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EFFECT OF FEEDING DIFFERENT LEVELS OF LINSEED MEAL INSTEAD OF SOYBEAN MEAL IN THE DIETS OF BALADY BLACK RABBITS DOES:
2- EFFECT ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE AND SOME BLOOD PARAMETERS.

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ABSTRACT

A total number of 15 bucks (3 per treatment) and 40 does black Balady rabbits was utilized to study the effect of substitution of soybean meal protein (44%) by soaked linseed meal protein SLSMP (26.26%) at levels of 0%, 25%, 50%, 75% and 100% on productive and reproductive performance and some blood constituents. In this experiment, live body weight (LBW) of rabbit does at partum and weaning did not differ significantly for all groups except for group fed 100% SLSMP which had the worst value (P<0.05 and P<0.01 respectively). Body weight of bunny (g) at birth, 21 day and 35 day of age showed the same trend. Group fed 50% SLSMP consumed more feed significantly (P<0.05 and P<0.01 respectively) than other treatments at gestation and lactation periods, this group had more milk yield (MY) which caused the best feed efficiency ratio (MY(g/d) / feed intake FI (g/d)) (P<0.001). Mortality rat from birth to weaning was significantly (P<0.01) lower at the same level than other groups. Increasing the level SLSMP up to 75 and 100% instead of soybean meal decreased milk yield significantly (P<0.01). It was observed that the highest values of MY g/day was recorded at 3 weeks of lactation period for all treatments especially those fed 50% SLSMP which average 142.2 g/day. Increasing the level of SLSMP up to 75 and 100% decreased significantly (P<0.001) crude protein CP, fat, lactose (Lac), total solids (TS) and solid non fat (SNF) of milk. Mean while at the end of lactation period CP, fat, TS and SNF increased significantly (P<0.001), however Lac percent was decreased. Increasing the level of l SLSMP did not affect plasma total protein (g/dl), albumen (g/dl), globulin (g/dl), GOT (IU/L), GPT (IU/L) and urea-N (mg/dl) but increased triglyceride (mg/dl), cholesterol (mg/dl) and creatinine (mg/dl) level significantly (P<0.001). From the nutritional and economical point of view, SLSMP may be used up to 50% of soybean meal protein rabbit diets without adverse affect on reproductive performance and biochemical constituting blood plasma.

It is interesting to not that the optimal level of SLSMP is 11% of dietary composition or 50% of SBMP which improved reproductive performance of rabbit does during pregnancy, lactation periods and minimal mortality of pups, however from economical points of 25% SLSMP or 5.6% of dietary composition could be used successfully and safely in feeding rabbit does without adverse effect on performance of rabbit does.

Keywords: Rabbit ; linseed ; reproductive ; biochemical constituting blood plasma.

INTRODUCTION

The feed is the largest single item in the cost of rabbit production, representing at least 65% (Marai, 1998). Linseed is one of the major oilseed crops, Linseed protein is reported to be superior to groundnut protein but because of its high level of mucilage (poly saccharide complex formed from sugar and uronic acid units) in which ranged 12.2 % (Medhusudhan *et al*., 1986) to 20% (El-Khimsawy, 1993). This may limit its usage in poultry feeds while rabbits can utilize it better due to the presence of microfloura in the cecum.

In Egypt, linseed is crushed by expellers and the deoiled remaining meal contains 25-35% protein and yearly production of linseed meal in Egypt reported to be about 20.000 tons (El-Khimsawy, 1990). The present study aimed to investigate the effects of feeding different levels of soaked linseed meal protein (SLSMP) instead of soybean meal protein (SBMP)on productive and reproductive performance, performance of growing black Balady rabbits, production and composition of milk and some blood plasma constituents.

