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SOME NUTRITIONAL STUDIES ON USING STRAWBERRY (FRAGARIA × ANANAS) VINE AS HAY IN RABBIT RATION.

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ABSTRACT

Sixty weaning (V line) White rabbits, five weeks old with an average body weight 718± 5 gm were used and devided randomly into four equal experimental groups (15 rabbits in each) to investigate the effect of replacing 0%,20%,40% and 60% of clover hay by strawberry vines (SBV) as hay in ration (A,B,C and D respectively) which were nearly the same level of crude protein (CP) (iso –nitrogenous) and digestible energy (DE)(iso-caloric k cal DE per 1kg DM). Feeding trial lasted 56 days(8 weeks) . All diets were fed in pellets to cover the nutrient requierements of rabbits according to Agriculture Ministry Decree (1996). Body weight (LBW) , weight gain (WG), feed intake and feed conversion were determined. Digestiblity and slaughter trials were carried out at the end of the experiment on three representative animal from each group for estimate nutrient digestibilies. Nutritive values, carcass characteristics and blood parameters were determined . The economic efficiency of the products was also calculated .

The results showed that the chemical composition of (SBV) was higher in ether extract EE, nitrogen –free extract (NFE) and digestible energy (DE), but it was lower in (OM), (CP), (CF), neutral detergent fibre (NDF%) ,acid detergent fibre (ADF%) and hemicellulose % compared to clover hay. The significantly lowest live body weight and daily body weight gain were recorded for rabbits fed the control diet (A) (without SBV). While the significantly best values were for 20% , 40% and 60% dietary SBV instead of clover hay. Including 40% dietary SBV (C) scored better body weight ,daily weight gain and daily feed intake, besides it had no adverse effect on feed conversion which were insignificantly . Animals fed ration C (containing 40% strawberry vines by – product) tended to significant ($P< 0.05$) higher feed intake at (9-13) weeks and appeard to the best feed conversion at (5-9 weeks). Moreover, group fed ration C had the highest nutrient digestibility and nutritive values.Rabbit dietary 60% SBV instead clover hay were lowet in water consumption and ml W.C. /gm DMI. Slaughter weight ,(hot carcass weight plus edible offal's) were significantly($p< 0.05$) increased for rabbits fed SBV hay diets (B,C and D) compared with those fed control diet (A). But the other parameters of carcass characteristics were not significant . The results showed that replacing 20 , 40 and 60 % of clover hay by SBV hay can be used in rabbit diet to get better net revenue, economical effecincy and feed cost per kg daily gain. Generally it could be shown that the inclusion of strawberry vines by-products with rat of 60% from clover hay in rabbit diets tended to economically effective **.**

INTRODUCTION

Feed is the largest single item in the cost of producing rabbit meat representing at least 65% of the total production cost. For this goal. There is urgent need to evaluate by products which are extremly important to formulate least cost rabbit diet . Rabbits are herbivorous animals, consuming

high roughage diets. Nevertheless , rabbits are poorly digest fibrous materials and their use of agricultural by- products may be limited if the lignin fraction is high. . It has been shown that dietary fibre components determine growth response in rabbit (Harris and Johnston, 1979) .Strawberry vines by-products (SBV)used as untraditional feed ingredients is the sun dried of fragaria ananassa beloning to the family Rosaceae (Eduard et.al.,2011) .Strawberry contained polyphenolic, tiliroside (Ellis et al 2011) and (Tsuyoshi et. al., 2011). Strawberry by-product as a cheep source of ingredients can be used economically in rabbit diets formulations Omer et.al., 2011 . This work aimed to study the effect of dietary (SBV) as a partial replacement at level 20% - 40% and 60% of clover hay on rabbits growth performance, nutrient digestibilites, carcas characteristics, blood parameters and economical studies.

