GROWTH PERFORMANCE OF NEW-ZEALAND WHITE RABBITS FED DIETS CONTAINING DIFFERENT LEVELS OF UNTREATED OR FUNGAL TREATED SUGAR BEET PULP.

A. Y. El-Badawi[1], A. A. Hassan[2] and A. A. Abedo[1]
[1]Department of Animal Production, National Research Center, Dokki, Giza, Egypt (e-mail: abedoaa@hotmail.com, Duckily@hotmail.com).
[2]Department of By-Products Utilization, Animal Production Research Institute, Dokki, Giza, Egypt (e-mail: aymanan199@yahoo.com).

ABSTRACT

Fifty New-Zealand White (NZW) growing rabbits aged eight weeks weighed 876.67±33.73g were randomly ranked in five similar groups (10 animals each). Untreated sugar beet pulp (USBP) or fungal treated sugar beet pulp (TSBP) with *Trichoderma reesei* were introduced in rabbit's diets at 25 and 50 %. All experimental diets were manipulated to be iso-caloritic and iso-nitrogenous. The results showed that the rabbits fed either 25 or 50 % TSBP were significantly ($P<0.05$) better than those fed control or 25 and 50 % USBP in daily weight gain, nutrients digestibility and dietary nitrogen utilization. Results of carcass characteristics showed higher dressing percentage and significantly ($P<0.05$) higher yield of edible giblets for rabbits fed 25 and 50 % TSBP. Chemical composition of lean meat showed higher ($P<0.05$) DM and ash content and lower fat content for rabbits fed either USBP or TSBP with comparison to control group. However, no significant difference was detected for the protein content among groups.

Key words: sugar beet pulp, fungal treatment, nutrients digestibility, growth performance, carcass characteristics, rabbits.

INTRODUCTION

Sugar beet pulp (SBP) is the solid residue that remains after sugar extracted form sugar beet roots; it comprises 6% of roots weight (Kjaergaard, 1984).

Dried beet pulp, a carbohydrate rich by-product of the sugar industry, has been used as a partial source of energy in the rations of dairy cattle, growing calves, lambs (Hemingway *et al*., 1986; Kercher and Romsa, 1986; and El-Badawi and El-Kady, 2006) and rabbits diets (Cobos *et al*., 1995; Volek *et al*., 2002 and Zaza, 2005). Most of the previous studies concluded that the nutritive value of SBP is comparable to corn or barley.

The protein content of sugar beet pulp is considered low (Abedo, 2006 reported from many studies it ranged from 6.6 to 13.3% with an average value of 9.9%) compared with the requirements of most ruminants and monogastric animals which are even higher. SBP contains high content of crude fiber (from 14.6 to 24.8% with an average 19.7%, Abedo, 2006); the fibrous carbohydrates of SBP are easily digested because of the amorphous structure of its cellulose and low content of its lignin. However, SBP is deficient in fat, phosphorus, carotene and certain B- vitamins which have been reported as a reason for even lower availability of the nutrients in SBP (Morrison, 1959).

Many attempts have been done to increase the protein content of SBP, by added NPN source like urea (El-Badawi *et al*., 2001 and Eweedah, 2001) or increase the protein content and quality using the biological treatment (bioconversion) applied the solid state fermentation approach with various lignocellulolytic fungi (Durand and Cherean, 1988; Ghanem *et al.,* 1991; Nigam, 1994; Bruder, 1997; Iconomou *et al*., 1998; Zaza, 2005 and Abedo, 2006).

The present work aimed to study the effect of incorporated fungal treated SBP by *Trichoderma reesei* as a protein and energy source or untreated SBP as an energy source in rabbit diets on performance of growing rabbits.

MATERIALS AND METHODS

Sugar beet pulp:

Dried pelleted SBP was purchased from Delta Sugar Company, Kafr El-Sheikh, Egypt.

Microorganism:

Trichoderma reesei F-418 was obtained from the Microbial Chemistry Department, National Research Center, Egypt. The organism was maintained on Potato Dextrose Agar (PDA) medium.

