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REPLACEMENT OF ALFALFA HAY BY MORINGA PETIOLES MEAL WITH OR WITHOUT ADDING CAPLIX IN GROWING RABBIT DIETS.

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A total number of 72 New Zealand White (NZW) growing rabbits of mixed sex, 6 weeks old with 500±13.75 g average body weight was used to study the effect of using different levels of Moringa petioles meal without or with supplementation of multi enzymes caplix on rabbit performance, nutrients digestibility, caecum activity, carcass characteristics and economic efficiency. Rabbits were divided into 6 treatments 12 rabbits each. Three substitution levels of Moringa petioles meal were used (zero, 25 and 50%) instead of Alfalfa dehydrate meal of control diet, with or without caplix addition at levels of 0.00 or 0.05% of diet in 3x2 factorial design.

***Results indicated that**, chemical analysis contents of Moringa petioles meal was higher in DM, OM, CP, EE, Ash, Cell., P and DE than Alfalfa dehydrate meal. While Alfalfa dehydrate meal was higher in CF, NFE, NDF, ADF, ADL, Hemi., Lig. and Ca. most nutrients digestibility were improved (P<0.05) with replacing Alfalfa dehydrate meal by Moringa petioles meal at level 25 or 50%. Also, adding caplix to rabbit diets improved the nutrients digestibility and nutritive values compared to the unsuplemented diets. Caecum weight and TVFS caecal juice concentrations increased (p<0.05) with replacing Moringa petioles meal compared to the control group. Adding caplix to rabbit diets increased (P<0.05) caecum weight, caecum length,*

caecum pH and TVFA'S concentrations compared to the unsuplemented diets. Using Moringa petioles meal in rabbit significantly (P<0.05) increased the average values of FBW, DBWG and DFI and also with adding caplix in rabbit diets compared to those groups fed diets without caplix. Carcass weight and total edible parts % increased (P<0.05) with either adding caplix or Moringa petioles meal at levels 25 and 50% compared to the control group. The tested diets not affect significantly meat content of DM, CP and EE. Replacement Alfalfa hay by Moringa petioles meal level or adding caplix did Replacing Moringa petioles meal for at level of 25 or 50% either with or without adding caplix to rabbit diets improved the economic efficiency.

***Conclusively,** replacement of 50% of alfalfa hay in the rabbits diet by moringa petioles meal with 0.05% caplex supplementation could be recommanded to improve rabbit growth performance parameters and feed efficiency of feed utilizationunder the Egyptian conditions.*

Keywords: Moringa petioles meal, caplix, growth performance, digestion, carcass characteristics.

In developing countries such as Egypt and South Africa the shortage of feedstuffs and its high cost are major represents a main problems facing the development of animal productivity. Many efforts have been made to solve the feeds shortage by improving the productivity of conventional feed sources and search about new unconventional feeds for animal feeding.

Moringa oleifera L commonly known as ″The Miracle Tree or Horseradish Tree", it is a good source of nutrients for human and animal feeding. Moringa leaves have been reported to be a valuable source of protein, vitamins (A, B-complex, C, D and K) beside some important macro-elements as calcium, potassium. Zinc, iron, copper and selenium (Dorga, and Tandon, 1975 and Booth and Wickens, 1988). Moreover, it was reported that *Moringa oleifera* leaves prevent effectively morphological changes and oxidative damage in human and animals by enhancing the activities of antioxidant enzymes, reducing the intensity of lipid peroxidation and inhibiting generation of free radicals (Sreelather and Padma, 2009. and Osman *et al*., 2012).

In Egypt, great attention has been given by plant breeders to implant *Moringa oleifera* imported seeds in agricultural and newly reclaimed lands for human and animal uses. Moringa plants are grown for many agricultural and industrial purposes. It can be grown well in a variety of soil conditions preferring well-drained sandy or loamy that is slightly alkaline (Kristin, D., 2000 and Luqman *et al.,* 2012). Little have been conducted on the effects on the effects of feeding moringa plants for tea moringa tea or as a fodder for animal feeding.

Adding enzymes to the diets of non ruminant animals particularly poultry, become more common in the recent years to improve digestibility of starch and non-starch polysaccharides of dietary cereals (Campbell and Bedford, 1992). These enzymes can partially hydrolyze non soluble protein, reduce viscosity of gut contents and improvements in nutrients absorption, fiber digestibility (Bolis *et al.*, 1996 and Fernandez *et al.*, 1996).