MATERIALS AND METHODS

This study was carried out at Gemmeza Experimental station, Animal Production Research Institute, Agricultural Research Center. Sixty weaned V line white rabbits weight average 718 ± 5gm were allotted to four experimental groups(15 in each) and the experimental period extended for eight weeks(56 days).The aim of this study was to use strawberry vines by – products in stead of clover hay with rate of 0.20 ,40 and 60% in rations A,B,Cand D; respectively. Strawberry((Fragaria × Ananassa) vines by – products (SBV)were collected after the end of fruits collection at june mounth in Ismailia governorat egypt . Strawberry vines was left(all plant and roots with some fruits) to sun drying about 5-7 days and dressing to 3-5 cm and kept in bags until to using in ration formulation . Four pelleted Experimental diets were formulated to be approximately iso caloric and iso-nitrgenous in which dried strawberry vines by – products was replacement as 0%- 20%- 40% and 60% from clover hay .The experimental diets were formulated to be iso – nitrogenous (17% CP) and iso – caloric (2500 K cal DE /kg diet). All diets were in pellets to satisfy the nutrients requirements of growing rabbits according to Agriculture Ministry Decree (1996). Ingredients and calculated nutrient content of the experimental diets are shown in Table (1).

The rabbits were housed in galvanized metal wire cages provided with feeders and automatic drinking system and were kept under the same managerial . Diets and fresh water were available all times *ad libitum*. Live body weight of rabbits and feed consumption were weekly recorded. Feed convertion ratio (FCR) was calculated as (g feed /g gain). Digestibility trials were carried out at the end of growth experiment using 3 rabbits in each group to determine the apparent digestibilities of nutrients , nutritive values , dry mater intake and water consumption of the experimental diets over period 7 days.

Feces were daily collected quantitiatively. Feed intake, water consumption of experimental rations and weight of feces were daily recorded. Representative samples of feces were dried of 60 oc for 48 hrs , ground and stored for later chemical analysis.

Table(1):Composition and calculated analysis of the experimental diets (as fed).

Items	Experimental diets(%)			
	A	B	C	D
Ingredients: (Kg)				
Clover hay (12% CP)	30.00	24.00	18.00	12.00
Strawberry vines by- products	-	6.00	12.00	18.00
Barley	30.90	24.45	20.50	15.00
Soybean meal (44%CP)	15.80	16.00	16.75	17.75
Wheat bran	17.00	23.10	26.10	30.90
Molasses	4.00	4.00	4.00	4.00
DL-Methionine	0.10	0.10	0.10	0.10
Vita.&Min .mix.[k]	0.30	0.30	0.30	0.30
Salt	0.50	0.50	0.50	0.50
Limestone	1.05	1.30	1.55	1.80
Di –Calcium phosphate	0.35	0.25	0.20	0.15
Total	100	100	100	100
Calculated analysis [l] :				
Moisture %	12.80	13.10	13.68	13.70
Dry matter (DM %)	88.20	86.90	86.60	86.30
Crude protein %	17.01	17.01	17.09	17.14
Ether extract%	2.17	2.16	2.09	2.05
Nitrogen free extract (NFE%)	48.66	48.29	47.89	4788
Ash %	5.79	6.24	6.60	7.02
Digestible energy (kcal/kg)	2502	2506	2523	2531
Crude fiber%	13.57	13.20	12.65	12.21
NDF % [m]	37.84	37.60	37.24	36.95
ADF % [n]	21.81	21.47	20.97	20.57
Hemicellulose %[o]	16.03	16.13	16.27	16.38
Calcium %	1.02	1.01	1.01	1.01
Total phosphorus%	0.51	0.51	0.50	0.51
Methionine %	0.35	0.53	0.34	0.34
Lysine %	0.80	0.77	0.75	0.73
DE:CP	147.07	147.27	147.61	147.66

