 1.33 mg; Se 16.6 mg; Zn 11.9; Iodine 16.6 mg and Antioxidant 10.0 g.

** according to 8 .

Analytical methods:

Mycotoxin detection:

Thin layer chromatography was applied according the method that described by 9 for detection mycotoxin in treated corn stalks.

Blood samples collection and analysis:

At 13 weeks of age, three rabbits from each treatment were randomly taken, individual blood samples from sacrificed rabbits were collected in heparinizedtubes. Then blood was transferred immediately into dry clean centrifuge tubes and centrifuged at 3000 r.p.m for 15 minutes, the plasma was transferred and stored in deep freezer (-20°C) for the subsequent biochemical analysis assays. Total protein was measured using Buiret method as described by ¹⁰. Albumin determined according to¹¹. Globulin calculated by difference between total protein and globulin. Cholesterol and triglycerides determined according to¹². Aspartic transeaminase (AST) and Alaminetranseaminase (ALT) were assayed by method of¹³. Urea was measured according to¹⁴. Creatinine was determined according to¹⁵. Alkaline phosphatase determined according to¹⁶.Calcium was determined according to¹⁷. Inorganic phosphorus measured according to¹⁸. Lipid Peroxidase (LPO) determined according to¹⁹. Total antioxidative capacity (TAC)was performed by the reaction of antioxidants in the samples with a defined amount of exogenously provide hydrogen peroxide according to²⁰. Catalase (CAT) was estimate according to²¹.

Total counts of bacteria, fungi, actinomyces and cellulolytic bacteria in caecum:

Three caecal of rabbits per treatment were separated carefully used to estimate the caecal microbial count. The serial dilution plate count procedure was used to estimate the total number of different groups of micro-organisms; bacteria; fungi and actinomyces. Three selective media were used for plate count; nutrient agar ²², Martin's medium ²³ for fungi account and glucose asparagine agar for actinomyces account. Plates were incubated at 28 °C for mesophilic. Fungal colonies were counted after 3 days, while bacteria and actinomyces colonies after 10 days and colonies of actinomyces have been distinguished by their characteristic growth, and by the use of straight needle and microscopic examination, counts were presented per one g oven dry weight of material. Five dilution tubes containing the different selective media were inoculated with 1.0 ml from each dilution. The most probable numbers of bacteria were obtained from the positive tubes using methodof²⁴. Dubos's cellulose medium was used todetermine aerobic cellulose-decomposing organisms, in the positive tubes, the filter paper showed a yellowish brown colour and gradually lost its con chancy. Each of the following carbon sources was added to glucose asparagine medium instead of glucose for testing the efficiency of the isolates to utilize those carbon sources; glucose, xylose, arabinose, rhamliose, mannose, galactose, fractose, sucrose, lactose, raffinose, marvutol, inositol and salicil at the rate of 1 %. Agar plates were streaked and incubated for 4 days at 28 °C for mesophilic.

Statistical analysis:

The collected data were subjected to statistical analysis as two factors factorial analysis of variance using the general linear model procedure of²⁵according to the following model:

 $Y_{ijk} = \mu + Ti + L_j + (TL)_{ij} + e_{ijk}$

Where; Y_{ijk} : observation, μ : the overall mean, Ti: effect of treatment, L_j : effect of level, TL_{ij} : the interaction between treatments and levels, e_{ijk} : the experimental error. And Duncan's Multiple Range Test²⁶was used to separate means when the differences were significant.

Results and Discussion

Blood Constituents:

Table (2) show values of total protein, albumin, AST, ALT, creatinine, urea, cholesterol and triglyceride contents found to be within the normal range of plasma blood analysis of rabbits according to²⁷, who mentioned that the normal ranges of rabbits blood total protein, albumin, albumin/globulin ratio, creatinine, AST, ALT, urea-N, calcium, phosphorus, cholesterol and triglyceride were 6.45±0.31 g/dl, 2.73±0.30 g/dl, $0.58, 0.8-2.57 \text{ mg/dl}, 47 \text{ U/l}, 79 \text{ U/l}, 14.3\pm3.0 \text{ mg/dl}, 10 \pm 2.24 \text{ mg/dl}, 4.16 \pm 0.46 \text{ mg/dl}, 26.7\pm 15.9 \text{ mg/dl}$ and 122 mg/dl. Statistical analysis showed significant differences ($P \le 0.05$) only in total protein between treatments. Rabbits fed treated corn stalks with T. ressei recorded lower values ($P \le 0.05$) of total protein concentration (5.39) than those fed stalks without T. ressei(6.06 g/dl) groups, while, no significant differences were observed between treatments on the other blood parameters. In this respect,²⁸ reported thatblood constituents for rabbits fed fungal treated sugar beet pulp (SBP) included; total protein, albumin, urea, creatinine, AST and ALT were within the normal range according to²⁷. However, rabbits fed untreated SBP recorded lower albumin and urea values than the other groups, but values of urea and ALT were higher for animals fed fungal treated SBP than the other groups. ²⁹ found that when treated wheat straw with *T. viride* replaced 25, 50 and 75% of CFM, blood total protein of growing lambs deceased by 18.0, 12.8 and 18.4%, albumin by 10.5, 7.9 and 10.0%, respectively. However, ³⁰ indicated that using biologically treated wheat straw with *T. reesei in sheep rations at level 25 and* 40% had no significant effect on blood total protein and globulin. While, ³¹observed that rabbits fed non-treated apple pomaceand biologically treated apple pomace at level of 26 or 50% had insignificant differences in blood albumen, globulin concentration and A/G- ratio. Also, ³² found no change in total protein when enzymes were added (Bentonite Co supplementation) to rabbit diets. Feeding growing rabbit on biologically treated corn stalks had insignificant differences in AST, ALT and alkaline phosphatase, compared to the control group. The same trend in activities of AST, ALT and alkaline phosphatase was reported by ²⁹ and ³⁰who fed lambs on biologically treated wheat straw with T. viride. Results in Table (2) showed that rabbits fed biologically treated corn stalks insignificantly lower in blood urea and creatinine compared with control group. Similar results obtained by ²⁹ and ³⁰ when fed lambs biologically treated wheat straw. In this respect, ³³ when add 0.5% of dried yeast to rabbit rations, who found no significant effect on blood creatinine concentration compared to the control diets. Theprevious results were in agreement with ³² who found that addition enzyme (Bentonite Co supplementation) to rabbit rations decreased serum urea concentration. Biologically treated corn stalks with *T. reesei* in rabbits diets had no significant effect on blood cholesterol and triglyceride, compared to the untreated corn stalks group. These results were found to be in disagreement with ³² who found that addition enzyme (Bentonite Co supplementation) to rabbit rations decreased cholesterol concentrations. The interaction between treatments and levels shown in Table (3). The results indicated that the interaction was significant (P≤0.05) in level 33%, whereas total protein was decreased with *T. ressei*. Also, calcium, catalase (CAT) and lipid peroxidase (LPO) were (P≤0.05) decreased with *T. ressei* nevels of 100, 66 and 100%, respectively. While ALT was significant increased for rabbits fed treated corn stalks with *T. ressei* at level of 33%.

Item	Treatments		SEM	Levels				SEM
	Without	With T.		0%	33%	66%	100%	
	T. reesei	reesei						
Total protein, g/dl	6.06 ^a	5.39 ^b	0.19	6.43 ^a	5.12 ^b	5.77 ^{ab}	5.58 ^b	0.19
Albumin, g/dl	3.67	3.58	0.13	3.94	3.54	3.27	3.77	0.13
Globulin, g/dl	2.39	1.81	0.06	2.49	1.58	2.50	1.81	0.06
A/ G ratio	1.54	1.98	0.03	1.58	2.24	1.31	2.08	0.03
Creatine, mg/ dl	0.46	0.29	0.06	0.29	0.45	0.53	0.23	0.06
AST, U/L	27.30	27.65	3.09	38.96	23.31	24.60	23.04	3.09
ALT, U/L	59.49	56.49	3.12	53.90	53.61	56.54	67.91	3.12
Urea, mg/ dl	36.25	34.75	1.19	29.67 ^c	37.17 ^{ab}	40.17 ^a	35.00 ^c	1.19
Alkaline phosphatase, UL	622.3	575.3	39.46	363.3 ^b	688.7 ^a	659.0 ^a	684.0 ^a	39.46
Calcium, mg/ dl	14.92	14.50	0.21	15.33 ^a	14.83 ^a	15.17 ^a	13.50 ^b	0.21
Phosphorous, mg/ dl	6.25	6.42	0.22	5.33 ^c	6.33 ^b	7.67 ^a	6.00^{bc}	0.22
Cholesterol, mg/ dl	27.92	30.83	2.27	33.33 ^a	21.17 ^b	28.83 ^{ab}	34.17 ^a	2.27
Triglyceride, mg/ dl	46.42	48.17	4.13	34.67 ^b	49.50 ^{ab}	52.67 ^a	52.33 ^{ab}	4.13
CAT, U/L	191.9	143.7	16.75	128.4 ^b	243.1 ^a	146.8 ^b	152.9 ^b	16.75
TAC, nmol/L	0.26	0.25	0.08	0.28^{a}	0.23 ^{ab}	0.27^{ab}	0.23 ^b	0.08
LPO,nmol/ml	6.58	4.17	0.52	5.67	4.50	5.50	5.83	0.52

