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EFFECT OF JATROPHA CAKE ON MILK YIELD, MILK COMPOSITION, SOME PHYSIOLOGICAL BODY REACTION, BLOOD COMPOSITION, ESTRUS INCIDENCE AND PREGNANCY RATE IN ZARAIBI DAIRY GOATS

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SUMMARY

The aim of this study was to investigate milk yield, milk composition physiological body reaction, blood composition, regulation oestrus and pregnancy rate as affected by replacement of soybean with treated jatropha cake in Zaraibi dairy goat's rations. Twenty-forty Zaraibi dairy goats showing healthy were divided into two groups. The control group (n=12) was fed basal ration contained concentrate feed mixture (CFM) with fresh berseem (Trifolim alexandrium), while the treatment group received (CFMJ=concentrate fed mixture with treated jatropha cake) where, replacement of 50% soybean meal with treated jatropha cake (TJC). Nutrient digestibility and nutritive value were determined by using Acid Insoluble Ash.

Results of digestibility coefficients of DM, OM, CF, EE and nutritive values (TDN) showed insignificant differences among tested groups. Meanwhile, digestibility coefficient of CP and DCP for R2 was significantly ($P<0.05$) higher than the control group (R1)., No significant differenceswere recorded among the tested groups in daily milk yield and milk composition. The physiological measurements were physiological body reaction included: rectal temperature (RT), skin temperature (ST), coat temperature (CT), respiration rate (RR) and heart rate (HR). Moreover, Blood samples, regulation of oestrus and pregnancy rate were evaluated. The results indicated that significant differences ($P<0.05$) between RT, ST and RR but, non-significantly with CT and HR. The blood parameter reported significant ($P<0.05$) for jatropha goat compared to control in total protein, albumin, glucose, zinc, calcium, phosphorus and magnesium. The differences in regulation of oestrus activity was significantly higher ($P<0.05$) for treated group than control. Pregnancy rate in group fed jatropha was more than the control group ($P<0.05$).Feed cost decreased 11.8% as compared to control group. Meanwhile, the return was increased by 18.14% for G^2 group. In conclusion that the substitution of soybean with treated jatropha cake has a very low risk of anti-nutritional factors and can improve reproductive performance and this will improve stockholder income.

Keyword: Dairy goats, Jatropha, regulation oestrus, physiological body reaction, pregnancy rate

INTRODUCTION

In Egypt, sheep and goats are less developed compared to other livestock. Commercial goat's production is on an intensive basis and Commercial for feed resources with human. Feeds costs in goat's production deem the highest cost of the production requirements and may account 70-80% of costs. Nutrition is an important factor in goat and sheep development, and a variety of nutrients are involved in proper growth and reproductive maturation. On contrast, it is well known that in Egypt, there is a serious shortage in rations and many oil crops had by-product which represent a real problem. Jatropha is oil crops belonged to family *Euphorbiaceae* was known for its toxicity. This family is included *Croton tiglium L., Castor plant* (*Ricinus communis L.) and Jatropha curcas L.* The toxicity of jatropha was related it's content of phorbol esters and curcin that similarly ricin in castor (Rao *et al*., 1988). Several study found that addition of 5% detoxified of castor meal in the diet has not been caused adverse effects or nutritive problems on lactating dairy cows, beef cattle and sheep (Alexander, 2008). On the other hand, Robb *et al*. (1974) reported that diets containing 10 and 20% detoxified castor meal were fed to lactating dairy cows over a 14-month appeared abnormal effects on production, reproduction and ricin transfer to milk. Moreover, these authors found that calves fed milk from cows fed concentrate mixture which including *Jatropha cake* showed neither apparent muscle residue accumulation nor organ abnormality. The heat treatment in combination with the chemical treatment of sodium hydroxide and sodium hypochlorite has also been reported to decrease the phorbol ester level in Jatropha *cake* to 75% (Hass and Mittelbach, 2000). About 70 hectare was planted with jatropha curcas on treated wastewater in Luxor, Ismailia, Suez and Giza. Jatropha is planted at rate of 350 - 500 saplings per hectare. The amount of seed production range between 1.5 - 12 tons per hectare with an average of 5 tons seed which produce about 1.85 tons of oil (El-Gamassy, 2008). The Jatropha curcas is a hardy plant thrives on degraded land and requires limited amounts of nutrients and water. The seed cake contains indigestible shells and left as a by-product after oil extraction by screw press. The cake is rich in protein and is a potential source of feed for livestock. Toxicity is ascribed to the presence of phorbol esters (Francis *et al*., 2005 and Rakshit *et al*., 2008). The protein quality of the meal obtained from shelled jatropha seeds is contains 1-2% residual oil but has a high crude protein (CP) ranging between 58 to 64%. Jatropha seed cake (free of shells) has been found to have a very high nutritive value compared to soybean meal (Goel *et al*., 2007). The available information on the toxicity principles of Jatropha is very scanty with feeding. Consequently, the objective of this study was to investigate changes in physiological body reactions, blood measurements, estrus incidence and pregnancy rate when dairy goats fed concentrate mixture with replacement of 50% soybean meal with Jatropha cake.