[k] **Supplied per kg.of diet;12000 IU vit.A;2200 IU D_3;10mg vit.E;2.0 mg vit k_3;1.0 mg vit.B_1;4.0 mg vit.B_2;1.5mg vit B_6; 10mg vit.B_{12};6.7mg vit.Pantothenic acid;6.67 mg vit,B_5;1.07mg Biotin;1.67mg Folic acid;400 mg Choline chloride;22.3 mg Zn;10mg Mn;25mg Fe ;1.67 mg Cu;0.25 mg1;0.033 mg Se and 133.4 mg Mg.**

[l] **According to M O A (2001) .**

[m.n.o] **Calculated according to Cheek (1987):**

[m] **% NDF=28.924+0.657(%CF)** [n] **% ADF =9.432+0.912(%CF).**

[o]

The chemical analysis of diets and feces were conducted according to AOAC (1996). The total digestible nutrients (TDN) were calculated according to the classic formula (Cheek, *et. al.,* 1982) as following; TDN= DCP+ DCF+ DNFE+(DEE× 2.25)where, DCP= Digestible crude protein, DCF= Digestible crude fibre , DNFE= Digestible nitrogen free Extract and DEE = Digestible Ether Extract.At the end of the experimental period three representative rabbite from each treatment were randomly chosen and fasted for 12 hours before slaughtering according to Blasco et. al., (1993),

and also determining the carcass traits and plasma parameters. After complete bleeding of rabbits, pelt, viscera and tail were removed carcass and edible tissues (liver, heart , kidney) were weighed . Blood samples were collected at slaughtering into heparinized tubes.A drop of blood from each sample was used to make smears for the differential leukocyte count.Differential counts of 100 leukocytes were made using sides stained with wright's stain and neutrophils /lymphocytes ratio (N / L) was measured . Blood samples were centrifuged at 4000 r.p.m for 20 minutes for preparation of blood plasma. The collected plasma was stored at - 20°c until assay. Blood plasma contents of glucose total protein ,albumin, globulin, cholesterol and activities of aspartate aminotransferase(AST) and alanin aminotransferase (ALT) were mausured using commercial kits. The total globulin values were iso calculated. Total protein and albumin were determined according to Doumas (1975) and Doumas *et.al* (1971, respectively , total cholesterol according to Pisani et.al. ,(1995), triglycerides according to Greiling and Gressner (1995) and activities of AST and ALT according to Harlod (1975).

Economic efficiency (%) of experimental diets was calculated according to the local market prices (2014 year) of ingredients and rabbit live body weight as:

Net revenue= total revenue- total feed cost

Economical efficiency(%) = net revenue/total feed cost .

Statistical analysis:

All date were analyzed using the general linear models proces of SAS (1998), data of percentages were subjected to ars- sin transformation to approximate normal distribution befor being analyzed and means were separated using Duncan's multiple range tests (Duncan ,1955). For the comparison among means of the experimental diets when the main effects were significant.

The model used was: $Yij = \mu + Ti + eij$ where

Yij = the observation of ij μ = the overal mean

Ti = the effect of i treatments (1:4) Eij = Random error

RESULTS AND DISCUSSION

1-Proximat analysis of strawberry vines (SBV) and clover hay:

The chemical analysis of strawberry vines and clover hay (Table 2) Showed that the strawberry vines by –product had higher NFE and DE contents than clover hay.

Hemicellulose=%NDF-%ADF.

On the contrary the clover hay had higher CP,CF,NDF,ADF and Hemicellulose. CP value of strawberry vines generally lower than other vines and vegetabl by-products Pea vines (13.79%). Sweet potato vines (16.07%), strawberry by-products (14.42%), cucumber vines straw (16.17%) and sugar beet tops hay (13.78%)with those abtained by literature (Hassan et.al. 2012, Elamin et.al., 2011, Omer et.al. 2011, Hayam et.al ., 2014 and Gaafar et.al . ,2010) respectively. But CF value is similar , expet in pea vines the CF is higher than in strawberry vines.

