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UTILIZATION OF RICE MILLING BY-PRODUCTS AND DRIED SUGAR BEET PULP IN RABBIT RATIONS

BY

A.A. Soliman[1]; A. E. Soliman[1] M. Sabry[1]; A.A.Biomy[2] and K.Y. El-Nagmy[1]

1 Animal Production Research Institute, Dokki, Giza, Egypt.
2 Animal Production Dept., Fac. Of Agric. South Valley Univ., Egypt.

SUMMARY

A total number of eighty four New Zealand White (NZW) rabbits 5 weeks of age and 545.35 ± 7.36 g average live body weight were allotted at random to seven similar experimental groups (of 12 rabbits each) and fed on seven different pelleted rations contained 0, 10, 20 and 30% (RM) or 10, 20 and 30% (SBP). The feeding trail extended for 8 weeks. The aim of the study to investigate the effect of introducing rice milling by-products (RM) and dried sugar beet pulp (SBP) in rabbit rations by different levels on growth performance, nutrients digestibility, mortality rate, some blood parameters, carcass characteristics and economic efficiency. Results obtained indicated that, digestion coefficients values of CP, CF, EE and NFE of diets containing 20% RM or SBP were significantly (P<0.05) higher than those fed control diet. Increasing RM and SBP levels from 10 to 20%, significantly (P<0.05) increased TDN from 63.09 & 61.87% to 64.87 & 65.16% and DCP from 12.02 & 11.98% to 12.33 & 12.37%, respectively. Introducing RM or SBP by 20% in rabbit diets grew 16.55 and 19.26% higher than control, respectively. The diets containing 10 and 20% (RM) and (SBP) showed better significantly (P<0.05) values of feed conversion than the other diets. Concentrations of serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) exhibited insignificant activities in rabbits fed diets containing different levels of MR or SBP. Serum total protein, albumin and globulin concentrations were significantly (P<0.05) higher in the blood of rabbits fed diets containing 10 and 20% RM or SBP than those fed the other diets. The significantly (P<0.05) increase of serum creatinine and urea-N levels in rabbits fed diets containing 20 and 30% RM or SBP within the normal range. Hot carcass weight and dressing percentages were significantly (P<0.05) higher in the 20% RM or SBP group than those of the control group. Chemical composition values of meat, with the exception of ether extract values were not significantly differed among the experimental groups. Economical efficiency values of rabbits fed diets contained 20% RM or SBP at marketing age (13 weeks) was higher than those of the other diets. It could be concluded that, rice milling by-products and dried sugar beet pulp could be introducing up to 20 of growing rabbit rations without any adverse effects on growth performance.

INTRODACTION

Dietary fibre plays an important role in rabbit nutrition. It is one of the main components of rabbit diets, which usually contain 35 to 40% neutral detergent fibre (**De Blas and Mateas, 1998**). Clover hay is the most common source of fibre used in Egypt. Dietary fibre helps to maintain a high passage rate, avoiding the accumulation of digesta in the caecum that reduce feed intake and impairs growth (**De Blas *et al.*, 1999).** Dietary fibre is required in rabbit feeds to stimulate ileocecal colonic motility preventing consumption and enteritis, its fermentation produce VFA'S which may reduce the incidence of digestive disorders **(Cheeke, 1983)**. On the other side, there are about 22 million tons of low quality roughages which are not efficiently utilize in Egypt (**Census (2004)** including agro-industrial by-products. Rabbits can convert dietary by-products to meat, fur and skin due to their high feeding efficiency. Therefore, may be useful. it could be advantageous to introducing a low percentage of a highly efficacious fibre such as rice milling by-product (RM) and dried sugar beet pulp (SBP) in rabbit concentrate feed mixture in Egypt as a tool for reducing feed cost in rabbit production. It is possible that a low level of fibre from (RM) or (SBP) might have an effect equivalent to that of a much higher levels of energy such as yellow corn (YC). **Bhattachary and Sleiman (1970**) reported that SBP energy was utilized as well as corn and barely up to 60% in concentrate rations for ruminants. The principal aim of this experiment is to study the effect of introducing rice milling or dried sugar beet pulp by-products in the rabbit rations on the growth performance, digestibility coefficients, feeding value, some blood parameters and carcass dressing percentage and carcass characteristics, as well as the economical efficiency of growing New Zealand White (NZW) rabbits.