Therefore, the main objective of the present investigation is to evaluate the effect of dietary substitution of 25 and 50% of alfalfa hay by Moringa petioles meal wit or without multi enzymes preparation on growth performance, nutrients digestibility and carcass characteristics of growing rabbits.

MATERIALS AND METHODS

The present experiment was carried out at the farm of Environmental Studies Institute, Sadat City University, Monofeya, Egypt during November and December, 2014. The chemical analysis was conducted at the laboratories of Regional Center For Food and Feed and Animal Production Research Institute. The *Moringa oleifera* by-products were obtained from the privet farm belonging to El-Minia governorate. The petioles were separate manually and the crushing and milling operations were carried out using a local hammer mill machine at Agricultural Engineering Research Institute, (AENRI). The fine products of petioles were separately pooled each other and on open door-dried to constant moisture levels, and there after bagged for experimental procedures.

A total number of 72 New Zealand White (NZW) mixed sex growing rabbits, six weeks with 500 ± 2.5g average body weight were used for 8 weeks to study the effect of substitution of 25 and 50% of alfalfa hay by moringa petioles meal levels with or without caplix multi-enzymes supplementation on rabbit performance, nutrients digestibility coefficient,

carcass characteristic and economic efficiency. Rabbits were randomly divided into 6 equal groups with four replicates (3 rabbits each). The rabbits were fed on diets containing 7.5 and 15% moringa petioles meal to subistitute 25 and 50% of alfalfa hay in the control diet (Table 1). In each group, diet was fed to the rabbits either un-supplemented or supplemented with caplix (0.05% of the diet). The diets were formulated to cover the requirement of growing rabbits according to NRC (1977). Chemical composition of moringa petioles meal and alfalfa dehydrated meal is shown in Table 2. Diets were offered to the rabbits *ad-libtum* and fresh water was available all the time during the experimental period. Individual live body weight, feed intake and feed conversion ratio were recorded weekly. Three samples of each feed were analyzed to determine the nutrients percentage composition.

Digestibility trials were carried out using four rabbits mix sex from each experimental group at the last week of the experiment. All cages were housed inside a building with a fan to improve the air quality. Rabbits had free access to feed as well as to water. Rabbits were housed in stainless steel cages measuring 100 × 70 × 30 cm (LWH), each containing seven to eight individuals and equipped with a nipple water; the temperature was 13–15 ◦C and relative humidity was 60–65%.

Rabbits for each group were housed in metabolism cages where feces and urine were collected separately four 4 consecutive days as a main period. Proximate chemical analysis of the diets and feces were carried out according to the methods of A.O.A.C.(2002).

At the end of experimental period, four mix sex rabbits were randomly taken from each group and fasted for 12 hours before slaughter according to Blasco *et al.,* (1993). Fasted rabbits were housed in separate cages and kept under the same managerial and hygienic condition. Rabbit meat samples included whole edible meat, including inter muscular fat and tendons. Liver, kidneys and lungs were separated and analyzed as 'rabbit offal'. Rabbit meat samples (a part of the hind leg), each sample was hand-boned and dissected from the fat surface, and the lean part was then finely minced. Samples were prepared for chemical analysis in duplicate for moisture, protein, fat and ash content.

The cecum was immediately exteriorized and caecal contents were removed. The contents from rabbits fed the same ration were pooled and taken to the laboratory for processing within 10 min of collection. A fresh sample strained through four layers of cheesecloth, the filtrate was immediately subjected to