Table (2): Chemical analysis (%) of strawberry vines by- products and clover hay used in the experimental diets.

Items	Strawberry vines	Clover hay *
Moisture %	15.34	10.00
Dry matter (DM%)	84.66	90.00
Organic matter (OM%)	87.48	91.20
Crude protein (CP%)	8.11	12.00
Ether extract (EE%)	2.16	2.10
Nitrogen free extract (NFE%)	59.43	47.10
Ash%	12.52	8.80
Crude fiber(CF%)	17.78	30.00
Neutral detergent fiber (NDF%)	40.61	56.00
Acid detergent fiber (ADF%)	25.65	40.00
Hemicellulose %	14.96	16.00
DE (kcal/kg)[K]	2366	1780

[K]Calculated according to Cheeke (1987):
NDF= cellulose +hemicellulose + lignin ADF = cellose +lignin
Hemicellulose (%) = NDF-ADF DE (kcal/g)=4.36-0.0491(%NDF)
*** According to M O A (2001).**

2-Digestibility coefficients and nutritive values of the experimental diets:

Results in (Table 3)showed that animals fed rations (C) containing 40% SBV replacing clover hay recorded higher digestibility of all nutrients compared with those fed the others. At the same time , ration (C) had the highest TDN (75.76%) and DCB (16.98%).

Table(3):Effect of the experimental diets on nutrients digestibility, nutritive values and water consumption of rabbits.

Items	Experimental diets			
	A	B	C	D
Digestibility Coefficients:				
Dry matter (DM)	76.57	76.50	78.21	73.60
Organic matter (OM)	79.68	79.44	81.04	77.14
Crude protein(CP)	81.36	80.46	81.64	77.86
Ether extract (EE)	73.61	71.33	76.55	76.41
Crude fiber (CF)	42.41	45.59	47.19	42.18
Nitrogen free extract (NFE)	88.83 [ab]	87.55[ab]	89.01[a]	84.37[b]
Nutritve values %:				
Total digestible nutrient (TDN)	75.54	74.38	75.76	72.55
Digestible crud protain (DCP)	15.95	15.59	16.98	16.12
DM intake (gm)	130.44	138.05	139.14	141.35
Water consumption (W.C.)(ml)	204.45	200.56	203.33	198.34
ml W.C/gm DMI	1.57	1.46	1.46	1.40

[a and b] Means in the same raw with different superscripts are significantly (p< 0.05) different.

The results were agreements with those obtained by Hassan et. al. (2012) who showed that group fed 50% pea vines (replacement of clover hay) tended higher digestibility of all nutrients compered with groups contain (0 ,25,75 and 100%)pea vines. They recorded also higher DCP, TDN and DE with ration containing 50% pea vines than the others.The results revealed that all nutrients digestibility of ration containing 40% were higher than that containing 60% strawberry vines by-products, as shown in Table (3).

It could be shown that animals fed rations containing strawberry vines by –products had higher DM intake with lower water consumption . Increasing in DM intake was relaited to lower water consumption, as shown in Table (3) The decrease in water consumption was expected correlated with increasing SBV levels . These results may be due to its lower content of DMI and NDF % which decrease its water holding capacity. These results were agreement with those reported by De Blas and Carbono , (1996) and Fatouh et. al. (2009) who found that sugar beet pulp increased water consumption of rabbits because its higher content of NDF which incraese its water holding capacity , small proportion of long particles and indigestible fibre , low rate of passage and high caecal retention time in rabbits .

3-Productive performance:

Effects of feeding experimental diets on LBW of growing rabbits throughout the experimental growth periods (5 to 13 weeks of age) are illustrated in Table (4).