MATERIALS AND METHODS

Location and duration period of experimental:

This work was conducted at Animal Production Research Station El-Serw Damietta Governorate, Animal Production Research Institute, Agriculture, Egypt. The duration of trial was carried out during the lactation period began from 1st February to 30th May and mating season from 1st June to15th July, 2010.

Experimental animals and feeding:

Twenty-four lactating Zaraibi goat doses were randomly assigned into tow groups control and treated each of 12 does with average body weight 35 kg and aged 2.5 to 3 years. The control group was fed traditional ration contained concentrate fed mixture (CFM), fresh berseem (FB) and rice straw (RS). Lacto bacillus bacteria treated Jatopha cake (TJC), replaced 50% of soy bean meal in concentrate feed mixture (G^2) Animals were fed twice daily at 8.00 and 16.00 hrs in group feeding. Clean water and minerals salt were permanently available throughout the entire experimental period to provide the production requirements. Nutrients requirement were calculated according to NRC (1990) allowances for goats. The composition of tested CFM is shown in Table (1). Nutrients digestibility and nutritive values of experimental rations were determined by using acid insoluble ash technique (Van Keulen and Young, 1977). Feces samples were collected twice daily for 7 successive days. Representative samples of feed staffs, total mixed ration and feces, were analyzed according to A.OA.C. (1999). The experimental dairy does were healthy and free from external and internal parasites. The experimental groups were kept in pens in similar conditions. Water and mineral salts were permanently available throughout the entire experimental period to provide the production requirements. At the end of the study, simple economical evaluation was calculated for tested rations according to the prevailing prices of ingredients during the time of the experiment.

Table 1. The chemical compositions (%) of feed ingridients

Ingredients	Experimental feedstuffs				
	FB	TJC	RS	CFM	CFMJ
DM	15.00	92.76	91.70	90.00	90.00
CF	26.32	10.77	40.11	14.10	14.10
CP	15.46	43.85	4.16	13.00	13.23
EE	3.50	6.45	1.28	03.20	03.20
NFE	42.56	31.69	41.35	60.60	60.37
Ash	12.16	7.24	13.15	9.10	9.10

CFM= Concentrate fed mixture TJC= Treated jatropha cake. FB = Fresh berseem
CFMJ = Concentrate fed mixture with treated Jjatropha cake RS = Rice straw

Some physiological body parameters:

Changes in rectal temperature (RT), skin temperature (ST), coat temperature (CT), respiratory rate (RR, rpm) and heart rate (HR, bpm) were recorded at noon for twelve weeks during lactation months. The RT was measured using a digital thermometer inserted into the rectum for one minute. The ST and CT were measured using thermostat probes (model 46 TUC Tele-thermometer YSI, Yellow Springs Ohio, USA). The RR was measured by observation of the movement of the thoracic cage and counting the flank movements for a minute and HR was calculated as beats in minutes using a stethoscope.