MATERIALS AND METHODS

The experimental work of this study was conducted at Sakha Animal Production Research Station, Animal Production Research Institute, to study the effect of substitution of SBMP (44%) in the diets of black local rabbits by SLSMP (26.26%) at levels of 0.0%, 25%, 50%, 75% and 100% (as show in Table 1)on reproductive performance and some blood plasma parameters. Linseed cake was purchased from Tanta company for linseed and oils, it was soaked in water bath at 37°C for 24 hr, it was dried in a sun until air drying until <10% moisture, then grounded to fine particles and used for the experimental diets. Forty black local rabbit does of 6 months old with body weight ranging from of 2.932 to 3.086 kg and 15 mature buck rabbits were used in this study. Rabbits were randomly distributed into five similar groups (8 does per each). Feed and water were available *ad libitum* basis for all time.

At mating each does was transferred to the buck pen of the same group and return to her own pen after mating. Live body weight, body weight gain (BWG) and FI of does during gestation and lactation period were recorded. Weight and size of litter, bunny weight and body weight gain from birth to 35 days of age (weaning age), feed efficiency and mortality rate were determined.

Average weekly milk yield of each doe was recorded at three successive days during each week by differences between LBW of bunnies of each doe before and after suckling. Milk samples were collected manually by gently massaging the mammary gland. The samples were cooled and transferred immediately to the laboratory for chemical analysis. . Fat, protein, Lac, TS and SNF were also determined in collected samples from teats at different positions (anterior, posterior and middle teats) using milko-scan (Model 133 B).

Blood samples were taken from three rabbit does from each treatment at (control, gestation and lactation) into heparinized tube, Plasma were separated by centrifugation at 4000 r.p.m for 15 minutes then frozen at –20°C until analysis. Plasma total protein (g/dl), albumin (g/dl), globulin (g/dl), glutamate oxaloacetate transaminase GOT (IU/L), glutamate pyruvate transaminase GPT (IU/L), triglycerides (mg/dl), cholesterol (mg/dl), urea (mg/dl) and creatinine (mg/dl) were determined colorimetrically using Kits according to (total protein, Doumas *et al*. 1981; albumin, Hill and Well 1983; globulin Hill and Well 1983; GOT and GPT, Reitman and Friankel 1957; cholesterol, Siedel et al., 1983; urea-N, Freidman *et al*., 1980 and creatinine, Ullmann 1976) and the colorimetric determination of plasma triglycerides.

Table(1): The composition and the chemical and calculated analysis of experimental diets

Ingredients	SLSMP%				
	0	25	50	75	100
Composition of experimental diets					
Clover hay	34.0	31.0	30.5	30.0	29.6
Wheat bran	22.2	23.6	23.0	23.5	25.4
Barley	22.0	22.0	21.6	20.0	17.0
Soybean meal(44%)	16.0	12.0	8.0	4.0	0
Linseed meal	0	5.6	11.2	16.8	22.4
Dicalcium phosphate	1.7	1.7	1.7	1.7	1.7
Methionin	0.2	0.2	0.1	0.1	0.0
Salt	0.3	0.3	0.3	0.3	0.3
Primix*	0.5	0.5	0.5	0.5	0.5
Anticoccidia	0.1	0.1	0.1	0.1	0.1
Molases	3.0	3.0	3.0	3.0	3.0
Total	100	100	100	100	100
Chemical analysis :**					
Crude Protein (CP)	19.15	18.94	18.61	18.59	18.94
Crude Fiber (CF)	16.27	15.74	15.74	15.77	15.87
Ether extract (EE)	2.59	2.66	2.57	2.75	2.89
Calculated analysis :***					
M.E (kcal/kg.)	2653.8	2670	2681.9	2688.4	2688.5
Calcium	1.00	0.97	0.97	0.98	0.98
Total Phosphorous	0.77	0.79	0.80	0.80	0.80
Lysin	0.95	0.90	0.84	0.79	0.75
Methionin	0.480	0.530	0.480	0.530	0.490
Methionin + Cyctin	0.70	0.73	0.73	0.75	0.75