MATERIALS AND METHODS

The present work was conducted at National Rabbit Project, Department of Animal Production, Faculty of Agriculture, South Valley University. A total number of eighty four weaklings New Zealand White (NZW) male rabbits of 5 weeks aged and averaged 545.35 $\pm$ 7.36 g weight were randomly divided into similar seven experimental groups (12 rabbits each). Rabbits were housed in galvanised wire cages (two rabbits in each) in a well-ventilated building. Tap water was automatically available all the time by stainless steel nipples. All rabbits were kept under the same managerial hygienic and environmental conditions.

Seven peletted rations were formulated according to **NRC (1982),** in which the 1st ration (T1) saved as a control and contained clover hay as the main source of roughage (Table 1). Diets T2 – T4, contained 10, 20 and 30% rice milling by-products and T5 – T7, were contained the same percentages of dried sugar beet pulp SBP, respectively.

The rations were adjusted every week according to the average daily feed intake. Individual live body weight and feed intake were weekly recorded up to 13 weeks of age. Feed conversion ratio was calculated as g feed/g gain and as g TDN/g gain. Performance index (PI) was calculated according to **North (1981)** as below:

PI = live body weight (kg) x 100 / Feed conversion

The economical efficiency was calculated by the following equation:

$$Y = [(A – B) / B]$$

Where A is selling cost of obtained gain and B is the feeding cost for this gain (**Cited from El-Kerdawy, 1997).**

Five animals from each groups at the end of 13th week of age (marketing age) were housed individually in metabolic cages for 10 days (5 days as preliminary and 10 days as collection period) to estimate the digestibility coefficients of the experimental rations. Samples of feed and faeces of each animal were taken daily through the collection period for chemical analysis, according to **A.O.A.C. (1990).** The digestible energy (DE) values of the offered diets were calculated according to the equation described by Fekate

and Gippert (1986) as follows: DE (kcal/ kg DM feed) = (4253 – 32.6 (CF%) - 144.4 (Ash%)
The total digestible nutrients (TDN) were calculated according **to Cheeke *et al.*, (1987)**. Blood samples were collected from five rabbits of each group at the end of metabolism trails; serum was separated and stored at (–20 C°) until assayed. Asperatate and alanine transaminase (AST&ALT) activities were determined according to the method **of Rictmans and Franked, (1957);** serum total protein (TP) were determined according to the Henry (1964), serum albumin (A) according to **Doumas and Blggs (1972**), urea according to **Patton and Grouch (1977)** and creatinine were determined according to **Bartels (1971),** cholesterol according to **Raltiff and Hall (1973).**

At the end of the growth experiment, 4 fasted rabbits from each group were randomly selected and weighed before slaughter. After complete bleeding the head, pelt, viscera, feet and tail were removed. Weights of carcasses of slaughtered rabbits were recorded. Samples of meat from the right caudal side of the carcass were analysis according to **A.O.A.C. (1990).**

The data were statistically analysed according to **Snedecor and Cochran (1982)** in one way analysis of variance design as the model:
$Y_{ij} = M + A_i + e_{ij}$, where:
Y_{ij} = An observation, M = Overall mean, A_i = Effect of rations and e_{ij} = experimental error.

Table (1): Formulation and chemical composition of the experimental rations.