Blood measurements:

Blood samples were collected from the jugular vein just before feeding from 6 does nourished both D1and D2 rations during second and fourth lactation months. Blood pH value was assessed by Astrup method using Acid-base Laboratory (ABL 4 Radiometer, Copenhagen-Denmark). Blood Samples were centrifuged at 1500 rpm for 20 min, separated serum was used for enzymes determination, while the remained part was kept frozen at- 20 °C for later analysis. Commercial kits were used for all blood measures, except blood total ketone bodies (BTKB / mmol.l^{-1}) which was measured in whole blood by the method described by Hradeck *et al.* (1978).

Estrus detection:

Estrus incidence was monitored to confirm the onset of estrus three times daily with 6 hours as the interval by teaser buck to evaluate estrus numbers through lactation period. The estrus signs observed included: searching for the male, restlessness, vocalization, frequent urination, tailing, contraction, hyperemia and edema of the vulva, vaginal mucous discharge and immobility on mounting.

Pregnancy rate:

Pregnancy rate was used the normal mating applied with D1 and D2 rations to calculate conception rate. The estrus was monitored two times daily at 7 a.m. and 7p.m. for two hours each time. Goat appeared heating in morning was mated at 7p.m. while, goat comes in estrus at 7p.m. were mated at 7a.m. next day. Goats were considered pregnant when they showed no estrus signs after two estrus periods.

Statistical analysis:

Data were statistically analyzed by using the statistical program according to SAS (2004).

RESULTS AND DISCUSSIONS

Chemical analysis and dry matter intake of tested diets:

The chemical composition of the experimental diets is presented in Table (2). The experimental diets had almost similar percentages of DM, CF, CP and ash, which ranged between 92.6- 92.83; 22.70 - 22.81%, 11.465 and 11.76% and 10.13-10.19%, respectively for tested diets.

Table 2. Chemical composition and dry matter intake of experimental diets

Items	Experimental diets	
Chemical analysis of experimental diets (%)	**D1**	**D2**
DM	92.60	92.83
OM	89.81	89.87
CP	11.45	11.76
CF	22.81	22.70
NFE	53.11	52.80
EE	2.44	2.61
Ash	10.19	10.13
Av. Feed intake g/head/day		
Concentrate feed Mixture g/head	621	582
Berseem g/head	527	505
Rice Straw g/head	270	261
Total DM intake g/head	1418	1348

Concerning the dry matter intake (DMI), for the lactating does seems to be similar since there were no significant differences among tested groups in DMI.

Digestion coefficients and nutritive values:

Digestion coefficients and nutritive values of the experimental diets are presented in table (3).

Table 3. Digestion coefficients and nutritive values (mean±S.E) of experimental diets

Items	Experimental diets		±SE
	D1	D2	
Digestion coefficients (%)			
DM	68.88	70.57	1.35
OM	71.83	73.97	1.97
CP	73.81[b]	76.94[a]	2.11
CF	62.63	65.26	2.13
EE	77.12	76.64	1.91
NFE	72.83	74.38	1.82
Nutritive values (%)			
TDN	64.04	66.00	1.72
DCP	7.91[b]	8.76[a]	1.45

a and b: means in the same raw bearing different letters differ significantly at ($P<0.05$)

Results presented in Table (3) revealed insignificant differences among experimental diets respecting digestibility of DM, OM, CF EE and NFE. Digestion coefficient of CP for D2 was significantly ($P<0.05$) higher as compared with control diet (D1). Improved nutrient digestibility of CP in D2 indicate the availability of fermented N, D2 diet, might have resulted in better utilization of the diet (Ferreira, *et al.,* 2002, Beleulu *et al.,* 2010). Concerning the TDN, there were no significant differences between experimental diets, but nutritive value calculated as DCP value, D2 was significantly ($P<0.05$) higher as compared with control diet (D1). These results are in agreement with the findings of Hess *et al.* (2005); Medan *et al.* (2005), Sedje-Assmann *et al.* (2007) and Mohamed *et al.* (2009) who reported higher DCP value when TJC was added to ruminant diets.