Fungal inoculum preparation:

Three days age fungal culture in test tube was crushed in 10 ml sterilized distilled water and used to inoculate the experimental flasks at 10% (v/w) of SBP weight. Five hundred-ml capacity conical flasks each contained 20g of ground sugar beet pulp moistened with minerals medium contained 1 % urea, 2% ammonium sulphate, 3% potassium phosphate and 0.2% magnesium sulphate of SBP weight at (1:2) solid: liquid ratio (according to Abedo, 2006). The flasks were sterilized by autoclave at 121 ^{o} C for 20 minutes. The cooled sterilized flasks were inoculated with the above prepared inoculum, and then incubated in incubator at 30^{o} C under static condition for 3 days.

Scaling up of fungal biomass:

The fungal culture was propagated in 20L capacity containers each contained 2 kg of ground SBP moistened with the above minerals medium at (1:2) solid: liquid ratio. The sterilized cooled containers were inoculated with the above propagation inoculum at 10 % (w/w) of the SBP weight. The inoculated containers were incubated at room temperature for 5 days to obtain sufficient amount of the solid state fermented beet pulp.

Production of fungal treated sugar beet pulp:

The treatment was carried out on a concrete floor room of 4x4 m equipped with two metal trolleys each has 6 perforated metal trays. The ground SBP was moistened with the above minerals medium at solid: liquid (1:2). The inoculum of fermented SBP was used at 10 % (w/w), mixed well and spread in the trays. for the proper incubation period, 7 days (according to Abedo, 2006). At the end of the fermentation period the treated beet pulp was collected and exposed to sun dry until the moisture content reached less than 10%. Chemical composition and cell wall constituents, amino acids content and enzymes content of untreated (USBP) and fungal treated sugar beet pulp (TSBP) are presented in Tables (2),(3) and (4), respectively.

Experimental diets:

Five diets were formulated containing: 0 % SBP (control), 25% USBP, 25% TSBP, 50% USBP, and 50% TSBP. The experimental diets were formulated and pelleted to be isonitrogenous and isoenergetic and cover the nutrients requirements of rabbits according to NRC (1994) recommendations. Chemical composition and cell wall constituents of the experimental diets are presented in Table (1). Prices of the experimental diets based on the prices of the ingredients in year 2006 as; 1163.25, 1138.25, 1104.75, 1120.25, and 1074.75 for diets contained 0% SBP, 25%USBP, 50%USBP,25%TSBP and 50%TSBP,respectively.And the price of kg rabbits live body weight: 15 LE.

Animals feeding and management:

Fifty New-Zealand White growing rabbits of 8 weeks of age with an average initial weight of 883.34±51.95g were allotted randomly to 5 equal groups of 10 rabbits each. Rabbits were fed different diets for 12 weeks. During the experimental period individual live body weight and feed consumption were recorded weekly. At the last 2 weeks of the experimental period a metabolism trial was conducted using 15 male rabbits were housed individually in metabolic cages for 14 days, 7 days as adaptation period followed by 7 days as a collection period. Blood samples were collected from the ear vein of the animal before access to feed and water at the end of the experimental period.

Analytical methods:

The chemical composition of the experimental diets, feces and urine were analysed according to A.O.A.C (1990). Cell wall constituents were analyzed according to Goering and Van Soest (1970). Pectin content was determined according to Michel *et al.* (1985). Amino acides content was measured according to Christias *et al.* (1975). The cellulase activity was determined according to Nelson (1944). The activity of xylanase was determined according to Tiaz and Honigman (1976). Polygalacturonase activity was determined according to Valsangiacomo and Gessler (1992). Pectinesterase activity was determined according to Wood and Siddiqui (1971). Amylase activity was determined according to Nelson (1944).

Serum total protein, Albumin, urea, Creatinine, Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) were measured calorimetrically used the specific kits using the Chemistry Auto-analyzer (Olympus AU 400).

At the end of the experimental period, five rabbits from each group were randomly taken, kept off feed for 16 hours, weighed and slaughtered. Dressing percentage was calculated. Giblets organs weight (liver, kidneys, lungs and heart) and carcass measurements were obtained and their proportion to the live body weight was calculated. The growth performance index (PI) was calculated according to the equation that described by North (1981).