Items	Control T1	Rice milling by-roducts			Dried sugar beet pulp		
		T2	T3	T4	T5	T6	T7
Rice milling by-products	00	10	20	30	0	0	0
Sugar beet pulp	0	0	0	0	10	20	30
Alfa Alfa hay	22	16	12	12	20	18	17
Barley grain	10	0	0	0	13	6	3
Yellow corn	19	20	19.5	19.5	12	11	7
Wheat bran	27. 5	32.35	29.55	20	22.05	21.5	22
Soybean meal (44% CP)	16.70	16.00	15.55	18.00	18.55	15.05	18.05
Molasses	3	3	1	1	3	3	1
Limestone	1	1	1	1	1	1	1
Sodium chloride	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Premix.*	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Dl. Methionine	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Calc. Chemical composition:							
Crude protein	17.05	17.15	17.08	16.98	17.22	17.13	17.01
Crude fibre	11.75	11.20	10.84	10.02	12.67	13.67	15.15
Ether extract	2.72	2.57	2.59	2.38	2.39	2.26	2.13
Calculated digestible energy kcal/kg	2627	2613	2645	2594	2639	2646	2636
Calcium	0.431	0.725	0.654	0.644	0.844	0.885	0.927
Available P	0.055	0.063	0. 030	0.030	0.050	0.045	0.042
Total P	0.498	0.653	0.763	0.824	0.456	0.432	0.419
Lysine	0.879	0.885	0.872	0.835	0.868	0.845	0.812
Methionine	0.418	0.426	0.430	0.767	0.402	0.386	0.371
Cyctine	0.030	0022	0.016	0.016	0.028	0.025	0.025
Meth. + Cyc	0.718	0.726	0.717	1.023	0.684	0.652	0.621
Sodium	0.216	0.223	0.227	0.230	0.214	0.210	0.209

* Each 1kg of premix contained: Choline chloride 200g, Mg66.7g, Ca 0.5g, I 33.3mg, Se 16.6mg, Zn 11.7g, Fe12.5g, Vit. A 200000 Iµ, Vit. D_3 150000 Iµ, Vit.E 8.33g, Vit.B_1 0.33 mg, B_6 0.33 g, B_{12} 1.7 mg, B_2 8.33g, Vit.K0.33 mg Pantothanic acid 3.33 g Biotin 33 mg and Folic acid 0.83 g.

The digestible energy (DE) values of the offered diets were calculated according to the equation described by **Fekate and Gippert (1986)** as follows: DE (kcal/ kg DM feed) = (4253 – 32.6 (CF %) - 144.4 (Ash %).

RESULT AND DISCUSSION

Digestibility coefficients:

Results of digestibility trials are shown in Table 2. It could be noticed that feeding growing rabbits diets containing 30% rice milling by-products (RM) or 20% sugar beet pulp (SBP) were significantly ($P<0.05$) increased the digestibility coefficient of DM and OM compared with the other experimental groups. Concerning the digestion coefficients of CP, CF, EE and NFE of diets containing 20% RM or SBP were significantly ($P<0.05$) higher values than those fed control diet. This improvement in CP digestibility coefficient values of diets containing 20% RM or SBP may be due to the higher proportion of soybean meal in these diets, while the improvement in CF digestibility coefficient values of the same diets may be due to increase energy intake.

In this respect, **Fraga *et al.,* (1991)** mentioned that the diets contained rice milling by-products promoted on increase both in retention of digesta in the gut and in the entry rate of CF into the cecum, and a decrease in the rate of turnover of cecal contents**. Skrivanova *et al.,* (1997)** Pointed that addition of sugar beet pulp to the diet positively influenced digestibility nutrients particularly of fibre.

On the other hand, **Oanh (1983)** replaced the barley, oats and part of maize by 40% rice milling in NZW rabbits diets, the digestibility of OM, CP, EE, CF and NFE was 65.1, 69.6, 81.6, 37.8 and 68.4%, respectively. As a consequence of differences in digestibility coefficients, the higher values of digestible energy content were recorded with the rations containing 20% rice milling by-products and or 20% dried sugar beet pulp.

Table (2). Effect of feeding diets containing levels of RM or SBP on digestibility coefficients and nutritive values of experimental diets.