Milk yield and composition:

Average daily milk yield and milk composition for lactating does fed the experimental diets are presented in Table (4).

There were no significant differences among the experimental diets in daily milk yield (ADMY), fat corrected milk (FCM) and milk composition (Table 4). These results are in harmony with those found by Hess *et al.* (2005) and Ali *et al.* (2007) who observed that including TJC in dairy animals ration has no adverse effect on milk yield and milk composition.

Table 4. Average daily milk yield and milk composition for lactating does fed the experimental diets

Items	Experimental diets	
	D1	D2
Milk Yield		
Av. Daily milk yield kg/head	0.890	0.865
Av. Daily fat corrected milk kg/head	0.857	0.855
Milk composition		
Protein	2.89	2.93
Fat	3.34	3.42
Total solids	11.54	11.67
lactose	4.60	4.67
S.N.F.	8.20	8.25
Ash	0.70	0.71

No significant differences were recorded between the two treatments at (P<0.05)

Some physiological body parameters:

Rectal temperature, skin temperature and rate of respiration were increased (P<0.05) for D2 compared to D1 (Table 5). Such nutritional changes influence the composition of blood in goats and physiological state of the organism (Abdelatif *et al.,* 2009). The changes of body temperature between D1and D2 are attributed to glucose level in blood that comes from jatropha protein (amino acids). Landau and Molle (1997) reported that in ruminant animals about 35% of glucose requirement can be provided from amino acids; therefore increase in blood protein can be due to an increase in glucose. Also, energy in jatropha may change body temperature. The jatropha contained gross energy of 31.1MJ/kg/ DM (Martı´nez-Herrera *et al.,* 2008) and metabolizable energy of 10.7 MJ kg/DM (Prueksakorn, and Gheewala, 200). 8In the present study, depression of food intake (Table 3) may be attributed to the rise in body temperature. Similar findings were reported by Armenta-Quintana *et al.* (2011) who indicated that body temperature rises and food intake decreases in order to reduce the heat production associated with feeding, digestion absorption and metabolism to prevent an excessive increase in body temperature.

Table 5. Mean ±S.E of physiological body reactions for dairy goats

Items	Experimental dairy goats	
	D1	D2
RT.(^{o} C)	$38.05{\pm}0.46^b$	$40.41{\pm}0.27^a$
ST.(^{o} C)	$34.15{\pm}0.17^b$	$37.48{\pm}0.16^a$
CT.(^{o} C)	$35.37{\pm}0.12^a$	$36.58{\pm}0.10^a$
RR. (rpm)	$31.36{\pm}0.15^b$	$35.23{\pm}0.26^a$
HR. (bpm)	$67.47{\pm}0.19^a$	$68.21{\pm}0.53^a$

a and b: means in the same raw bearing different letters differ significantly at (P<0.05)

Blood measurements:

Blood parameters in Table 6 showed no significant differences in pH, WBC, RBC, Hb, and PCV between D1 and D2 rations.