Table (4) : Effect of the experimental diets on live body weight, daily gains, daily feed intakes and feed conversions of rabbits at different ages of the experimental period (5-13 week of age)

Items	Experimental diet			
	A	B	C	D
Live body weight (LBV) (g)at:				
5 weeks	719	715	723	719
9 weeks	1183	1250	1252	1229
13 weeks	1592 ^{b}	1749 ^{a}	1760 ^{a}	1734 ^{a}
Average daily gain (g)				
5-9 weeks	16.57	19.11	18.96	18.33
9-13 weeks	14.59	17.83	18.09	18.02
5-13 weeks	15.58 ^{b}	18.47^{a}	18.52^{a}	18.17^{a}
Average daily feed intake(g)				
5-9 weeks	96.91	96.89	95.49	97.82
9-13 weeks	92.07^{b}	102.75^{a}	109.42^{a}	105.12^{a}
5-13 weeks	94.49	99.82	102.45	101.47
Feed conversion (F/G)				
5-9 weeks	5.95^{a}	5.18^{b}	5.16 ^{b}	5.43 ^{a}
9-13 weeks	6.60 6.20	5.90	6.34	6.41
5-13 weeks		5.45	5.76	5.70

$^{a \text{ and } b}$ **Means in the same raw with different superscripts are significantly (P< 0.05) different.**

All rabbits had commenced with nearly similar intial LBW which ranged between 715 and 723 g . Rabbits fed the diet (A) (control group

)containing without strawberry vines had lower LBW than those of other experimental groups during 9and 13 weeks . In the final of experimental period control group is significant (p< 0.05) lower LBW than those of other groups .At the same trend the daily gain of groups fed strawberry vines (group fed rations B and D) were higher than control group showing significantly (P< 0.05) higher in overall period.

These results are in the same trend with those obtained by Hamed and Badr (2013) who find that replacing berseem hay with Pea straw in diet at 0,25,50,75 and 100% had significant effect (p < 0.05) on final live body weight (FLBW), total gain (TG) and average daily gain (ADG) among the different experimental groups. Also, Gad Alla (1997),Mohamed (1999);El-Adawy and Borhami (2001); Tag El- Din et .al., (2002) , Abdel- Magid (2005)and Omer et. al., (2011) , noted that replacing berseem hay by carrot – tops, strawberry by – products , peanut hay, kidney beans or pea straws significntly improved the growth performance of growing rabbits than those fed the control diet.

Results in Table (4) indicated that rabbits fed strawberry vines recorded the highest values of DM intake and improved of feed conversion during 9 and 13 weeks. Data presented in Table (4) showed that, animals fed ration C (containing 40% strawberry vines by – product) had the highest daily feed intake during 9 and 13 weeks gaving the best feed conversion at 5 weeks. Generally, animals fed rations containing strawberry vines by – product (rations B, C, and D) tended to higher feed intake and appeared better feed effeciency during the overall period, as shown in Table (4). This was probably due to the effect of resistance starch in (SBV) which switable to improve the caccum fiber digestion by eliminates the hazard microorganisms (Duan and Zhao, 2009). Also These results are in agreement with those noted by Abdel - Magid (2005)and Hamed and Bader (2013). They observed that rabbits fed diet containing pea straw instead of berseem hay had higher daily feed consumption and good feed conversion

4- Carcass characteristics of the experimental groups:

Carcass traits , dressing percentage are shown in Table(5). The results indicats that, there were segnificant (P< 0.05) differences between the level of SBV that used in this experiment and control group in slaughter weight , inedible offal's , hot carcass weight and hot carcass weight + edible offal's. The differences in carcass traits my be attributed to the differences in slaughter weight . Dressing percentages showed no significant among different groups . Data in Table (5) revealed that slaughter weight increased with using strawberry vines by– product (animal fed rations B , C and D) ,showing significant differences. The same trend was observed with inedible offal's hot carcass,hot carcass plus edible offal's and dressing percentage. Also, it could be noticed that dressing percentage increased with animals fed rations containing strawberry vines by- products with rate of 20 , 40 and 60% by 0. 11, 5.59 and 3.45%, respectively. However, animals fed ration C had the highest hot carcass and dressing percentage These results were in harmony with those obtained by El –Adawy and Borhami (2001) ; El –Gendy et. al., (2002); Abdel – Magid (2005); El-Medany et. al., (2008) and Omer et.

al., (2011), they noted that feeding growing rabbits diet replaced clover hay with Pea , chick pea or kideny beans straw , peanut hay , dried carrot processing waste or strwberry by products had no significant differences in dressing percentages.