Item	Control Diet	Rice milling by-products			Dried sugar beet pulp			Pooled
		10%	20%	30%	10%	20%	30%	
	T1	T2	T3	T4	T5	T6	T7	± SE
Digestibility coefficients:								
DM	65.31 [c]	68.53 [a]	68.62 [a]	68.94 [a]	67.25 [b]	69.21[a]	65.24 **[c]**	0.34*
OM	69.22 [c]	68.43 [c]	69.46 [b]	70.62 [d]	68.43 [b]	68.65 [a]	68.84 **[b]**	0.65*
CP	70.45 [b]	70.15 [e]	72.21 [b]	68.54 [c]	69.56 [b]	72.23 [a]	68.13 **[d]**	0.58*
CF	62.36 [e]	63.79 [d]	64.21 [c]	60.74 [b]	60.24 [b]	65.62 [a]	61.62[ab]	0.72*
EE	72.17 [b]	71.62 [a]	75.16 [a]	71.12 [ab]	71.35 [ab]	74.54 [b]	72.57 [b]	0.59*
NFE	71.15 [b]	72.36 [a]	75.78 [a]	71.65 [b]	71.25 [b]	76.48 [a]	70.28 [c]	0.65*
N. values:								
TDN%	56.12 [b]	63.09 [b]	64.87 [a]	60.43 [c]	61.87 [a]	65.16 [a]	59.97 [c]	0.64*
DCP%	12.01 [a]	12.02 [a]	12.33 [a]	11.49 [b]	11.98 [a]	12.37 [a]	11.59 [b]	0.08*

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

Nutritive values:

The nutritive value of the experimental rations expressed as TDN, DCP presented in Table 2 illustrated no significant differences among all tested diets except T3 and T6 (introducing of RM or SBP by 20%) in rabbit diets caused a significant (P<0.05) increase in TDN and DCP% . Increasing RM and SBP levels from 10 to 20%, significantly (P<0.05) increased TDN from 63.09 & 61.87% to 64.87 & 65.16% and DCP from 12.02 & 11.98% to 12.33 & 12.37%, respectively. In this respect, **Gihad *et al.*, *(*1989)** reported that, the addition of SBP up to 40% in the diets of sheep did not affect on the value of TDN, but decreased significantly (P<0.05) the DCP from 6.52 to 5.35%. **El-Adawy *et al.* *(*2000)** found that, the TDN, DCP and ME values were significantly (P<0.05) decreased by 8.3, 13.9 and 7.9 % in groups fed total replacement by sugar beet pulp instead of alfalfa hay.

Feed Intake and Feed Conversion Ratio:

Results of the fattening trial are shown in (Table 3). Daily DM intake and energy intake of rabbits fed 20% RM or SBP diets showed significantly (P<0.05) higher values than those of the other diets. Also, Introducing different levels of RM or SBP significantly increased live body weight and daily weight gain. Obviously, introducing RM or SBP by 20% in rabbit diets grew 16.55 and 19.26% faster than control, respectively. These results were similar to those obtained by **Perez *et al.*, (1991)** mentioned that increasing sugar beet pulp in rabbit diets, the average daily live weight gain was increased. **Skrivanova *et al.*, 1997**. **Jensen (1989)** pointed that, dried sugar beet pulp in rabbit feed mixture with 20% or more dried sugar beet pulp grew 11% faster than control. **Raharjo *et a.*, (1988**) reported that when Flemish Giant ×NZW rabbits fed on 0, 40 or 60% rice bran recorded average daily gain was 25.7, 24.1 and 23.3g, respectively. However, there were significant (P<0.05) differences among treatments in feed conversion ratio Table (3). Rabbits fed diets containing 10 and 20% RM or SBP were significantly (P<0.05) higher than those fed the other experimental diets. These results are in harmony with the finding of **Raharjo *et al.*, (1988), Perez *et al.*, (1991)** and **Onh (1983)** who mention that the rice milling by-products improved the digestibility and feed conversion ratio.