Table 6. Mean±S.E of blood parameters in experimental dairy goats

Blood parameter	Experimental dairy goats	
	D1	D2
pH	7.33 ± 0.02^a	7.36 ± 0.03^a
WBC. (x10^3/L)	12.08 ± 0.32^a	12.13 ± 0.23^a
RBC. (x10^6/L)	12.96 ± 0.28^a	13.13 ± 0.17^a
PCV. (%)	33.03 ± 0.22^a	33.17 ± 0.10^a
Hb (g/dl)	12.08 ± 0.17^a	12.64 ± 0.14^a
T. protein (g/dl)	6.42 ± 0.10^b	7.22 ± 0.06^a
Albumin (g/dl)	3.02 ± 0.06^b	5.25 ± 0.05^a
BTKB. / mmol.l^{-1}	10.30 ± 0.13^a	10.33 ± 0.14^a
Creatinine mmol/I	90.14 ± 0.17^a	90.25 ± 0.14^a
AP. (U/L)	60.83 ± 0.18^a	60.87 ± 0.23^a
AST. (U/L)	120.68 ± 0.26^a	120.82 ± 0.22^a
GGT. (U/L)	59.81 ± 0.16^a	59.67 ± 0.18^a
LDH. (U/L)	264.16 ± 0.34^a	264.86 ± 0.16^a
Glucose(mg/dl)	52.30 ± 0.23^b	57.47 ± 0.11^a
Cl .(mEq/L)	107.61 ± 0.22^a	107.49 ± 0.14^a
Na (mEq/L)	148.64 ± 0.16^a	148.29 ± 0.13^a
K. (mEq/L)	4.14 ± 0.07^a	4.17 ± 0.08^a
Zn. (µmol.l^{-1})	7.11 ± 0.08^b	11.41 ± 0.09^a
Ca. (µmol.l^{-1})	14.43 ± 0.10^b	18.18 ± 0.09^a
P .(µmol.l^{-1})	0.71 ± 0.03^b	1.97 ± 0.04^a
Mg.(µmol.l^{-1})	0.56 ± 0.01^b	1.93 ± 0.03^a

a and b means in the same raw bearing different letters differ significantly at (P<0.05)

Goats fed jatropha showed significantly higher (P<0.05) total protein, albumin and glucose concentrations than does nourished D1 ration. The highest concentration of total blood proteins may be due to increase synthesis of protein from jatropha when supplemented to ration **(**Harinder *et al.,* 2008). Also, Azza and Ferial (2010) recorded that chemical composition proved that jatropha cakes are a good source of protein (32.88%) and carbohydrates (30.11%) when supplemented to ration instead of soybean. There were no significant differences in blood ketones AP., AST., GGT. and LDH. between the control and experimental groups. However, significant (P<0.05) higher levels of Zn, Cu, P and Mg were found in blood of goats of D2 than D1 goats. The increases in blood mineral concentrations might have occurred due to enhanced minerals in jatropha (Oladele& Oshodi, 2008; Nzikou *et al.,* 2009; Emil *et al.,* 2009 and Kimbonguila *et al.,* 2010).

There were no observed statistically significant differences in pH, WBC., RBC., Hb, and percentage of PCV. between trial groups in this study. This was attributed to that jatropha can provide the food needs of the clipboard operations vital to the dairy goat.

These results are in agreement with the findings of Selje-Assmann *et al.* (2007) who found that seed shell of jatropha after oil extraction by screw press prevents used in animal diets, it has 45–47% lignin and has a high energy value 19.5 MJ/kg. Also, a comparison between the amino acid composition of jatropha meal and soybean are identical (Harinder *et al*., 2009).

Blood biochemical examinations revealed that there were significant ($P<0.05$) reductions for control goats in total protein, albumin and glucose concentrations as compared to jatropha animals. Rich blood biochemical may be due to the utilization proteins by increased synthesis of protein from jatropha when supplemented to ration. Harinder *et al.* (2008) concluded that protein concentrate was 53% when the proteins from the shell- containing were solubilised at pH 11 for 1h at 60◦C. Also, great level of glucose in jatropha goat blood was related to altitude carbohydrates. Azza and Ferial (2010) recorded that chemical composition proved that jatropha cakes are a good source of protein (32.88%) and carbohydrates (30.11%). Although, there was non significant changes in blood ketones, AP, AST, GGT and LDH between control and trail groups in the present study. There was a significant higher ($P<0.05$) concentration of Zn, Cu, P and Mg in blood of goat fed jatropha than control goats. The increase in minerals blood activities might have occurred due to enhance minerals in jatropha (Oladele and Oshodi 2008, Nzikou *et al.,* 2009, Emil *et al.,* 2009 and Kimbonguila *et al.,* 2010). Moreover, Azza and Ferial (2010) recorded that whole seeds are rich in various micro-elements (Mn, Fe, and Zn) which recorded 28.37, 0.38 and 47.13 mg/kg, macro-elements (K, Ca, Na, Mg and P), which recorded 103.13, 34.21, 8.44, 109.89 and 185.17 mg/kg, respectively.