Collected data of digestibility trials, growth trials, carcass characteristics and blood parameters were statistically analyzed according to the completely randomized design using SAS (1998). Means were separated using Duncan's Multiple Range Test (Duncan, 1955).

Table 1: Formulation and chemical composition of the experimental diets.

Item	0%SBP (Control)	25% USBP	25% TSBP	50% USBP	50% TSBP
Ingredients					
Berseem hay	30	30	30	15	15
Sugar beet pulp	-	25	-	50	-
Fungal treated SBP	-	-	25	-	50
Barley grain	10	7	10	3	10
Yellow corn	16	10	14	3	12
Wheat bran	26	7	9	6	8
Soybean meal	15	18	9	20	2
Ca. diphosphate	0.5	0.5	0.5	0.5	0.5
Limestone	1	1	1	1	1
Salt	0.5	0.5	0.5	0.5	0.5
Vitamins& Min.mixture	0.4	0.4	0.4	0.4	0.4
DL-Methionine	0.1	0.1	0.1	0.1	0.1
Yeast	0.5	0.5	0.5	0.5	0.5
Chemical composition					
Moisture	9.34	9.76	10.57	9.85	11.88
Component, % on DM basis					
OM	93.97	92.12	90.58	90.64	90.48
CP	15.78	15.89	15.85	15.76	15.71
CF	12.63	15.41	15.17	17.23	16.67
EE	3.23	3.01	3.11	2.88	3.03
NFE	62.33	57.81	56.45	54.77	55.07
Ash	6.03	7.88	9.42	9.36	9.52
Cell wall constituents, %					
NDF	23.53	26.64	24.53	28.46	26.22
ADF	17.57	19.98	18.43	21.04	20.21
ADL	5.96	6.84	6.12	7.72	6.33
Hemicellulose*	5.96	6.66	6.10	7.42	6.01
Cellulose**	11.61	13.14	12.31	13.32	13.88
DE, Kcal/kg DM* **	2635	2706	2687	2763	2743

* NDF – ADF. ** ADF – ADL. ***calculated according to CLFF (2001).

RESULTS AND DISCUSSION

Chemical composition, amino acids and enzymes contents of fungal treated SBP:

Fungal treatment increased the crude protein content of SBP from 9.94 % for untreated to 20.47 for treated SBP (Table 2), suggested that increasing occurred mainly by convert the addition inorganic nitrogen to organic nitrogen as a microbial protein by fungi and partially by liberated the acid insoluble protein from cell wall constituents of SBP. These results were in agreement with Durand and Chereau (1988), Ghanem *et al.* (1991), Israilides *et al.* (1994), and Zaza (2005). Also fungal treatment increased all amino acids concentration in TSBP (Table 3), particularly methionine, leucine, threonine, phenylalanine, tyrosine, histidine, arginine and proline. These results were in agreement with results of Durand and Chereau (1988) and Ghanem *et al.* (1991). The increasing in the amino acids content ranged from 1.5 times for valine to 7.5 times for methionine as content of USBP. Fungal treated SBP contains higher alanine, valine and histidine and contains near threonine, leucine, phenlalanine content compared with soybean meal. Fungal treated SBP was contained (unit/g) 7.8 cellulase, 290.9 xylanase, 52.8 polygalacturonase, 75 pectinesterase and 47.6 amylase enzymes (Table 4). The enzymes are required to enhance digestion of fibrous diets particularly those contain high level of SBP. **Nutrients digestibilities, feeding value and nitrogen utilization:**

Results in Table (5) indicated that all nutrients digestibilities were significantly ($p<0.05$) increased when rabbits fed fungal treated SBP either 25 or 50% compared with groups fed control and untreated SBP, the increasing in nutrients digestibilities caused by presence of exogenous enzymes in TSBP. Incorporated USBP in diets, especially at 50% significantly ($p<0.05$) decreased digestibility of DM, OM, CP, and CF, while increased EE digestibility, but not affect on NFE digestibility. TDN values were not different for diets containing TSBP or 25% USBP and control diet, while was decreased for diet contained 50% USBP. Values of DCP were significantly ($p<0.05$) higher for diets contained TSBP than the other diets, the lowest value was recorded for 50% USBP diet.