Performance Index (PI%):

The performance index results of rabbits fed rations with 10 and 20% of RM or SBP (T2 & T54) and (T3&T6) showed significantly (P<0.05) higher values than those fed the diets containing 30% RM, SBP and control (Table 3). On the other hand, diets which contained 20% of RM or SBP (T3&T6) significantly (P<0.05) increased the performance index values by 26.46 and 28.70%, respectively than those of the control diet. These results were in agreement with the finding of **Cheeke and Patton (1979), Zaki El-Din (1996) and El-Adawy *et al* (2000).**

Mortality Rate:

Mortality rate of rabbits at the end of 13th week of the experiment (Table 3) were found to occur more frequently with the low fibre ration, mainly these containing 30% (RM) and 10% (SBP) rations. These might support the theory of a” carbohydrate overload **“(Cheeke and Patton, 1980),** in which high mortality occurs in rabbits due to sever diarrhoea, feeding diet containing a high level of soluble carbohydrate, but a low fibre level. The lower consumption of cecotropes with the low fibre diets agrees with the results of **Fekete and Bokori (1985)** and **Yono *et al.*, (1990).**

Table (3).Effect of feeding diets containing levels of the experimental diets on growth performance and feed conversion of growing rabbits.

Item	Control diet	Rice milling by-products			Dried sugar beet pulp			Pooled $\pm$ SE
		10%	20%	30%	10%	20%	30%	
		T1	T2	T3	T4	T5	T6	
Initial Body weight, g	545.07^{c}	544.84^{a}	548.82^{a}	540.80^{a}	545.14^{b}	541.73^{a}	552.04^{c}	7.36*
Final body weight, g	1925.22^{c}	2026.04^{c}	2157.70^{b}	1912.80^{d}	2059.38^{b}	2187.13^{a}	1960.44^{b}	8.65*
Total gain, g	1380.40^{e}	1481.20^{c}	1608.88^{a}	1372.00^{e}	1514.24^{b}	1646.40^{a}	1408.40^{d}	5.58*
Daily weight gain, g	24.65^{b}	26.45^{e}	28.73^{b}	24.50^{c}	27.04^{b}	29.40^{a}	25.15^{d}	0.72*
Daily feed intake, g	99.28^{e}	105.16^{d}	102.23^{c}	107.02^{b}	102.06^{a}	104.83^{a}	101.05^{ab}	2.59*
D. energy intake, kcal	260.81^{e}	274.78^{b}	277.61^{a}	267.33^{d}	269.34^{c}	277.38^{a}	266.37^{d}	3.48*
Feed conversion	4.03^{c}	3.98^{a}	3.56^{a}	4.37^{d}	3.77^{ab}	3. 57^{a}	4.02^{c}	0.65*
PI, %	47.77^{e}	50.90^{c}	60.41^{a}	43.95^{b}	54.74^{d}	61.48^{a}	48.76^{e}	1.64*
Mortality%	12.16^{a}	7.52^{a}	10.18^{a}	13.33^{b}	13.27^{a}	8.07^{a}	7.37^{b}	0.63*

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

Blood Parameters:

Data presented in (Table 4) illustrated that some metabolic enzymes such as aspartate aminotransferase (AST) and alanine aminotransferase (ALT) exhibited insignificant activities in rabbits fed diets containing different levels of MR or SBP which reflect a better function of liver. On the other hand, data showed that, In this respect, **Habeeb *et al.*, (1989)** pointed that total serum protein concentration may be due to decrease of thyroxin production which stimulates the protein synthesis. In the contrary, **Mohsen *et al.*, (1999)** pointed that no significant differences in the concentration of plasma protein in the blood of bucks fed three levels of SBP (10, 25 and 50%). The significantly (P<0.05) increase of serum creatinine and urea-N levels in rabbits fed diets containing 20 and 30% RM or SBP within the normal range. The increase in serum creatinine in the present study may be associated with improvement of CP digestibility or may be due to the break dowen of elevated protein level during metabolism **(Murray *et al.*, 1991). Mohsen *et al.*, (1999)** pointed that, the concentration of urea-N was increased significantly (P<0.01) in the blood of bucks fed diets containing SBP (25 and 50%) by 0.20 and 0.40%, respectively. The obtained results of creatinine and urea-N levels indicated normal function of kidneys as reported by **Habeeb *et al.*, 1997**, who reported that, serum creatinine and urea levels were 1.4 and 2.1 mg/100 ml, respectively, for NZW rabbits. Also, rabbits fed diets containing 10 and 20% RM or SBP showed slightly higher serum total lipids and cholesterol than those fed the other diets.