Table (5): Carcass characterisitics for slaughtered rabbits as affected with different levels of strawberry vines.

Items	Experimental diets			
	A	B	C	D
Live body weight (LBW)(g)	1678[b]	1847[a]	1882[a]	1830[a]
Slaughter weight (SW)g	1640[b]	1797[a]	1830[a]	1792[a]
Inedible offal's g	257[c]	277[b]	302[a]	290[ab]
Giblets (edible offal's)g	123	125	125	115
Hot carcass weight ,g (HCW)	898[b]	985[ab]	1058[a]	1015[a]
Hot carcass weight +Edible offal's g	1021	1110	1183	1130[a]
Digestive tract weight ,g (full)	362	410	345	372
Dressing percentages (HCW/SW)	54.75	54.81	57.81	56.64

[a,b and c] **Means the same raw with different superscripts are significantly (P< 0.05) different.**

5- Blood partameters:

The results of blood plasma constituents as affected by replacement of breseem hay are shown in Table (6) in the result indicated that there were no signifficant differences in total plasma proteins , albumin and globulin. These results are in agreement with those found by El- Bordeny et al (2011) who found that replacing clover hay by palm tree leaves coused no significant increase in total protein , albumin and globulin concentrations as compared to the control .

Table (6): Effect of the experimental diets on some blood plasma parameters on rabbits.

Items	Experimental diets			
	A	B	C	D
Total protien (g/di)	6.44	6.54	6.73	6.34
Albumin (g/di)	3.60	3.73	3.83	3.36
Globulin (g/di)	2.84	2.81	2.90	2.98
Glucose (mg/di)	118.41	103.19	109.95	99.69
Total lipids (g/di)	3.96	3.26	3.23	3.58
Cholesterol (mg/di)	153.67	138.95	141.63	143.33
Createnin (mg /di)	1.10	1.09	1.03	0.97
Urea (mg/di)	47.68	42.57	40.27	45.16
AST (mg/di)	24.33	25.33	27.30	24.67
ALT (mg/di)	14.33	13.30	14.90	15.31

On the other hand, glucose, total lipids , cholestrol , createnin , urea, ASTand ALT did not different among the different experimental groups. These results may be attributed to that the different diets were opproximatly isocaloric and isonitrogenous and those contained similar percentage of methionin , lysine , calcium and phosphorus . These results were in the same trend approximatly with this noted by El – Bordeny *et. al.,* (2011) who

found that cretenin concentration of blood plasma did not different among all experimental groups when replacing clover hay by palm tree leaves . Also , aspartateamino transferase (Ast) and alanine aminotransferase (ALT) were not different in experimintal groups which contain diferent levels of pea straw as shown by , Hamed and Badr(2013).

The means did not statistical analysis.

6-Economical evaluation:

The economical effeciency of dietary treatments is presnted in Table (7) The profitability of using strawberry vines (SBV) as replacement in rabbit diets depends upon the price of tested diets and the growth performance of rabbits fed these diets. Costing of one kg fed (LE) was decreased by 4.54, 7.66 and 10.57 for B , C and D respectively compared to control diet (A). Increasing the rate of replacement (SBV) from 0 %to 60 % of clover hay lead to increase the total revenue, net revenue,economical efficiency and relative economic efficiency. These results affected by the low price of (SBV) and the improvement of growth performance for (SBV) treatments compared to the control group. Relative economic efficiency values were 170.17 , 177.35 and 177.48 for groups fed rtions B, C and D containing (SBV) as raplacement of clover hay by 20 ,40 and 60 % respectively compared to control group (A). On the other hand , feed cost /kg LBW (LE)were decreased by 8.21 , 9.40 and 11.79 % respectively in groups fed B , C and D rations compared to control group. These results are in agreement with those obtained by Omer *el. al*., (2011) and Hamed and Badr (2013), they observed that inclusion strawberry by- products or pea straw to partially or completely replacement of berseem hay contributed in lowering the feeding cost and hence increasing the economic efficiency .