***Estrus detection**:*

Significantly ($P<0.05$) higher estrus onset % was observed for the treated group than control during lactation months (Table 7). The total percentage of animals in heat during lactation months, February, March, April and May, were 33.33, 58.33, 66.67 and 75.00 for D1 ration, but 50.00, 75.00, 83.33 and 91.67 with D2 ration, respectively. The estrus behavior was dependant on blood components such as glucose, total protein, hormones and minerals which activation ovary when offered D2 ration.

Table 7. Estrus incidence rates during lactation months

Lactation months	Estrus incidence rates					
	No D1	No. of estrus	Heating %	No D2	No. of estrus	Heating %
February	12	4	33.33^{b}	12	6	50.00^{a}
March	12	7	58.33^{b}	12	9	75.00^{a}
April	12	8	66.67^{b}	12	10	83.33^{a}
May	12	9	75.00^{b}	12	11	91.67^{a}

a and b letters denote differences between means in the same raw species at $P<0.05$

Rabiee and Lean (2000) explained that glucose have been implicated as a factor affecting ovarian steroidogenesis, follicular dynamics and oocyte development. Also, Khanum *et al.* (2006) reported that glucose caused 63% of the variation in the ovarian rate and it is a major source of energy for the ovary activity. Blood protein increases the gonadotropin realizing hormone (GnRH) secretion and thereby increases circulating gonadotropin levels (LH and FSH) and that in turn increases ovulation rate (Mahmut, 2003; Medan *et al.,* 2005; Kausar *et al.,* 2005; Paredes *et al.,* 2005; Hess *et al.,* 2005; Patton *et al.,* 2007; Shahneh *et al.,* 2008 and Ismaila *et al.,* 2010). Vázquez-Armijo1 *et al.* (2011) suggested that the most common signs of minerals deficiency on the reproductive activity of females and weak or silent estrus which delayed conception.

Pregnancy rate:

The results of the present study show that treatment of jatropha significantly ($P<0.05$) increased pregnancy rate than control group (Table 8). The higher pregnancy rate for jatropha goats could be attributed to the best blood compassion which presented with D2 ration. Blood glucose has a significant effect on several aspects of reproduction including hormone production, fertilization, and early embryonic development (Hess *et. al.,* 2005). Minerals are critical for maintaining goat's pregnancy and necessary to reproductive efficiency and embryo survival (Domínguez-Vara and Huerta-Bravo 2008). Blood protein plays an important role in embryo development and subsequent viability, while decreasing in protein can be either fetal loss or inhibitory offspring development and reducing blastocyst cell number (Sabra and Hassan, 2008, Sonoko *et al.,* 2009 and Belewu *et al.,* 2010).

Table 8. Effects of jatropha cake treatment on pregnancy rate of Zaraibi dairy goats

Goat groups	Number of goats	Pregnancy rate %
D1	12	66.67 (8/12)
D2	12	83.33* (10/12)

*Significantly different from control ($P<0.05$)

Feed conversation and economic efficiency for Experimental diets:

Data of economic efficiency of tested rations is presented in Table 9. Results indicated that does fed D2 which contained jatropha revealed significantly ($P<0.05$) the lowest average total feed cost (147 LE) followed by D1 (180 LE) which contained CFM only.

Table 9. Feed conversation and economic efficiency of lactating does fed experimental diets

Item	Experimental rations	
	D1	D2
Feed conversation		
Kg DM intake /kg FCM	1.660	1.580
Kg TDN intake /kg FCM	1.07	1.04
g DCP intake /kg FCM	1.31	1.38
Economic efficiency		
Total feed cost LE	180	147
Price of milk LE	386	385
Return LE	206	238
Economic efficiency	2.14	2.62
Economic efficiency improvement %	-	18.32

Moreover, it cold be deduced that dairy goats nourished D2 showed the best economic efficiency (2.62) compared to D1 (2.14). Thus including jatropha in D2 to replace 50% of CFM reflects superiority over D1 in its economic efficiency improvement by about 18.32%. The economical evaluation was conducted to determine the return of feeding D2 ration compared to ration based on CFM.