*** Vitamins and minerals premix manufactured by Egypt company for chemical & pharmaceuticals (ADWIA) Each 2.5 kg contains: Vit. A 12000000 IU; vit. D3 2000000 IU; vit. E 110000 mg ; vit. B1 1000 mg; vit. B2 4000 mg ; Niacin 20000 mg ; vit. Pantothenic acid 10000 mg; vit. B12 10 mg; vit. K3 2000 mg; Folic acid 1000 mg; vit. B6 1500 mg; Biotin 50 mg; Copper 10 gm; Iron 30 gm; Iodine 1000 mg; Manganese 55 gm; Selenium 100 gm; Zinc 55 gm; Choline chloride 500 gm; Ethoxyquine 3000 mg.**

**** According to (AOAC 1995) & *** According to (NRC 1994).**

Data were analyzed using one-way except for data of milk yield (g/d) and milk composition (%) when a factorial experimental analyses was used in the model with treatment and time as the main effect, however data were

presented based on the main effect only due to the significant of the interaction according to SAS program (SAS, Institute, Inc., 1985).The application of the least square procedure tests of significance for the differences among the different diets were done according to Duncan (1955).

Economic efficiency (Y) were calculated in the experiment as following equation, $Y = ((A – B) / B) \times 100$ Where : A is the selling cost of the obtain gain, B is the feeding cost of this gain.

RESULTS AND DISCUSSION

Reproductive performance of rabbit does :

The reproductive performance of rabbit does are summarized in Table (2). Data showed that no significant difference in the LBW of rabbit does at mating and pre-partum, while at partum and weaning there were no significant differences ($P<0.05$) due to feeding SLSMP up to 75% of SBMP while increasing SLSMP to 100%significantly decreased LBW and BWG ($P<0.05$ and $P<0.01$). This is may be due to decreasing digested feed (Radwan et al., 1997).

Amber *et al.,* (2002); Amber, (2002) and Rashed, (2002) reached similar results. On the other hand El-Husseiny *et al.*, (1997**)** reported that daily BWG for growing rabbit was lower in rabbit fed control diet (soybean meal 44%) than those fed diet containing 10.6% linseed meal although this differences were not significant.

Table (2): Effect of feeding different levels of SLSMP on reproductive performance of rabbit does during gestation and lactation periods

Parameters	Level of soaked linseed meal protein SLSMP %					SEM	Sig.
	0	25	50	75	100		
Does weight (g) at :							
Mating	3021	3040	3010	3060	3000	0.013	NS
Pre-partum	3280	3285	3209	3229	3117	0.036	NS
Partum	3222^{a}	3109^{a}	3159^{a}	3130^{a}	2860^{b}	0.038	*
Weaning	3044^{a}	2956^{a}	3056^{a}	2926^{a}	2706^{b}	0.034	**
Does weight gain (g) at :							
Pregnant	260	245	199	169	117	0.033	NS
Lactation	-179	-154	-103	-204	-154	0.014	NS
Feed intake (g/d) and Milk yield (g/d):							
Pregnant does	245.2^{b}	242.9^{b}	253.4^{a}	235.2^{c}	246.9^{ab}	1.39	***
Lactation does	276.1^{bc}	282.5^{a}	276.9^{bc}	280.3^{ab}	275.2^{c}	0.747	**
Milk yield (g/d)	93.73^{bc}	99.02^{ab}	102.5^{a}	91.88^{c}	78.97^{d}	1.618	***
Feed conversion ratio (FI / MY) :							
FI (g) / MY (g)	3.36^{bc}	3.65^{b}	3.05^{c}	3.41^{b}	4.11^{a}	0.074	***

a, b, c,…. Means values with in the same raw with different superscript were significantly.
***(P<0.05) , ** (P<0.01) , ***(P<0.001) and NS not significant.**
SEM = the standard error means, Sig. = Significant

Does fed diet containing 50%SLSMP consumed significantly ($P<0.01$ and $P<0.001$) more feed than other the treatments during the pregnant and lactation periods and yielded more milk (102.5 g/doe/day) thus improved feed

conversion ratio (FI / MY). In this regard, Does which were heavier at kindling yield more milk and reared a heavier litters and more efficient in conversing feed into milk El-Sayiad, (1994) found the same results.