Conclusively , according to the circumstances of this study , it could be recommended that replacement up to 60 % of clover hay by strawberry vines hay (SBV) in growing rabbits diet as a good source realized improvement in all digestion coefficients and nutritive values , also increased total body weight gain and average daily gain and improved the economic effeciency without adverse effect on health of growing rabbits .

Table (7): Economical efficiency of growing rabbits as affected by feeding different levels of strawberry vines .

Items	Experimental Diets			
	A	B	C	D
Marketing weight,kg	1.592	1.749	1.760	1.734
Feed consumed /rabbit (kg)	5.291	5.590	5.737	5.682
Cost of one kg feed (LE)[1]	2.271	2.168	2.097	2.031
Total feed cost (LE)	12.02	12.12	12.03	11.54
Management /rabbit, (LE)[2]	5.00	5.00	5.00	5.00
Total cost (LE)[3]	33.02	33.12	33.03	32.54
Total revenue (LE)[4]	38.21	41.98	42.24	41.62
Net revenue (LE)	5.19	8.86	9.21	9.08
Economical efficiency[5]	0.1572	0.2675	0.2788	0.2790
Relative economic efficiency[6]	100	170.71	177.46	177.48
Feed cost/kg LBW(LE)[7]	7.55	6.93	6.84	6.60
Total gain (g)	0.873	1.034	1.037	1.018
Feed cost /kg daily gain	13.77	11.72	11.60	11.34

1- **Based on prices of year 2014 which were clover hay 1300; strawberry vines 400; barley 2500;soybean meal 4000;wheat bran 1850; molasses 2000; Dl- methionen 30000;vit-min mix 6000; salt 1000;limestone 100 and Di –calcium phosph. 800 LE,/ton, respectively.**

2- **Include medication , vaccines , sanitation and workers**

3- **Include the feed cost of experimental + rabbit price which was LE 16 + rabbit management**

4- **Body weight x prices of one kg at selling which was 24 LE**

5- **Net revenue per unit of total cost .**

6- **Assuming that the relative economic efficiency of control diet equal 100**

7- **Feed cost /kgLBW= feed intake *price of kg/live weight.**

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بعض دراسات غذائية على إستخدام دريس عرش الفراولة فى علائق الأرانب

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تم إجراء هذه الدراسة بمزرعة إنتاج الأرانب بمحطة بحوث التربية بالجميزة التابعة لمعهد بحوث الإنتاج الحيوانى مركز البحوث الزراعية وأجريت التحليلات المعملية بمعامل معهد بحوث الإنتاج الحيوانى – دقى –جيزة إستخدام 60 أرنب في لاين بعد الفطام عند عمر 5 اسابيع بمتوسط وزن 5 ± 718 جم وقسمت إلى 4 مجاميع فى كل مجموعة 15 أرنب بهدف دراسة إحلال جزئى لدريس عروش مخلفات محصول الفراولة بصورته الكاملة بعد إنتهاء موسم جمع الثمار فى شهر يونيو بدلاً من دريس البرسيم.

وتم تكوين أربعة علائق تجريبية متساوية فى الطاقة والبروتين كالتالى:

1 - عليقة المقارنة تحتوى دريس برسيم وبدون دريس عروش الفراولة.
2 - إحلال 20% دريس الفراولة محل دريس البرسيم.
3 - إحلال 40% دريس الفراولة محل دريس البرسيم.
4 - إحلال 60% دريس الفراولة محل دريس البرسيم.