Table1. Formulation and Chemical analysis of the experimental diets

Ingredients	Moringa petioles levels, %					
	0		25		50	
	Caplix addition					
	(-) 0	(+) 0.05	**(-) 0**	(+)0.05	**(-) 0**	**(+)** 0.05
Barley 2 rowed	31.07	31.00	31.235	30.96	31.18	31.14
Alfalfa, dehydrated meal	30.00	30.00	22.50	22.50	15.00	15.00
Soybean seeds, meal(44%)	12.50	12.50	12.50	12.50	12.50	12.50
Moringa petioles meal	0.00	0.00	7.50	7.50	15.00	15.00
Corn gluten Meal	0.98	1.00	0.725	0.725	0.70	0.70
Yellow corn	1.80	1.80	1.80	1.80	1.80	1.80
Calcium phosphate, dibasic	0.25	0.25	0.25	0.25	0.24	0.24
Sunflower oil, refined	1.00	1.00	1.00	1.00	1.00	1.00
Sugar cane molasses	3.00	3.00	3.00	3.00	3.00	3.00
Coarse wheat bran	17.65	17.65	17.65	17.65	17.65	17.65
Salt (Nacl)	0.35	0.35	0.35	0.35	0.35	0.35
Premix*	0.30	0.30	0.30	0.30	0.30	0.30
Limestone	0.72	0.72	0.76	0.76	0.78	0.78
L-Lysine HCL 98%	0.00	0.00	0.05	0.05	0.10	0.10
Methionine	0.38	0.38	0.38	0.38	0.40	0.40
Anzyme(Caplix)	0.00	0.05	0.00	0.05	0.00	0.05
Total	**100**	**100**	**100**	**100**	**100**	**100**
Calculated Chemical analysis						
CP ,%	16.58	16.58	16.62	16.62	16.80	16.79
DE (Kcal/Kg)**	2549.7	2549	2550.8	2550.1	2553.2	2552.8
CF , %	13.65	13.64	13.56	13.56	13.46	13.46
EE, %	3.22	3.22	3.22	3.22	3.22	3.22
Ca, %	0.84	0.84	0.84	0.84	0.84	0.84
P, %	0.54	0.54	0.54	0.54	0.54	0.54
Methionine, %	0.61	0.615	0.60	0.60	0.60	0.60
Lysine, %	0.77	0.77	0.77	0.77	0.77	0.77

(-) Without Caplix enzyme (+) with Caplix enzyme

***Vitamin and minerals premix at level of 0.3% of diet supplies the following per Kg of diet** = Vit. A 12000 IU, Vit. D3 2000 IU, Vit E 10 mg, Vit. K3 2mg, Vit B_1 1mg, Vit B_2 5mg, Vit.B_6 1.5 mg, Vit. B_{12} 10 mg; Niacin 30 mg, Pantotheanic acid 10 mg; Folic acid 1mg, Choine 250 mg, Biotin 50 mg, Copper 5mg, Manganese 60 mg, Zinc 50mg, Iron 30mg, Iodine 0.3 mg Selenium 0.1mg and Cobalt 0.1mg .

**Calculated according to Fernandez *et al.,* (2004).

pH determination with a combination electrode. A portion of the filtrate was sampled and frozen at -20°C for determination of ammonia-N and volatile fatty acid (TVFA"s) content. Samples for ammonia-N determination were acidified with a solution of 0.2 M hydrochloric acid (1 ml/ml).

An input – output analysis and economic efficiency were calculated. Economic efficiency of each diets was defined as LE returned for one LE invested in feed. Economic efficiency was calculated by this equation:

Economic efficiency = (Selling price of one kg live body weight – Feeding cost of one live body weight / Feeding cost of one kg live body weight) × 100

All data were subjected to analysis of variance using the generally linear models GLM Procedure of (SAS, 2002) and differences obtained upon statistical analysis were compared using Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

1. Proximate analysis of alfalfa dehydrated meal and Moringa petioles meal

The chemical analysis of tested Moringa petioles meal on DM basis compared to alfalfa dehydrated meal is shown in Table 2. The obtained data showed that the moringa petioles meal showed higher contents of DM, OM, CP, EE, Ash, Cell., P and DE than alfalfa dehydrated meal. While alfalfa dehydrated meal was higher in CF, NFE, NDF, ADF, ADL, Hem., Lig. And Ca. In this connection Safwat *et al*.(2014) reported that *Moringa olifera* (stems and leaves) contain 23.94% DM, 21.04% CP, 15.28% CF, 31.32% NDF, 26.88% ADF, 6.25% EE and 8.89% ash.

2. *Effect of substitution of alfalfa hay by moringa petioles meal with or without caplix on:*

a. Digestibility and nutritive value

Digestion coefficients of DM, OM, CP, EE, CF, NFE, NDF, ADF, ADL, Hemicellulose, Cellulose and Lignin, were significantly ($P<0.05$) increased as affected by substitution of 25 and 50% alfalfa hay by moringa petioles meal compared to the control group (Table 3). Also, there were significantly ($P<0.05$) increases in digestibility of CP, EE, CF, NDF, ADF, ADL, Hemicellulose, Cellulose and Lignin and nutritive value as TDN and

DCP with replacing 50% alfalfa dehydrated meal by Moringa petioles meal in rabbit diets compared to the control group. In this respect, Dougnon *et al* (2012), Talha (2013) and El-Badawi *et al*.(2014) who found that feeding rabbits on diets supplemented with Moringa dried leaves up to 0.3% was associated with significant (P<0.05) increases of nutrients digestibility and dietary nitrogen utilization.