Table (4): Effect of feeding diets containing levels of the experimental diets on some blood parameters of growing rabbits.

Item	Control diet	Rice milling by-products			Dried sugar beet pulp			Pooled ± SE
		10%	20%	30%	10%	20%	30%	
		T1	T2	T3	T4	T5	T6	
								0.34NS
AST (IU/l)	46.41 ^{a}	47.56 ^{a}	46.36 ^{a}	47.85 ^{a}	46.72 ^{a}	47.65^{a}	47.84 ^{a}	0.65NS
ALT (IU/l)	25.21 ^{a}	24.53 ^{a}	24.18 ^{a}	25.76^{a}	25.12 ^{a}	24.85 ^{a}	24.97 ^{a}	0.58*
Total protein (g/d)	6.25 ^{c}	7.24 ^{a}	7.78 ^{a}	6.54 ^{b}	7.49 ^{a}	7.77 ^{a}	6.51 ^{b}	0.72*
Albumin (mg/dl)	3.40 ^{e}	3.86 ^{a}	4.14^{a}	4.22 ^{b}	4.01 ^{a}	4.13 ^{a}	4.18^{ab}	0.59*
Globulin (mg/dl)	2.85 ^{b}	2.92 ^{a}	3.64 ^{a}	3.02 ^{ab}	2.68 ^{ab}	2. 64 ^{b}	2.33 ^{b}	1.65NS
Cholesterol (mg/dl)	94.63 ^{a}	96.47 ^{a}	96.31 ^{a}	95.52 ^{a}	96.42 ^{a}	97.63 ^{a}	95.86 ^{a}	2.64NS
Total lipids (mg/dl)	277.56	275.24 ^{a}	276.61 ^{a}	273.18 ^{a}	275.74 ^{a}	278.87	274.14 ^{a}	0.08*
Urea –N (mg/dl)	^{a}	16.06 ^{b}	16.87 ^{a}	17.05 ^{a}	16.16 ^{b}	^{a}	17.12 ^{a}	0.06 *
Creatinine (mg/dl)	15.18 ^{c}	1.30 ^{b}	1.31 ^{a}	1.32 ^{a}	1.30 ^{b}	16.89 ^{a}	1.33^{a}	
	1.27 ^{c}					1.31^{a}		

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

Carcass characteristic:

Table (5) showed that the carcass characteristics of slaughtered rabbits at 13 weeks of age. The differences in relative carcass traits as a results to the effect of feeding treatments were significantly (P<0.05) differed. Under the condition of this experiment, it appears that, the highest values for dressing % was recorded with rabbits which fed on diet containing 10 and 20% RM or SBP. These treatments had the best digestible coefficients, which reflect on improving feed conversion and weight gain as previously mentioned in Table 2 and 3. The data was in agreement with those reported by **Perez *et al.,* (1991).**

Meat chemical composition:

Data in Table (5) presented that, the introducing of RM and SBP in the rabbit diets had no significant effects on the meat chemical analysis with the exception of ether extract which significantly (P<0.05) increased with diets T1, T2, T3 and T5 by 14.44, 4.60, 4.63 and 9.85%, respectively, than the control group, these may be due to the increase of ME content of these diets. These results were supported by the finding obtained by **Zaki El- Din (1996) and El- Adawy *et al* (2000).**

Table (5).Effect of feeding diets containing levels of the experimental diets on dressing percentage, carcass characteristics and meat chemical composition of growing rabbits.