Table 2: Chemical composition and cell wall constituents of untreated and fungal treated SBP.

Item	Untreated SBP	Fungal treated SBP
Chemical composition, %		
Moisture	7.94	6.98
Component, % on DM basis		
OM	96.01	92.95
CP	9.94	20.47
CF	21.27	23.96
EE	0.64	0.65
NFE	64.16	47.87
Ash	3.99	7.05
Cell wall constituents, %		
NDF	50.01	44.43
ADF	28.86	34.00
ADL	2.68	4.20
Cellulose*	26.18	29.80
Hemicellulose**	21.15	10.43
Pectin	16.53	11.66
DE (Kcal /Kg DM*	2818	2900

* NDF – ADF. ** ADF – ADL. ***calculated according to CLFF (2001).

Table 3: Amino acids content of untreated, fungal treated sugar beet pulp and soybean meal.

A.A. Concentration (mg/100g DM)	**Untreated SBP**	**Fungal treated SBP**	**Soybean meal**
Aspartic	37.46	81.59	150.52
Serine	20.18	42.62	46.44
Threonine	14.68	43.51	57.05
Glutamic	37.26	95.90	231.47
Proline	7.78	54.67	61.85
Glycine	18.12	44.49	52.53
Alanine	21.41	58.75	54.76
Cystine	0.43	0.51	3.78
Valine	31.81	54.40	47.96
Methionine	0.59	4.46	7.77
Leucine	6.72	35.78	47.24
Isoleucine	19.52	50.93	92.29
Phenylalanine	9.05	30.79	44.62
Tyrosine	5.98	30.47	72.89
Histidine	22.22	126.80	42.34
Lysine	22.89	51.01	72.13
Arginine	11.46	38.71	94.33
Total amino acids	287.56	845.39	1179.97

Table 4: Enzymes content (Unit/g) of untreated and fungal treated sugar beet pulp.

Item	Untreated SBP	Treated SBP
Cellulase	0.0	7.8
Xylanase	0.0	290.9
Polygalacturonase	0.0	52.8
Pectinesterase	0.0	75.0
Amylase	0.0	47.6

Nitrogen balance values were significantly (p<0.05) higher (1.26 and 1.13) for rabbits fed diets contained 25 and 50% TSBP than 0.90, 0.73, and 0.54 g/h/day for control, 25 and 50% USBP, respectively. The depression in CP digestibility and N balance for rabbits fed USBP results from increasing the dietary fiber content that increase the fecal nitrogen loss as a metabolic fecal N (Cheeke, 1987). Kratchanova *et al.* (2004) stated that various non enzymatic interactions between pectin and an amino compounds such as lysine, glysine and arginine could occur during the processing and storage of the feedstuffs that containing pectic substances. Kijora *et al.* (1993) infused pectin via a ruminal cannula in heifers at 10 % of the digesta DM, They found that infused pectin increased N^{15} of the fecal bacterial from 4.7 % to 10.5 %. Roth-Maier *et al.* (1993) fed sows on a semi-synthetic basal diet supplemented with 0 and 334 g pectin /day, they recorded that the apparent digestibility of nitrogen was reduced by more than 20 % and the fecal N excretion increased, and hence N retention was reduced. Zaza (2005) studied the effect of partial replacement 50 or 75 % of corn grain by biological treated sugar beet pulp (TSBP) on rabbit growth performance, found that rabbit group that fed ration contained 75 % TSBP was significantly superior in the digestibility of DM, OM, CP, CF, and NFE followed by the group that fed 50 % TSBP, but the lowest values were recorded with the control one. The highest value of TDN was significantly recorded with the groups fed on TSBP compared with control. The group that fed on 75 % TSBP was (p<0.05) higher in DCP value.

Table 5: Digestibility coefficients, nutritive value and nitrogen utilization of the experimental diets.