The results revealed that adding caplix to rabbit diets containing petioles meal improved the nutrients digestibility and nutritive value compared to the unsupplemented diet. These observations are supported by those reported by Abd El-Latif, *et al*.(2008) who noticed that rabbits fed 10% crud fiber provided with enzymes preparation recorded better (P<0.05) values of dry mater, crude protein and crude fiber digestibility. The authors noted that adding caplix enzymes enhanced microflora growth in the gut and caecum as well as increase the volatile fatty acids production and organic matter digestibility.

The obtained results showed that rabbits fed diet containing 50% petioles meal with caplix had the best (P<0.05) nutrients digestibility and nutritive value compared to the other experimental groups.

b. Caecum activity

Data in Table 4 showed that, caecum weight**,** caecum length, caecum pH and total volatile fatty acids (TVFA´S) in caecal juice were higher (P<0.05) in rabbits fed diets containing 50% moring petioles meal (MPM) compared to other diets. الجملة ناقصة

volatile fatty acids (TVFA´S) compared to the control group. The recorded value were 10.78 vs. 9.86 g; 12.10 vs. 11.30 cm; 6.60 vs. 6.84 and 4.5 vs. 3.85 mq/100ml, respectively. Also, the values of weight caecum and TVFA´S caecal juice were significantly higher (P<0.05) with 25% replacing level compared to the control group, being 10.43 vs. 9.86 g and 4.32 vs. 3.85 mq/100 ml, respectively.

Adding caplix enzyme to rabbit diets increased (P<0.05) caecum weight**,** caecum length, caecum pH and TVFA´S caecal juice compared to the unsupplemented diets, being 11.12 vs. 9.59 g; 12.33 vs. 11.15 cm; 6.51 vs. 6.92 and 4.66 vs. 3.78 mq/100 ml, respectively.

Data concerning the interaction effect of moringa petioles meal and caplix, showed that the highest values (P<0.05) for caecum weight**,** caecum length, caecum pH and TVFA´S caecal juice were recorded with rabbits group fed 50% subistitution MPM diet with caplix. The respective values

Table 4. Caecum activity of growing White New Zeland White rabbits fed the experimental diets . (Means ± SE).

Items	**Caecum weight (g)**	**Caecum length, (cm)**	**Caecum pH**	**TVFA´S caecal juice (mq/100ml)**
Effect of Moringa Petioles meal levels				
0	9.86^{b}	11.30^{b}	6.84^{a}	3.85^{b}
25	10.43^{a}	11.83^{ab}	6.71^{ab}	4.32^{a}
50	10.78^{a}	12.10^{a}	6.60^{b}	4.50^{a}
SE	±0.1592	±0.2212	±0.0537	±0.0625
Effect of Caplix levels (%)				
0.00	9.59^{b}	11.15^{b}	6.92^{a}	3.78^{b}
0.05	11.12^{a}	12.33^{a}	6.51^{b}	4.66^{a}
SE	±0.1300	±0.1806	±0.0439	±0.0510
Effect of Interaction Moringa Petioles meal X Caplix)				
0 (-)	9.28^{c}	10.70^{d}	7.02^{a}	3.36^{d}
0 (+)	10.44^{b}	11.90^{abc}	6.65^{bc}	4.34^{b}
25 (-)	9.56^{c}	11.25^{cd}	6.95^{a}	3.84^{c}
25(+)	11.30^{a}	12.40^{ab}	6.46^{cd}	4.79^{a}
50(-)	9.94^{bc}	11.50^{bcd}	6.79^{ab}	4.14^{b}
50(+)	11.61^{a}	12.70^{a}	6.41^{d}	4.85^{a}
SE	±0.2251	±0.3128	±0.0760	±0.0883

.a, b, c ……Means within the same column with different letters are significantly different ($P<0.05$). (-) Without Caplix (+) With Caplix

were 11.61 g; 12.70 cm; 6.41 and 4.85 mq/100ml. While the lowest values were recorded with that group fed the control diet without caplix. The respective values were 9.28 g, 10.27 cm, 7.02 and 3.36 mq/100 ml.