The estimated economic efficiency presented in Table (6) illustrate that TJC substitution in D2 diet, with soybean meal reflected superiority over control diet (D1). Moreover, economical efficiency improved by 22.43 as compared to control diet (D1).

CONCLUSION

It could be concluded that feeding treated jatropha cake (TJC) as 50% of soya bean in the commercial concentrate feed mixture in dairy goat rations had no adverse effects on animal performance, which was reflected on feeding cost and economical efficiency

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تأثير كسب الجاتروفا على كل من إنتاج اللبن، تركيب اللبن، بعض مقاييس الجسم الفسيولوجية وتركيب الدم وحدوث الشبق ومعدل الحمل للماعز الزرايبى

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يهدف هذا البحث الى دراسة تأثير استبدال ٥٠% من كسب فول الصويا بكسب الجاتروفا المعامل بالبكترياعلى انتاج وتركيب اللبن، وكذلك تغيرات الجسم الفسيولوجية،تركيب الدم ، حدوث الشبق ومعدل الحمل مع الماعز الحلابة. ولقد تم اختيار ٢٤ماعز حلابة بصحة جيدة وقسمت الى مجموعتين. مجموعة الضابطة (D1) تم تغذيتها على علف مركز مع برسيم ،بينما غذيت المجموعة المختبرة (D2) على نفس العليقة للمجموعة الضابطة مع استبدال ٥٠% من كسب الفول الصويا بكسب الجاتروفا. وتم دراسة كل من القيم الهضمية والغذائية باستخدام طريقة (تقدير الرماد الغير ذائب) . كذلك تم تقييم مقاييس الجسم الفسيولوجية (درجة حرارة الجلد، درجة حرارة الشعر، معدل التنفس ، معدل النبض بالاضافة الى الى بعض مقاييس الدم، ومعدل حدوث الشبق، ومعدل الحمل.

ودلت نتائج معاملات الهضم على عدم وجود فروق معنوية بين المجموعتين المختبرتين لمعاملات هضم كل من المادة الجافة ، المادة العضوية ، والألياف الخام ومستخلص خالى الأزوت وكذلك القيمة الغذائية محسوبة كمركبات مهضومة كلية. بينما كان كل من معامل هضم البروتين والبروتين المهضوم للمجموعة D2 (المختبرة) أعلى بدرجة معنوية ($P<0.05$) مقارنة بالمجموعة الضابطة. كذلك لم توجد فروق معنوية بين المجموعتين المختبرتين بالنسبة لكل من معدل انتاج اللبن وكذلك تركيب اللبن. وقد دلت النتائج على وجود فروق معنوية فيما يتعلق بكل من معدل التنفس ، درجة حرارة الجلد، ولكن لم توجد فروق معنوية لكل من درجة حرارة الشعر ، معدل النبض. بالنسبة لمقاييس الدم فقد وجد ان الماعز التى غذيت على كسب الجاتروفا حققت قيم أعلى معنوية ($P<0.05$) مقارنة بالمجموعة الضابطة وذلك لكل من البروتن الكلى ، الألبيومين، الجلوكوز، الزنك ، الكالسيوم ،الفوسفور والمغنسيوم. كمــا كان نشاط الشبق ومعدل الحمل للماعز التى غذيت على كسب الجاتروفا أعلى بدرجة معنوية ($P<0.05$) مقارنة بالمجموعة الضابطة.كما أدى ادخال كسب الجاتروفا الى تقليل تكاليف التغذية بمقدار ١١,٨% مقارنة بالمجموعة الضابطة. مما أدى الى زيادة العائد المادى بمقدار ١٨,٢%بالنسبة لمجموعة الجاتروفا. ونستنتج من هذة النتائج أن استبدال كسب فول الصويا بكسب الجاتروفا المعامل ان تأثير مضادات التغذية كان منخفض للغاية. مع تحسن الأداء التناسلى مما سيساعد على تحسين دخل المربين.