Table (2): Effect of treatments and levels of corn stalks on blood parameters for experimental groups.

a, b and c: Means of treatments and levels having different superscripts significantly differ (P < 0.05). SEM :Standard error of the mean.

Table (3): The interaction between treatments and levels of corn stalks on blood parameters for experimental groups.

Item	Experimental diets							
		Without T. reesei			W			
	0%	33%	66%	100%	33%	66%	100%	
Total protein, g/dl	6.43 ^a	6.29 ^a	5.69 ^b	5.81 ^b	5.95 ^b	5.85 ^b	5.34 ^b	0.19
Albumin, g/dl	3.94	3.35	3.36	4.04	3.13	3.17	3.49	0.13
Globulin, g/dl	2.49	2.94	2.33	1.77	2.82	2.68	1.85	0.06
A/ G ratio	1.58	1.14	1.44	2.28	0.90	1.18	1.89	0.03
Creatine, mg/ dl	0.29 ^{ab}	0.67 ^a	0.45 ^{ab}	0.44 ^{ab}	0.24 ^{ab}	0.61 ^a	0.02 ^b	0.06
AST, U/L	38.96	20.33	22.97	26.95	26.29	26.23	19.12	3.09
ALT, U/L	53.90 ^{bc}	41.44 ^c	59.73 ^{bc}	82.88 ^a	65.77 ^{ab}	53.35 ^{bc}	52.95 ^{bc}	3.12
Urea, mg/ dl	29.67 ^c	42.33 ^a	37.67 ^{ab}	35.33 ^{bc}	32.00 ^{bc}	42.67 ^a	34.67 ^{bc}	1.19
Alkaline phosphatase, UL	363.3 ^b	651.0 ^a	736.5 ^a	738.3 ^a	726.5 ^a	581.5 ^{ab}	629.8 ^b	39.46
Calcium, mg/ dl	15.33 ^a	14.67 ^a	15.33 ^a	14.33 ^a	15.00 ^a	15.00 ^a	12.67 ^b	0.21
Phosphorous, mg/ dl	5.33°	6.67 ^b	7.00 ^b	6.00 ^{bc}	6.00 ^{bc}	8.33 ^a	6.00 ^{bc}	0.22
Cholesterol, mg/ dl	33.33 ^{abc}	19.00 ^d	17.67 ^d	41.67 ^a	23.33 ^{cd}	40.00^{ab}	26.67 ^{bcd}	2.27
Triglyceride, mg/ dl	34.67 ^{cd}	31.00 ^d	47.33 ^{bcd}	72.67 ^a	68.00^{ab}	58.00 ^{abc}	32.00 ^d	4.13
CAT, U/L	128.4 ^{bc}	266.1 ^a	220.2 ^{ab}	152.9 ^{abc}	220.2^{ab}	73.39 ^c	152.9 ^{abc}	16.75
TAC, nmol/ L	0.28 ^a	0.26 ^{ab}	0.26^{ab}	0.23 ^{ab}	0.21 ^b	0.27^{ab}	0.23 ^{ab}	0.08
LPO,nmol/ml	5.67 ^b	6.00 ^b	5.33 ^{bc}	9.33 ^a	3.00 ^{bc}	5.67 ^b	2.33 ^c	0.52

a, b, c and d: Means of treatments and levels having different superscripts significantly differ (P < 0.05). SEM :Standard error of the mean.