These results are in agree with those reported by Abd El-Latif, *et al.* (2008) who noted that caplix enzymes enhance the micro flora growth in the gut and Caecum, as well as increase caecal TVFA's production and organic matter digestibility. Moreover, Abd El-Rahman *et al*. (2010) indicated that, dietary addition of multi-enzymes for rabbits could lead to favorable modification in gastro-intestine tract (GIT), environment presumably, acidification of caecal contents and stabilization of ammonia nitrogen concentration. These alterations may be improve the caecal fermentation

pattern and rabbit metabolism that might lead to higher body weight and increase in efficiency of feed utilization.

c. Growth performance

Data in Table 5 show that replacing alfalfa hay by moring petioles meal in rabbit diets at level 50% increase ($P<0.05$) the averages final body weight (FBW) and daily weight gain (DWG) and improved feed conversion ratio (FCR) in comparison with the control group. The values were 2112.22 vs. 2017.94 g; 28.78 vs. 27.10 g and 3.34 vs. 3.63, respectively. However, the differences in FBW and DWG values were not significant between rabbits groups fed the 25% substitution MPM diet and the control group. The average of daily feed intake (DFI) and FCR values were better ($P<0.05$) with rabbits fed 25% substitution MPM diet than those of the control group. The obtained values were 106.48 vs. 98.44 g and 3.79 vs. 3.63, respectively.

Table 5 show significant ($P<0.05$) increases in average values of FBW, DWG and DFI with adding caplix in rabbits diets compared to those fed diets without caplix. The recorded values were 2131.78 vs. 2003.77g, 29.134 vs. 26.841gm and 104.737 vs. 95.884 g, respectively. However, adding caplix to the different experimental diets did not affect FCR values.

Also, data in Table 5 indicate that, average of FBW and daily BWG and FCR were the highest ($P<0.05$) with rabbits group fed 50% substitution MPM with adding caplix. The values were 2198 g, 30.30 g and 3.24, respectively. The lowest values of DBWG and DFI were recorded with rabbits fed the control diet without caplix (1984.88 g and 26.52 g).

Generally adding moringa petioles meal to rabbit diets in substitution with levels 25 and 50% of alfalfa dehydrate meal (7.5 and 15% of the diet) improved the growth performance of rabbits. Talha (2013) noticed that weaned rabbits fed a diet containing 0.3% moringa leaf meal significantly ($P<0.05$) increased daily weight gain. Also, Ibrahim *et al* (2014) found that daily weight gain significantly increased in the rabbits fed 0.2 or 0.4% moringa seeds compared to those of control group. In broilers Safa (2012) reported that Ross broiler chicks fed diets containing *Moringa oleifera* leaf meal at levels of 3, 5 and 7%, gained significantly higher and superior feed conversion ratio than those fed the control diet.

d. Carcass characteristics

Data in Table 6 show that, carcass weight and total edible parts (%) increased ($P<0.05$) with replacing 25 and 50% alfalfa dehydrate meal by

Moringa petioles meal compared to the control group. The values of dressing %, liver and kidney weights were also increased ($P<0.05$) with 50% substitution level in comparison with control group. Safa (2012) found that inclusion of moringa leaf meal in broiler diets up to 5 or 7% significantly ($P<0.05$) improved hot carcass weight, dressing percentage, breast and drumstick percentages and tenderness and juiciness scores for both breast and thigh meat.

Tables 6 indicate that the values of carcass weight, dressing %, liver weight and total edible parts % increased ($P<0.05$) with adding caplix to the diets in compared to those fed to the unsupplemented diets. However, adding caplix to the rabbit diets decreased ($P<0.05$) kidney weight. In this respect, Nahla *et al.* (2015) reported no significant differences in the hot carcass percentage were found between rabbits fed control, exogenous enzymes (ZAD) and combination of lactobacillus acidophilus and ZAD (LZ).