Item	Control diet	Rice milling by-products			Dried sugar beet pulp			Pooled ± SE
		10%	20%	30%	10%	20%	30%	
		T1	T2	T3	T4	T5	T6	
No of rabbits	4	4	4	4	4	4	4	---
Live body weight, g	1930[c]	2030 [c]	2145 [b]	1910 [d]	2050 [b]	2200 [a]	1955 [b]	0.65*
Hot carcass weight,	1090 [b]	1195 [e]	1285 [b]	1050 [c]	1190 [b]	1295 [a]	1060 [d]	0.58*
g	56.48 [e]	58.87 [d]	59.91 [c]	5497 [b]	58.05	58.86 [a]	56.72[ab]	0.72*
Dressing, %	62.92 [b]	72.47 [a]	78.29[a]	65.59 [ab]	73.39 [ab]	79.42 [b]	66.86	0.59*
Giblets (liver + heart								
+ kidneys) wt., g	5.77 [b]	6.06 [a]	6.09 [a]	6.25 [b]	6.17 [b]	6.13 [a]	6.31 [c]	0.65*
Giblets, % relative								
wt. hot carcass wt.								
Meat chemical								
compost. :	73.55 [b]	73.04 [b]	5.75 [a]	73.41 [c]	73.36 [a]	73.82[a]	73.34 [c]	0.64*
Moisture	19.26 [b]	19.17 [a]	10.18 [a]	19.08 [b]	19.12 [a]	19.18 [a]	19.23 [b]	0.08*
CP	4.57	5.23 [b]	3.32 [b]	4.78 [b]	5.01 [b]	4.12 [b]	4.56 [b]	3.32 [b]
EE	2.62	3.32 [b]	2.56 [b]	2.73 [b]	2.51 [b]	2.88 [b]	2.87 [b]	3.32 [b]
Ash								

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

Economical Efficiency:

Results in Table (6) showed that the profitability of introducing RM or SBP with levels of 10 or 20% in rabbit diets (R3 &R4) or (R6&R7) depend on the price of these feedstuffs, assuming that the other costs are constant. Therefore, the value of economical efficiency of rabbits fed diets contained 20% RM or SBP at marketing age (13 weeks) was higher than those of the other diets. Data of relative feed efficiency showed that the all levels except for 30% RM or SBP, recorded lowest values than the other groups and higher than control group which contained alfalfa hay and barley grain.

Table (6).Effect of feeding diets containing levels of the experimental diets on economical efficiency of growing rabbits.

Item	Control diet	Rice milling by-products			Dried sugar beet pulp			Pooled ± SE
		10%	20%	30%	10%	20%	30%	
		T1	T2	T3	T4	T5	T6	
Total weight gain, g	1380.4 ^{e}	1481.20 ^{c}	1608.88 ^{a}	1372.00 ^{e}	1514.24 ^{b}	1646.40 ^{a}	1408.40	5.58*
Total revenue/wt	27.61 ^{d}	29.62 ^{b}	32.18 ^{a}	27.44 ^{d}	30.28 ^{b}	32.93 ^{a}	^{d}	0.71*
gain, L.E.	5.560 ^{d}	5.889 ^{a}	5.725 ^{c}	5.993 ^{a}	5.715 ^{b}	5.870 ^{a}	28.17 ^{c}	0.56*
Total feed intake,	8.77	8.01	7.66	7.84	8.32	8. 46	5.659 ^{b}	---
kg	18.84 ^{d}	21.52 2.70	24.52	19.60	21.96	24.47	8.06	---
Total feed cost, L.E.	2.15	^{a}	3.20 ^{a}	2.50	2.64	2.89	20.11	---
Net revenue, L.E.	100	125.58	148.80	116.29	122.74	134.53	2.50	---
Economical							116.08	---
efficiency								
Relative FE, %								

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

**Based on free market prices of feed ingredients 2008, the cost of the experimental rations was estimated as the total prices of the diets used, bearing, 1578, 1360, 1338, 1308, 1456, 1442 and 1424 L.E/ton. For R1 to R7, respectively. Prices of one kg body weight on selling 20.00 L.E.at the experimental.*

*** Total revenue = Average live body weight gain (kg rabbit × price kg live weight. Net revenue = total revenue – total feed cost. Economical efficiency= Net revenue/total feed cost.*

In conclusion, from the previous results, rice milling by-products and dried sugar beet pulp can be used up to 20 % instead of clover hay and barley in the growing rabbit rations resulted in better digestibility coefficients, daily weight gain, feed and economical efficiency, hot carcass weight and dressing percentage as compared with control groups without any adverse effects on growth performance.