Data for the effect of feeding different levels of linseed meal on litter performance from birth until weaning are presented in Table (3). It was observed that inclusion of 25% SLSMP in doe diets increased significantly the litter weight at 35 day of age compared to the control group and 100% SLSMP fed group. Similar trend was shown of group fed 75% SLSMP, while feeding 50% SLSMP gave the highest litter BW (g) at birth, 21 day and 35 day (weaning), however increasing the level of SLSMP to 100% decreased significantly BW (g) and BWG, Amber et al., (2002); Amber, (2002) and Rashed, (2002) found the similar results. This is may be due to reduction in milk yield which averaged 78-97 g/day. In accordance with present results, El-Sayiad (1994), reported reductionof 13.1% in digested protein for group fed 100% SLSMP, Abd El-Hady (2001) indicated that there were weak medium positive correlation between protein intake and BWG of does and litters (r = +0.2) and (r = +0.34) respectively and number of litter at birth and weaning age (r = +0.24 and r = +0.47) respectively.

Also increasing the level of LSM to 75 and 100% SLSMP increased mortality rate insignificantly, the same results was found by (Amber, 2002 and Rashed, 2002), this may be due to increasing the harmful substances as mucilage (El-Khimasawy, 1993).

It was clear that feeding diet containing up to 50% SLSMP improved feed conversion, increased growth of pups till 35 day of age and decreased mortality rate. The same trend was observed by (El-Husseiny *et al.*, 1997 and Attia, 2003).

Table (3): Effect of feeding different levels of SLSMP on litter performance from birth until weaning

Parameters	Level of soaked linseed meal protein SLSMP%					SEM	Sig.
	0	25	50	75	100		
Litter size at :							
Birth	6.75	7.00	6.25	6.25	6.63	0.147	NS
21 day	5.63	6.00	5.75	5.00	5.50	0.129	NS
35 day (weaning)	5.50	5.75	5.63	4.88	5.38	0.124	NS
Mortality rate % at :							
Birth- 21 day	16.41	13.91	7.52	19.32	16.86	1.454	NS
Birth- weaning	18.50	17.26	9.30	21.10	18.94	1.462	NS
Litter weight (g) at :							
Birth	49.32^{b}	48.18^{b}	53.74^{a}	43.87^{c}	42.57^{d}	0.668	***
21 day	200.8^{c}	248.1^{b}	274.9^{a}	272.2^{a}	177.8^{d}	6.39	***
35 day (weaning)	366.4^{b}	473.0^{a}	484.1^{a}	481.6^{a}	313.6^{c}	11.44	***
Daily feed intake (g) at :							
Lactation period	276.1^{bc}	282.5^{a}	276.9^{bc}	280.3^{ab}	275.2^{c}	0.747	**
Feed conversion rate as feed intake (g) / body weight (g) :							
FI (g) /BW (g)	6.21^{a}	4.18^{b}	4.13^{b}	4.81^{b}	7.05^{a}	0.228	***

a, b, c,…. Means values with in the same raw with different superscript were significantly.
***(P<0.05) , ** (P<0.01) , ***(P<0.001) and NS not significant.**
SEM = the standard error means, Sig. = Significant

The effect of feeding different levels of SLSMP on MY (g/d) and milk composition (%) of rabbit does during lactation periods is presented in Tables (4 and 5). Results indicated that there were significant differences between treatments, week after delivery and interaction (P<0.05, P<0.01 and P<0.001), where increasing the level of SLSMP increased MY up to 102.5 g/day of group fed 50% SLSMP than groups fed either 0 and 25% SLSMP. This rate was about 9%, then milk yield decreased progressively as the rate of SLSMP increased to 75 and 100% of SBMP. Also, it was observed that the highest values of milk yield (g/day) was recorded at 3 wk after devilry for all treatments especially of group fed 50% SLSMP which averaged 142.02 g/day. The effect of wk after delivery on milk yield was significant showing an increase up to 3rd wk of lactation and decreased progressively (Table 4).