Item	Groups				
	0%SBP (Control)	**25% USBP**	**25% TSBP**	**50% USBP**	**50% TSBP**
Digestibility coefficients, %					
DM	61.34 ± 0.28^{b}	59.18 ± 0.35^{c}	63.94 ± 0.33^{a}	57.16 ± 0.09^{d}	64.02 ± 0.28^{a}
OM	64.09 ± 0.30^{b}	62.10 ± 0.36^{c}	66.35 ± 0.28^{a}	60.58 ± 0.16^{d}	66.87 ± 0.32^{a}
CP	61.91 ± 0.59^{b}	61.30 ± 0.39^{b}	65.52 ± 0.26^{a}	58.70 ± 0.16^{c}	65.12 ± 0.22^{a}
CF	45.65 ± 0.79^{c}	40.22 ± 0.42^{d}	56.18 ± 0.49^{a}	37.77 ± 0.34^{e}	50.23 ± 0.27^{b}
EE	80.25 ± 0.22^{e}	83.23 ± 0.21^{d}	86.59 ± 0.44^{b}	85.18 ± 0.12^{c}	89.04 ± 0.17^{a}
NFE	67.54 ± 0.31^{b}	67.04 ± 0.55^{b}	68.19 ± 0.24^{b}	67.00 ± 0.28^{b}	70.58 ± 0.42^{a}
Nutritive value, %					
TDN	63.47 ± 0.29^{a}	60.33 ± 0.33^{b}	63.46 ± 0.28^{a}	57.30 ± 0.53^{c}	62.54 ± 0.28^{a}
DCP	9.77 ± 0.09^{b}	9.74 ± 0.06^{b}	10.38 ± 0.04^{a}	9.25 ± 0.02^{c}	10.23 ± 0.03^{a}
Nitrogen utilization, g/h/day					
NI	2.89 ± 0.07^{ab}	2.60 ± 0.02^{c}	3.00 ± 0.03^{a}	2.27 ± 0.03^{d}	2.79 ± 0.05^{b}
ND	1.79 ± 0.05^{b}	1.59 ± 0.01^{c}	1.97 ± 0.02^{a}	1.34 ± 0.02^{d}	1.82 ± 0.02^{b}
NB	0.90 ± 0.02^{c}	0.73 ± 0.01^{d}	1.26 ± 0.02^{a}	0.54 ± 0.02^{e}	1.13 ± 0.03^{b}
NB/NI, %	31.09 ± 0.26^{b}	28.18 ± 0.06^{c}	42.01 ± 0.38^{a}	23.89 ± 0.72^{d}	40.61 ± 0.83^{a}
NB/ND, %	50.23 ± 0.59^{b}	45.98 ± 0.32^{c}	64.13 ± 0.36^{a}	40.71 ± 1.28^{d}	62.36 ± 1.12^{a}

a, b, c, d and e Means in the same row with different superscripts are different at (P<0.05).

Growth performance:

Body weight gain, feed efficiency and economic efficiency are presented in Table (6). The results showed that the average daily gain were significantly (p<0.05) higher for rabbits fed 25 and 50% TSBP diets (25.99 and 23.99) than those fed control, 25 and 50% USBP diets, respectively (21.50, 21.04 and 17.00 g/day). Feed intake was not affected when incorporated TSBP in diet, while was significantly (p<0.05) decreased when incorporated USBP, this results due to high absorbing capacity (870 ml water/100g) and swelling capacity (380% of SBP, causing reducing rate of feed passage (Cheeke, 1987). Feed efficiency values were significantly (p<0.05) higher (4.55 and 4.63) for rabbits fed 25 and 50% TSBP than (5.33, 4.86 and 5.30 kg feed/kg gain) for rabbits fed control, 25 and 50% USBP, respectively. Growth performance index (PI) recorded the highest value (70.84) for rabbits fed 25% TSBP compared with 65.80, 52.94, and 56.99 and 45.53% for rabbits fed 50%TSBP, control 25 and 50% USBP, respectively. Increasing of weight gain and feed efficiency for rabbits fed diets contained TSBP may be due to containing TSBP high content of exogenous enzymes, amino acids, and other secondary metabolites, like vitamins as a result of microorganism activity. Cobos *et al.* (1995) found that no significant differences in growth rate, feed efficiency and dressing percentage of rabbits fed barley based diet or with diet contained 15 % SBP in substitution of barley, however all parameters were decreased when SBP substituted barley by 50 %. Bruder (1997) stated that the fermented beet pulp had better nutritional characteristics than non fermented pulp for chicks and pigs, some of fermented beet pulp could be added to chick diets without detrimental effects caused by addition of non fermented pulp. Fermented BP could also be added in pig diets up to a maximum level around 40% with good results; according to the European Union Regulations no toxic effect was detected. Zaza (2005) reported that the rabbits fed rations contained 50 and 75 % biological treated SBP were significantly ($p<0.05$) higher in the average daily gain than control. Group fed 50 % TSBP was ($p<0.05$) higher in feed conversion than group fed on 75 % and control, also the group that fed 75 % TSBP was ($p<0.05$) higher than the control. However, no significant differences were found among the three groups in feed intake. The highest economic efficiency was achieved with the group that fed on 50 % TSBP followed by the group that fed 75 % TSBP and then by the control group.

Table 6: Growth performance, feed efficiency and economic efficiency of rabbits fed diets containing fungal treated or untreated SBP.

Item	Groups				
	0%SBP (Control)	**25% USBP**	**25% TSBP**	**50% USBP**	**50% TSBP**
No. of rabbits	10	10	10	10	10
Body weight, g					
Initial	886.67±46.52	876.67±33.73	883.33±39.64	883.33±51.36	886.67±34.03
Final	2821.67±39.53^{c}	2770.00±50.40^{c}	3223.33±90.91^{a}	2413.33±114.15^{d}	3046.67±104.58^{b}
Average daily gain, g	21.50±0.26^{c}	21.04±0.19^{c}	25.99±0.71^{a}	17.00±0.94^{d}	23.99±0.83^{b}
Feed efficiency					
Daily feed intake	114.53±2.88^{ab}	102.27±0.80^{c}	118.35±1.30^{a}	90.15±1.04^{d}	111.03±2.04^{b}
FE (feed/gain)	5.33±0.34^{a}	4.86±0.74^{b}	4.55±0.52^{c}	5.30±0.64^{a}	4.63±0.71^{bc}
PI, %	52.94±0.11^{b}	56.99±0.34^{b}	70.84±0.41^{a}	45.53±0.25^{c}	65.80±0.24^{ab}
Economic evaluation					
Total feed intake, g	10307.70	9204.30	10651.50	8113.50	9992.70
Price of weight gain, LE	29.03	28.40	35.10	22.95	32.40
Total feed cost, LE	11.99	10.48	11.93	8.96	10.74
Net revenue, LE	17.04	17.92	23.17	8.96	21.66
Economic efficiency, Y	142.12	170.99	194.22	156.14	201.68
Relative economic efficiency	100	120.31	136.66	156.14	141.91

Carcass characteristics:

Data of Carcass characteristics are presented in Table (7). Results showed that the dressing percentage for rabbits fed diets contained 25 and 50% TSBP (75.15 and 73.96) were not different compared with control (72.14), but it were significantly ($p<0.05$) higher than (69.15 and 64.05%) for rabbits fed 25 and 50% USBP. Edible giblets percentage, especially liver, kidneys and heart were higher for rabbits fed TSBP diets, especially at 50% compared with rabbits fed control and 25% USBP diets. Also the rabbits fed 50% USBP recorded higher kidneys and heart percentages. Chemical composition of lean meal showed higher content of DM, but less EE content for rabbits fed USBP diets compared with control group. Rabbits fed TSBP recorded higher ash content compared with those fed control and 25% USBP diets. CP content was not different between all groups.