The highest ($P<0.05$) values of carcass weight, dressing, liver and total edible parts were recorded with rabbit's group fed 50% substituted moringa petioles meal diet with adding caplix, while the lowest values were recorded with group fed the control diet.

e - Chemical composition of rabbit meat

Data illustrated in Table 7 show meat content moisture, CP and EE were not affected significantly by substitution of moringa petioles meal level or adding caplix. Accordingly, the interaction effect between moringa petioles meal level was not significant. Generally, Nuhu (2010) found a reduction in ether extract of meat with growing rabbits fed a diet containing xx % of moringa leave meal when compared to those fed the control diet.

f. Economic efficiency

Data presented in Table 8 indicate that replacing moringa petioles meal instead of alfalfa hay at levels of 25 and 50%, either with or without caplix in rabbit diets increased the net revenue and consequently improved the economic efficiency compared to the control group, while net revenue values were 16.62, 18.19 and 19.28 L.E. (without caplix) and 18.80, 18.90 and 24.12 L.E. (with caplix), respectively. The obtained values of economical efficiency (EE) were 0.406, 0.457 and 0.488 (without caplix) and 0.462, 0.436 and 0.609 (with caplix), respectively. The relative economic efficiency (REE) was improved by 112.56 and 120.20%, for rabbit fed diets without caplix, and 113.79, 107.39 and 150% for those fed diets with

Table 7. Effects of the experimental diets on rabbit meat chemical analysis (Means ± SE).

Items	Moisture%	DM%	CP%	EE%
Effect of replacing Moringa Petioles meal levels, %				
0	68.09	31.91	25.09	2.97
25	68.18	31.82	25.07	2.84
50	68.32	31.69	25.00	2.86
SE	± 0.13	±0.1320	±0.1686	±0.0609
Effect of Caplix levels , %				
0.00	68.24	31.76	25.00	2.92
0.05	68.15	31.85	25.11	2.86
SE	± 0.11	±0.1078	±0.1376	±0.0497
Effect of (Moringa Petioles meal X Caplix), %				
0 (-)	68.10	31.90	25.05	3.02
0 (+)	68.08	31.92	25.13	2.93
25 (-)	68.11	31.89	25.14	2.91
25(+)	68.25	31.75	25.01	2.78
50(-)	68.51	31.49	24.82	2.83
50(+)	68.12	31.88	25.19	2.89
SE	±0.18	±0.1867	±0.2383	±0.0861

. a, b, c ……Means within the same column with different letters are significantly different ($P<0.05$). (-) Without Caplix (+) With Caplix

caplix, respectively compared to the control. The improvement in EE could be attributed to the improvement in the feed conversion of rabbits fed these diets. Owen *et al* (2013) studied the economics of raising rabbits using *Moringa olifera* leaf meal as a replacement for soybean in the rabbit's feed. Their obtained results showed that significant differences existed in weight gain, feed intake, feed conversion ratio, cost of feed, cost of weight gain and net benefit.

Conclusively, replacement of 50% of alfalfa hay in the rabbits diet by moringa petioles meal with 0.05% caplex supplementation could be recommanded to improve rabbit growth performance parameters and feed efficiency of feed utilization, under the Egyptian conditions.

Table 8. Economic efficiency as affected by subistitution of different levels of alfalfa hay by moring petioles meal with or without caplix enzyme in diets of rabbits during the experimental period.

Items	Replacing moringa Petioles meal (%)					
	0(Control)		25		50	
	Caplix addition					
	(-)	(+)	(-)	(+)	(-)	(+)
Total FI/rabbit kg	5.577	5.448	5.273	6.652	5.258	5.496
Price 1kg FI (L.E.)	2.5895	2.6026	2.5241	2.5311	2.4707	2.4779
Feed cost/ rabbit (L.E.)	14.442	14.179	13.310	16.837	12.991	13.619
Total cost(LE)(a)	40.94	40.68	39.81	43.34	39.49	39.62
BW	1.9849	2.051	2.000	2.1463	2.0264	2.198
Cost/kg BW (L.E)	20.63	19.83	19.91	20.19	19.49	18.03
Total revenue (LE)(b)	57.56	59.48	58.00	62.24	58.77	63.74
Net revenue(L.E)	16.62	18.80	18.19	18.90	19.28	24.12
*EE (c)	0.406	0.462	0.457	0.436	0.488	0.609
**REE(d)	100	113.79	112.56	107.39	120.20	150.00

(a) Including fixed cost (26.50L.E/rabbit), (b) Assuming that the selling price {is (29) L.E}, (C) Net revenue per unit total cost, (d) Considering the economic efficiency (EE)of the control diet without caplix = 100%.

* EE = economical efficiency **REE = relative economical efficiency

(-) Without caplix, (+) With caplix at level 0.05%.