Table (4): Effect of feeding different levels of SLSMP on milk yield (g/d)

Week after delivery	Level of soaked linseed meal protein (SLSMP%)					SEM	Sig.	Average weeks after delivery
	0	25	50	75	100			
1	58.17^{b}	78.60^{a}	62.19^{b}	63.38^{b}	63.23^{b}	2.18	*	65.12^{d}
2	102.09^{b}	132.94^{a}	123.94^{a}	108.42^{b}	108.79^{b}	2.77	***	115.24^{b}
3	136.64^{a}	136.69^{a}	142.02^{a}	126.94^{ab}	112.19^{b}	2.80	**	130.90^{a}
4	111.18^{a}	110.35^{a}	111.74^{a}	105.32^{a}	68.47^{b}	3.24	***	101.41^{c}
5	60.59^{b}	36.53^{c}	72.63^{a}	55.32^{b}	42.17^{c}	2.61	***	53.45^{e}
Average	93.73^{bc}	99.02^{ab}	102.50^{a}	91.88^{c}	78.97 ^{d}	1.62	***	***

a, b, c,…. Means values with in the same raw with different superscript were significantly.
***(P<0.05) , ** (P<0.01) , ***(P<0.001) and NS not significant.**
SEM = the standard error means

Amber, (2002) and Rashed, (2002) found the similar results, This is may be due to the decrease 13.1% in CP digested of group fed 100% SLSMP, and the lower BW (2706 g).Similarly, El-Sayiad (1994), found that does which were heavier at kindling yielded more milk and were more efficient in converting feed to milk.

Results in Table(5) indicated that there were significant differences (P<0.01 and P<0.001) among treatments and week of lactation on milk composition (%). Results showed that increasing the level of SLSMP up to 75 and 100% of SBMP decreased significantly CP, fat, Lac, TS and SNF mean, while at the end lactation period CP%, fat, TS% and SNF% of milk increased significantly (P<0.001), however Lac percent was decreased. Pascual *et al.,* (1999), indicated that fat and protein of milk did not vary until the end of the 3rd week of lactation, after which they increased steadily as the milk yield declined, Amber (2002), found that the replacing linseed meal protein for soybean meal protein in diets for pregnant and lactating V-line rabbit does from 0, 7, 14 or 28% respectively, fat and DM contents of milk significantly increased by 57.04 and 18.58% respectively, however CP and lactose contents of milk significantly decreased by 14.29 and 30.54% respectively, due to increasing dietary linseed levels from 0 and 28% .

Data in Table (6) showed the effect of feeding different levels of SLSMP on some biochemical constituents of blood plasma parameters, it was clear that increasing the level of linseed meal did not affect on plasma total protein (g/dl), globulin (g/dl), GOT (IU/L), GPT (IU/L) and urea-N (mg/dl)

although there were significantly (P<0.001) increase steadily in triglyceride (mg/dl), cholesterol (mg/dl) and creatinine (mg/dl) level with increasing the level of SLSMP, on the other hand, the oppiste trend was shown in albumen.

Similar trends were recorded by Attia, (2003) observed that the nutrimental value of soaked linseed cake (SLSC) and the possibility to include it at the rate of 0, 5, 10 and 15% in finishing diet for broilers as a source of protein and n-3 fatty acids, the plasma total protein was not significantly affected by including SLSC up to 15% in the diet for broiler males during the period from 30 to 45 days of age, however including 15% SLSC in the diet for broiler significantly (P<0.01) increased plasma triglyceride and cholesterol.

Table (5): Effect of feeding different levels of SLSMP and day of lactation on milk composition (%)