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استخدام مخلفات مضارب الأرز و تفل بنجر السكر في علائق الأرانب

أحمد على محمد سليمان[1] - -عبد الرحيم إدريس سليمان[1] - مصطفى محمد صبرى[1]– أحمد عبد الجليل بيومى[2] - كمال يوسف النجمي[1]

1 معهد بحوث الإنتاج الحيواني – مركز البحوث الزراعية – الدقى – مصر.
2 قسم الإنتاج الحيوانى – كلية الزراعة – جامعة جنوب الوادى.

تم تقسيم 84 من ذكور الأرانب النيوزلندي الأبيض عمر 5 أسابيع و متوسط وزن حي 545.35 ± 7.36 جم حيث وزعت عشوائيا على سبعة مجموعات تجريبية وغذيت على سبعة علائق مختلفة على هيئة مكعبات تحتوى على مستويات مختلفة من مخلفات مضارب الأرز و تفل البنجر كمصدر رئيسى للمادة الخشنة (الألياف) و التى تم ادخالهافى العليقة بنسبة صفر & 10 & 20& 30% لكل معاملة حيث استمرت تجربة التغذية 8 أسابيع . و لدراسة تأثير إدخال هذة المخلفات فى علائق الأرانب على المعاملات الهضمية و معدل النمو و نسبة النفوق و قياسات الدم و خواص الذبيحة و الكفاءة الاقتصادية و قد أشارت النتائج المتحصل عليها إلى أن قيم معاملات الهضم للبروتين الخام و الألياف الخام و المستخلص الاثيرى و المستخلص الخالى من الأزوت للعلائق المحتوية على 20% من مخلفات مضارب الأرز أو تفل البنجر كانت أعلى معنويا (5%) عن مثيلاتها لعليقة الكنترول كما زادت قيم المركبات المهضومة الكلية بدرجة معنوية (5%) من 63.09 & 61.80% الى 64.87 & 65.16% و البروتين الخام المهضوم من 12.02 & 11.98 الى 12.33 & 12.37% على التوالى . ادخال مخلفات الأرز وتفل بنجر السكربنسبة 20% فى علائق الأرانب النامية زاد من نمو الأرانب بنسبة 16.55 و 19.26% على التوالى مقارنة بمجموعة الكنترول. الأرانب التى غذيت على 10 و20% مخلفات مضارب الأرز أو تفل البنجر أظهرت تحسنا معنويا (5%) فى قيم معامل التحويل الغذائى عن المعاملات الأخرى . أظهرت تركيزات البروتين الكلى و الألبيومين و الجلوبيولين فى سيرم الدم زيادة معنوية فى الأرانب التى غذيت على علائق تحتوى 10 و 20% مخلفات مضارب الأرز أو تفل البنجر عن الأرانب التى غذيت على علائق أخرى . كما أن هناك زيادة معنوية (5%) فى تركيز الكرياتنين و اليوريا نيتروجين فى الأرانب لتى غذيت على علائق تحتوى 10 و 20% مخلفات مضارب الأرز أو تفل البنجر و ان كانت فى مدى الحدود الطبيعية . كان وزن الذبيحة الساخن ونسبة التصافى أعلى معنويا (5%) فى المجموعات التى تحتوى علائقها على 20% مخلفات مضارب الأرز أو تفل بنجر السكرمقارنة بالمجموعة التى غذيت على عليقة الكنترول . لا توجد اختلافات معنوية فى التركيب الكيماوى للحوم الأرانب باستثناء الدهن الخام . من النتائج السابقة يمكن أن نستنتج أن مخلفات مضارب الأرز و تفل بنجر السكر يمكن إدخالها فى علائق الأرانب النامية حتى 20% دون أية أثار ضارة على أدائها الانتاجى