Blood parameters:

Values of blood serum constituents are presented in Table (8). Blood constituents included; total protein, albumin, urea, creatinine, AST and ALT were within the normal range according to Kaneko (1989). However, rabbits fed USBP recorded lower albumin and urea values than the other groups. Values of urea and ALT were higher for animals fed TSBP than the other groups. Zaza (2005) reported that no significant differences were found among the rabbits fed biological treated SBP and control in total protein, albumin, globulin, A/G ratio, GPT and GOT, rabbits that fed 50 % TSBP ration was showed ($p<0.05$) higher blood urea concentration compared with those fed on 75 % and the control ration.

Table 7: Carcass characteristics and chemical composition of lean meat for rabbits fed diets containing fungal treated or untreated SBP.

Items	Groups				
	0% SBP (Control)	25% USBP	25% TSBP	50% USBP	50% TSBP
Pre-slaughter weight, g	3050.50±65.96[ab]	2950.00±83.86[b]	3460.50±66.92[a]	2670.30±112.87[c]	3380.00±69.23[a]
Hot carcass weight, g	2200.50±73.88[b]	2040.00±9265[b]	2600.50±45.97[a]	1710.20±94.82[c]	2500.00±52.89 [a]
Dressing percentage, %	72.14±1.17[a]	69.15±2.54[b]	75.15±0.81[a]	64.05±2.31[c]	73.96±1.49[a]
Edible giblets, %					
Liver	2.05±0.01[b]	1.93±0.02[c]	2.02±0.01[b]	2.06±0.01[b]	2.32±0.03[a]
Kidneys	0.53±0.01[c]	0.59±0.01[c]	0.64±0.01[b]	0.66±0.01[b]	0.77±0.02[a]
Lungs	0.55±0.01	0.57±0.01	0.54±0.02	0.59±0.01	0.56±0.02
Heart	0.20±0.01[b]	0.22±0.01[ab]	0.24±0.01[a]	0.26±0.01[a]	0.27±0.01[a]
Chemical analysis of carcass meat, % on DM basis					
Dry matter	23.26±1.49[b]	26.18±1.03[a]	24.57±1.54[ab]	28.21±1.57[a]	25.86±2.02[ab]
CP	71.05±3.24	69.23±2.33	70.04±3.31	68.88±2.39	72.33±3.41
EE	23.62±1.23[a]	19.43±0.66[b]	21.48±1.14[a]	18.55±0.37[b]	22.44±1.11[a]
Ash	4.62±0.43[b]	5.24±0.17[b]	6.33±0.27[a]	5.78±0.21[ab]	6.51±0.17[a]

Table 8: Blood parameters of rabbits fed diets containing fungal treated or untreated SBP.

Item	Groups					Normal range*
	0% SBP (Control)	25% USBP	25% TSBP	50% USBP	50% TSBP	
Total protein, g/dl	7.56±0.55[ab]	6.88±0.71[b]	7.86±0.35[ab]	6.37±0.57[b]	8.12±0.44[a]	6.45±3.1
Albumin, g/dl	4.08±0.21[a]	3.43±0.12[b]	4. 23±0.35[a]	3.58±0.23[b]	4.63±0.11[a]	2.73±3.0
Globulin, g/dl	3.48±0.13	3.45±0.25	3.63±0.36	2.79±0.31	3.49±0.15	-
Urea-N, mg/dl	13.69±1.35[b]	13.01±1.12[bc]	14.29±1.23[a]	12.30±1.28[c]	15.14±2.11[a]	14.3±3.0
Creatinine, mg/dl	0.96±0.02[ab]	0.92±0.04[b]	1.00±0.01[a]	0.90±0.04[b]	1.03±0.02[a]	0.71-2.27
AST, U/L	33.61±1.09[ab]	31.21±1.22[b]	33.73±0.45[a]	31.66±1.02[b]	35.32±1.34[a]	47
ALT, U/L	24.88±0.85[b]	23.37±1.08[b]	27.11±1.21[a]	22.44±1.13[b]	28.03±1.37[a]	79

CONCLUSION

From the previous results, it could be concluded that could be incorporated fungal treated sugar beet pulp by *Trichoderma reesei* up to 50% as a protein and energy source in rabbit's diets, whereas it increased the body weight gain, feed conversion and economic efficiency, although increasing the fiber content in diets.

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