Week	Level of linseed meal SLSMP %					SEM	Mean
	0	25	50	75	100		
Crude protein:							
1	9.67	9.60	9.19	9.15	8.79	0.098	9.28^{b}
2	9.06	9.31	9.32	8.35	9.34	0.087	9.08^{bc}
3	8.80	9.39	8.89	8.68	8.67	0.126	8.89^{c}
4	10.90	10.91	11.40	11.12	10.55	0.115	$10.^{98a}$
5	10.59	11.21	11.95	10.84	10.64	0.145	11.04^{a}
Mean	9.80^{bc}	10.08^{ab}	10.15^{a}	9.63^{c}	9.60^{c}	0.085^{***}	0.114^{***}
Fat:							
1	11.49	12.02	14.59	11.25	11.75	0.242	12.22^{c}
2	11.66	12.93	12.17	10.85	11.70	0.207	11.86^{c}
3	11.48	12.81	12.62	11.36	11.89	0.193	12.03^{c}
4	12.71	13.45	14.50	12.84	13.37	0.245	13.37^{b}
5	15.40	16.84	17.75	16.35	14.54	0.263	16.17^{a}
Mean	12.55^{c}	13.61^{b}	14.33^{a}	12.53^{c}	12.65^{c}	0.153^{***}	0.230^{***}
Lactose:							
1	2.29	2.40	2.20	3.04	2.22	0.080	2.43^{c}
2	3.64	2.69	3.13	3.26	3.53	0.077	3.25^{a}
3	3.75	3.33	2.59	3.54	3.57	0.095	3.36^{a}
4	3.40	3.89	3.28	3.26	3.33	0.075	3.43^{a}
5	2.94	2.79	3.17	2.41	2.27	0.083	2.72^{b}
Mean	3.20^{a}	3.02^{abc}	2.88^{c}	3.10^{ab}	2.98^{bc}	0.046^{**}	0.082^{***}
Total solids:							
1	26.87	27.92	30.14	25.89	26.44	0.316	27.45^{d}
2	27.92	29.58	28.93	25.70	28.30	0.344	28.09^{cd}
3	28.41	29.86	29.87	27.04	28.42	0.307	28.72^{c}
4	30.29	32.69	34.93	32.13	32.22	0.404	32.45^{b}
5	32.83	36.57	38.36	35.38	31.77	0.502	34.98^{a}
Mean	29.26^{c}	31.32^{b}	32.45^{a}	29.23^{c}	29.43^{c}	0.266^{***}	0.375^{***}
Solid non fat:							
1	15.38	15.90	15.55	14.65	14.69	0.171	15.23^{c}
2	16.26	16.65	16.76	14.86	16.60	0.202	16.22^{b}
3	16.93	17.06	17.25	15.68	16.53	0.244	16.69^{b}
4	17.57	19.24	20.44	19.29	18.85	0.286	19.08^{a}
5	17.43	19.73	20.61	19.03	17.24	0.347	18.81^{a}
Mean	16.71^{b}	17.72^{a}	18.12^{a}	16.70^{b}	16.78^{b}	0.156^{***}	0.250^{***}

a, b, c,…. Means values with in the same raw with different superscript were ignificantly.
***(P<0.05) , ** (P<0.01) , ***(P<0.001) and NS not significant.**
SEM = the standard error means, Sig. = Significant

Table (6): Effect of feeding different levels of SLSMP on and day of lactation on some blood parameters

Parameters	Level of soaked linseed meal protein (SLSMP%)					SEM	Sig.	Physiological state			SEM	Sig.
	0	25	50	75	100			Control[1]	Gestation pr	Lactation pr		
Total protein (g/dl)	7.35	7.59	7.45	7.44	6.83	0.119	NS	7.23	7.29	7.47	0.207	NS
Albumen (g/dl)	4.16^{a}	4.17^{a}	4.45^{a}	4.03^{a}	3.10^{b}	0.143	**	3.20^{b}	4.39^{a}	4.36^{a}	0.206	***
Globulin (g/dl)	3.18	3.43	3.01	3.41	3.73	0.156	NS	4.03^{a}	2.91^{b}	3.11^{b}	0.239	*
GOT (IU/L)	34.22	34.13	34.01	34.89	34.16	0.340	NS	34.87^{a}	32.58^{b}	35.40^{a}	0.493	**
GPT (IU/L)	23.41	22.64	21.61	22.54	22.72	0.302	NS	21.77^{b}	24.51^{a}	21.48^{b}	0.390	***
Triglyceride(mg/dl)	92.62^{c}	93.42^{bc}	96.54^{b}	99.85^{a}	102.77^{a}	0.738	***	95.95	96.50	98.67	1.264	NS
Cholesterol (mg/dl)	73.32^{d}	74.79^{d}	77.50^{c}	79.55^{b}	81.72^{a}	0.525	***	76.93	78.18	77.02	0.915	NS
Urea-N (mg/dl)	54.96	55.59	56.22	56.46	56.06	0.208	NS	55.56	56.12	55.74	0.363	NS
Creatinine (mg/dl)	0.82^{c}	0.83^{bc}	0.85^{ab}	0.85^{a}	0.86^{a}	0.004	**	0.83^{b}	0.85^{a}	0.85^{a}	0.007	**