Cecum microbial counts:

The results of the total bacteria, fungi, actinomyces and cellulolytic bacteria are shown in Table (4). The recorded values were 56.3, 7.3, 5.5 and 30.0 with for without *T. reesei*and 58.8, 10.7, 7.4 and 30.8 for with *T. reesei*, respectively. The rabbits fed fungal treated corn stalks showed significantly ($P \le 0.05$) higher total bacteria, fungi, actinomyces and cellulolytic bacteria counts than group fed corn stalks without *T. reesei*. The results revealed that feeding rabbits at 100% regardless of treatment showed the highest ($P \le 0.05$) value of bacteria, fungi and actinomyces count compared with the other levels, while the highest value of cellulolytic bacteria count increased as the level of 66%. In general, total bacteria, fungi, actinomyces and cellulolytic bacteria count and cellulolytic concentration attributed to the higher crude fiber digestibility compared to the control group. On the other hand, biological treatments are alternative treatments to modify digestion of fibrous materials by ruminants. The mode of fungal action on roughages by white rot fungi was found to improve invitro dry matter digestibility of the decoyed substrate³⁴. So rabbitscan convert dietary by-products to meat and skin due to their high feeding efficiency, because it have a large cecum that containing varied species of microorganisms and arecetophage³⁵.

Table (5) shown the interaction between treatments and levels, the results indicated that biological treated corn stalks with *T. reesei* was significant ($P \le 0.05$) increased total bacteria, fungi, actinomyces and cellulolytic bacteria counts, especially at levels of 66 and 100%.

Item	Treatments		SEM	Levels				SEM
	Without T. reesei	With T. reesei		0%	33%	66%	100%	
Bacteria, 10 ⁵	56.3 ^b	58.8 ^a	2.10	40.3 _b	62.9 ^a	62.9 ^a	64.0 ^a	2.10
Fungi, 10 ³	7.3 ^b	10.7 ^a	0.58	5.9 ^c	9.3 ^b	10.3 ^a	10.5 ^a	0.58
Actinomyces, 10 ³	5.5 ^b	7.4 ^a	0.35	4.7 ^c	6.2 ^b	7.1 ^{ab}	7.7a	0.35
Cellulolytic bacteria, 10 ³	30.0 ^b	30.8 ^a	0.62	25.4 ^c	32.1 ^a	32.5 ^a	31.6 ^b	0.62

 Table (4): Effect of treatments and levels of corn stalks on cecum microbial counts.

a, b and c: Means of treatments and levels having different superscripts significantly differ (P < 0.05). SEM :Standard error of the mean.

Table (5)	: The interaction	between treatments and	l levels of corn stalks	on cecum microbial counts.
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Item	Experimental diets							SEM
		Without T. reesei			With T. reesei			
	0%	33%	66%	100%	33%	66%	100%	
Bacteria, 10 ⁵	40.3 ^c	61.1 ^b	61.3 ^b	62.6 ^b	40.3 ^c	64.8 ^a	64.5 ^a	2.10
Fungi, 10 ³	5.9 ^e	7.0d ^e	7.7 ^{cd}	8.6 ^c	5.9 ^e	11.6 ^b	12.9 ^a	0.58
Actinomyces, 10 ³	4.7 ^e	5.0 ^e	5.7 ^{de}	6.6 ^{cd}	4.7 ^e	7.4 ^{bc}	8.5 ^{ab}	0.35
Cellulolytic bacteria, 10^3	25.4 ^d	31.5 ^{bc}	31.9 ^{bc}	31.2 ^c	25.4 ^d	32.7 ^a	33.1 ^a	0.62

a, b, c, d and e : Means in the same row having different superscripts significantly differ (P < 0.05). SEM : Standard error of the mean

Similar results have been obtained by³⁶ when studied effect of partial and completely replacement of clover hay by fungal treated corn stalks in growing rabbit diets, found that total bacteria countwas significantly (P \leq 0.05) higher for rabbit fed 35% treated rice straw than control group. And the cellulolytic bacteria count increased in rabbits fed diet contained 35% treated rice straw with bacteria plus fungi compared with groups fed control diet. These results are in agreement with those of³⁷ found that colonization of the cecum with organisms favorable for cellulose digestion requires large number of bacteria and found that *cellulomonace* bacteria increased with increasing cellulose in the diet.

Conclusion

From the previous results it could be concluded that it can be used biological treated corn stalks with *T*. *reesei* in growing rabbits feeding.

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