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تأثير استخدام مستويات مختلفة من اعناق أوراق المورينجا على الهضم و نشاط الأعور و أداء الأرانب النامية

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استخدم فى هذة الدراسة عدد ٧٢ أرنب نيوزيلاندى أبيض نامى مختلط الجنس عمر ٦ أسابيع ومتوسط وزن ٥٠٠ جم ±٢,٥ جم و ذلك لدراسة تأثير استبدال ٢٥ و ٥٠% من دريس البرسيم فى العليقة بأعناق أوراق المورينجا مع أو بدون اضافة انزيم الكابلكس على أداء الارانب و معاملات الهضم و المركبات الغذائية و نشاط الأعور وصفات الذبيحة والكفاءة الإقتصادية. قسمت الأرانب طبقا لتصميم احصائى عاملى الى ٦ معاملات حيث اتخذت احدى المجموعات كمقارنة و كل معاملة ١٢ أرنب مقسمة الى ٤ مكررات (٣ ارانب لكل مكرر)وغذيت على عليقة بدون او مع اضافة ٠,٠٥% نستحضر انزيمى أما بقية المجموعات تغذت على علائق تم استبدال دريس البرسيم بمسحوق أعناق المورينجا بنسبة ٢٥و ٥٠% بدون او مع اضافة انزيم الكابلكس على التوالى و قد أظهرت نتائج الدراسة ما يلى :

محتوى مسحوق أعناق أوراق المورينجا كان أعلى فى كلا من المادة الجافة والمادة العضوية والبروتين الخام ومستخلص الاثير والرماد والسليلوز والفسفور والطاقة المهضومة مقارنة مع ممسحوق دريس البرسيم بينما كان محتوى دريس البرسيم أعلى فى الألياف الخام والمستخلص الخالى من الازوت و السيليلوز والهيمسليلوز و اللجنين و الكالسيوم. لوحظ وجود زيادة معنوية فى معامل هضم معظم المركبات الغذائية مع إحلال مسحوق أعناق أوراق المورينجا محل دريس البرسيم فى علائق الأرانب عند مستوى ٢٥% أو ٥٠%. ولوحظ أيضا أن إضافة الكابلكس إلى علائق الأرانب المحتوية على مسحوق أعناق المورينجا حسن من معامل هضم المركبات الغذائية والقيمة الغذائية مقارنة بالعلائق الغير مضاف إليها الكابلكس . إزداد معنويا كلا من وزن الأعور وتركيز الأحماض الدهنية الطيارة مع إحلال مسحوق أعناق أوراق المورينجا عند مستوى ٢٥ او ٥٠% مقارنة بالمجموعة الكنترول. ونتج أيضا عن إضافة الكابلكس إلى علائق الأرانب

زيادة معنوية فى وزن وطول الاعور ودرجة حموضة وتركيز الاحماض الدهنية الطيارة فى عصير الاعور مقارنة بالعلائق الغير محتوية على الكابلكس. إضافة مسحوق أعناق أوراق المورينجا إلى علائق الأرانب عند المستويات المختبرة (٢٥ ، ٥٠%) كبديل لدريس البرسيم أدى الى تحسين معدل النمو . وأيضا كان هناك زيادات معنوية فى متوسط قيم و وزن الجسم النهائى وكمية الغذاء المأكول مع إضافة الكابلكس الى علائق الأرانب مقارنة بتلك المجاميع المغذاة على علائق بدون الكابلكس.

إزداد معنويا وزن الذبيحة والنسبة المئوية للأجزاء الكلية المأكولة مع إحلال مسحوق أعناق أوراق المورينجا عند مستوى ٢٥ ، ٥٠% مقارنة بالمجموعة الكنترول. لم يؤثر معنويا مستوى إحلال مسحوق أعناق أوراق المورينجا أو إضافة الكابلكس إلى العليقة على محتوى اللحم من الرطوبة والمادة الجافة والبروتين ومستخلص الإثير. تحسنت الكفاءة الإقتصادية نتيجة لإحلال مسحوق أعناق أوراق المورينجا عند مستوى ٢٥ ، ٥٠% سواء بدون أو مع إضافة الكابلكس إلى علائق الارانب.

التوصية: توضح نتائج الدراسة الى امكانية استبدال ٥٠% من دريس البرسيم فى علائق الأرانب النامية (١٥% من تركيب العليقة)مع اضافة ٠,٠٥% من المستخلص الانزيمى كابلكس و ذلك لتحسين مؤشرات كفاءة النمو و الاستفادة الغذائية فى الارانب النامية .