a, b, c,…. Means values with in the same raw with different superscript were significantly.
***(P<0.05) , ** (P<0.01) , ***(P<0.001) and NS not significant.**
SEM = the standard error means, Sig. = Significant
1 control = no gestation and no lactation

Also, Morsy (2001) found that plasma total protein and glucose were significantly decreased (P< 0.01 & P< 0.001), but plasma cholesterol and triglycerides were significantly increased (P< 0.001) by increasing the level of SLSMP in the growing rabbit diets, similar trend was observed by Amber *et al*. (2002) and Rashed, (2002) who found that plasma total protein (g/dl), albumen (g/dl), globulin (g/dl), triglyceride (mg/dl), cholesterol (mg/dl) and urea-N (mg/dl) did not differ significantly at gestation and lactation periods, but GOT (IU/L) and creatinine (mg/dl) increased in lactation period while GPT (IU/L) was decreased. There were significant changes on some biochemical constituents of blood plasma in physiological states, it was observed that albumen was increased at gestation and lactation periods, while the opposite trend was observed in the globulin. The GOT was significantly highest of lactating does, while, GPT was significantly higher of the pregnant does.

Data in Table (7) show the effect of feeding different levels of SLSMP on the economical efficiency . The lower price of SLSMP reflected on the price of the experimental diets, feeding cost/rabbit and values of economical efficiency, where the results showed that using 25% SLSMP recorded highest economical efficiency compared to the other experimental groups, the feed cost (LE /head and offspring) and relative feed cost to control were significantly decreased (P< 0.001) by increasing the level of SLSMP in the growing rabbit diets. Similar trends were recorded by Attia, (2003) observed that soaked linseed cake (SLSC) could be included up to 15% in finishing diet for broilers males older than 30 days without adverse effect on the economical efficiency during 30-45 days of age.

El-Husseiny *et al.* (1997) found that rabbit fed diet containing 10.6% linseed meal had better economic efficiency value than those fed the control diet (soybean meal 44%). While Morsy, (2001) reported that the best economic efficiency was obtained the growing rabbits fed diet containing 28% linseed meal protein.

Table (7): Effect of feeding different levels of SLSMP on the economical efficiency of reproductive performance

Items	Level of soaked linseed meal protein SLSMP%					Sig.
	0	25	50	75	100	
Weaning bunny number	20.63	23.00	21.13	16.63	20.00	NS
Total revenue (LE)	247.5	276.0	253.5	199.5	240.0	NS
Feed consumption (kg/doe and offspring)	63.35^{c}	65.24^{b}	63.21^{c}	62.01^{d}	68.54^{a}	***
Feed cost (LE /head and offspring)	70.64^{a}	70.72^{a}	66.25^{b}	62.57^{c}	66.42^{b}	***
Net revenue (LE / head)	176.86	205.28	187.25	136.93	173.59	NS
Economical efficiency (%)	250.09	289.74	282.23	218.81	261.19	NS
Relative economical efficiency to control	100.0	115.85	112.85	87.49	104.44	NS
Relative feed cost to control	100.0^{a}	100.12^{a}	93.79^{b}	88.58^{c}	94.02^{b}	***

Price of weaning bunny = 12.0 LE
Price of kg of treatment diets LE : 0%= 1.115 , 25%= 1.084, 50%=1.048, 75%=1.009 and 100%= 0.969

It is interesting to not that the optimal level of SLSMP is 11% of dietary composition or 50% of SBMP which improved reproductive performance of rabbit does during pregnancy, lactation periods and minimal mortality of pups, however from economical points of 25% SLSMP or 5.6% of dietary composition could be used successfully and safely in feeding rabbit does without adverse effect on performance of rabbit does.