وإستمرت تجربة التغذية لمدة 8 أسابيع (56 يوماً) وغذيت المجاميع التجريبية طبقاً للمقرارت الغذائية NRC (1977)

أجريت تجربة هضم لعدد 3 حيوانات تحت كل معاملة وكذلك 3 حيوانات للذبح لمعرفة خصائص الذبيحه وكذلك قياسات بلازما الدم.

1 - أوضحت الدراسة بأن دريس عروش الفراولة تتميز بإرتفاع فى الدهن الخام ،مستخلص خالى الأزوت والرماد والطاقة المهضومة ومنخفض فى المادة العضوية والبروتين الخام والألياف الخام والهيميسليلوز عن دريس البرسيم.
2 - إرتفع وزن الجسم الحى إرتفاعاً معنوياً وكذلك معدل الزيادة اليومية للأرانب المغذاه على العلائق التى تحتوى عروش الفراولة.
3 - أظهرت المجموعة التى تغذت على 40 % عروش فراولة (المجموعة c) إرتفاعاً معنوياً للماده الجافه المأكوله وأفضل كفاءه غذائيه عند (5 - 9 أسابيع)
4 - لم يكن للعلائق التحريبية اى تأثيرات معنوية على معاملات هضم المادة الجافة والمادة العضوية والبروتين الخام والدهن الخام والألياف الخام وكذلك القيم الغذائية سواء مركبات مهضومة كلية أو برتين مهضوم. مع إرتفاع كل القيم السابقة مع العليقة المحتوية على 40 % عرش فراولة وقد إنخفضت بصوره معنويه المجموعة الرابعه المغذاه على عليقه محتويه 60% دريس فراولة عن المجموعه الثالثه المغذاه على 40% دريس فراولة فى مستخلص خالى الأزوت .
5 - سجلت المجموعه الثالثه (40% دريس الفراولة) أحسن قيم فى كل معاملات الهضم المختلفة وكذلك القيم الغذائية سواء مركبات مهضومة كلية أو بروتين مهضوم.
6 - المجموعة الرابعة المغذاه على 60% دريس فراولة سجلت أقل قيمة فى الماء المستهلك وكذلك الماء المستهلك بالنسبة للماده الجافه الماكوله .
7 - تفوق بصورة معنوية وزن الذبيحه وكذلك نسبة التصافى ووزن الأعضاء المأكوله (كبد – قلب – كلى) للمجموعات المغذاه على علاقة تحتوى دريس عروش الفراولة عن عليقة المقارنة (دريس برسيم فقط) ولكن باقى معاملات الذبيحه لم تكن هناك فروق معنوية.
8 - لم تتأثر مكونات بلازما الدم سواء بروتين كلى أو لبيدات وكذلك الكولسترول بإحلال الفراولة محل دريس البرسيم فى العلائق.
9 - أدى إحلال عروش الفراولة بدلاً من دريس البرسيم فى العلائق بنسبة 20، 40 ، 60% إلى تحسين الكفاءة الإقتصادية وكذلك معدل الكفاءة الإقتصادية مقارنة بعليقة المقارنة (عليقه A) بنسبة 70% ، 77%، 77% للعلائق C,B, D على التوالى.

من خلال النتائج المتحصل عليها فى هذه الدراسة يمكن الإشارة إلى أنه يمكن إستخدام عروش الفراولة المتوفر بصورة كبيرة فى حقول إنتاج الفراولة عند المستويات المقررة فى هذه الدراسة حتى 60% من دريس البرسيم دون حدوث أى تأثير سلبى بل على العكس تحسن الأداء بصورة أفضل على معاملات الهضم أو آداء الحيوانات أو وزن الذبيحه والتصافى وكذلك الكفاءة الإقتصادية.