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تأثير التغذية على مستويات مختلفة من كسب بذرة الكتان لتحل محل كسب فول الصويا فى علائق أرانب البلدى الأسود : دراسة التأثير على الأداء الإنتاجى للأمهات وبعض قياسات الدم

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تم إستخدام عدد ٤٠ أنثى و ١٥ ذكر أرنب بلدى أسود وذلك بهدف دراسة تأثير إستبدال المصدر البروتينى فى العليقة (كسب فول الصويا ٤٤%) بمصدر بروتينى آخر (كسب بذرة الكتان المنقوع) وذلك بالنسب الآتية٠%، ٢٥%، ٥٠%، ٧٥% ثم ١٠٠% ومعرفة تأثير ذلك على الأداء الإنتاجى للأرانب وكذلك إجراء بعض المكونات البيوكيميائية لبلازما الدم.

وكانت النتائج كالأتى :

- لم يختلف وزن الجسم للأمهات فى فترة ما قبل الحمل معنويا ولكن فى فترة الحمل و الرضاعة كانت المجموعة المغذاة على ١٠٠% كسب كتان معامل أقل فى وزن الجسم عن المجموعات الأخرى عند معنوية (٠,٠٥ و ٠,٠١) وكذلك وزن الخلفة عند عمر الميلاد و٢١ و٣٥ يوم.
- المجموعة المغذاة على ٥٠% كسب كتان معامل أستهلكت غذاء أكثر معنويا(٠,٠١ و ٠,٠٠١) عن باقى المعاملات وأنتجت كمية لبن أكبر ولذلك كان لها أحسن كفاءة تحويلية عند ٠.٠٠١ وأيضا كانت أقل نسبة نفوق فى المجموعة المغذاة على ١٠٠% كسب كتان معامل.
- زيادة مستوى كسب الكتان المنقوع إلى ٧٥ و ١٠٠% أدى إلى إنخفاض كمية اللبن معنويا عند ٠,٠١ وكان أعلى إنتاج للمعاملات كلها عند الأسبوع الثالث وعلى الأخص فى المجموعة المغذاة على ٥٠% كسب كتان معامل حيث بلغت ١٤٢,٠٢ جرام/يوم كذلك زيادة الإحلال إلى ١٠٠% كسب كتان معامل أدى إلى إنخفاض معنوى (٠,٠٠١) فى البروتين و الدهن والجوامد الكلية ولوحظ إرتفاع هذه النسب مع نهاية فترة الرضاعة فيما عدا اللاكتوز فقد إنخفضت نسبته معنويا عند ٠,٠٠١.
- لم تؤثر معنويا نسب إحلال كسب الكتان المنقوع حتى ١٠٠% على نسبة بروتينات الدم والألبيومين والجلوبيولين وإنزيمات الكبد (GOT , GPT) ونيتروجين اليوريا ولكن أدت الزيادة إلى زيادة الدهون الثلاثية والكوليستيرول والكرياتينين معنويا عند ٠,٠٠١.
- أما من الناحية الغذائية والإقتصادية فيتضح أنه يمكن زيادة نسبة إحلال كسب الكتان المعامل ليحل محل كسب الصويا حتى نسبة ٥٠% من غير تأثير سيىء على أداء الأمهات.

وخلاصة القول من هذه النتائج أنه يمكن إستخدام بروتين كسب الكتان المنقوع حتى مستوى ٥٠% من بروتين كسب فول الصويا أو حوالى ١١% من مكونات العليقة لأمهات أرانب البلدى الأسود بدون تأثيرات ضارة على الصفات الإنتاجيه والمكونات البيوكيميائية لبلازما الدم وإنتاج اللبن ومكوناته ، أما من الناحية الإقتصادية فإن التغذية على عليقة تحتوى على ٢٥% من بروتين كسب الكتان المنقوع أو ٥,٦% من مكونات العليقة فقد سجل أفضل كفاءة إقتصادية.