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PRODUCTIVE PERFORMANCE, SOME RUMEN PARAMETERS AND BLOOD PROFILE OF ZARAIBI GOATS FED RATIONS SUPPLEMENTED WITH CHUFA TUBERS DURING LATE PREGANNCY AND SUCKLING PERIODS.

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ABSTRACT

This research was conducted to evaluate effects of dietary supplement with Chufa tubers on the productive performance of Egyptian Zaraibi does and their newly born kids as well as some rumen parameters and blood profile. Twenty four pregnant does were divided into four equal groups (G_1, G_2, G_3 and G_4) and fed according to NRC (1981) allowances, where diets contained 0, 5, 10 and 15g Chufa tubers (CT)/h/d, respectively.

The obtained results showed that the highest values of daily feed intake as % of BW and g/kg $W^{0.75}$) during late pregnancy were recorded with G_4 (3.46 and 91.84, respectively) while the lowest value was detected with G_1 (3.24 and 86.16, respectively). The same trend was also observed during the suckling period. In the same time, the daily DM intake as %BW and g/kg$W^{0.75}$ during suckling period were higher than those consumed during the suckling period in all groups.

The daily water consumption noticeably decreased during late pregnancy with increasing the level of Chufa tubers (CT).

The minimum pH values and the maximum total VFA,s values were recorded at 3 hrs post-feeding . The effect of adding CT to pregnant goats rations on ruminal pH values and ammonia-N concentrations were not significant. But, ruminal total VFA's concentrations post-feeding (3 and 6 hrs.) were significantly higher as a result of adding Chufa tubers (CT) to Zaraibi does rations .In the sametime, ruminal VFA's took the reverse trend of ruminal ammonia-N , since they were affected by the physiological status.

Concerning hemato-biochemical parameters, the results indicated that most tested constituents of blood profile were not significantly affected by the tested experimental rations. Moreover, hemoglobin (Hb), red blood cells (RBC's), MCHC, serum total protein, globulin, calcium, phosphorus and magnesium concentrations were significantly decreased during late pregnancy than in suckling period. Whereas, serum enzymes and thyroid hormones took the reverse trend .

The effect of treatment was positive on live body weight of does and their born kids. Daily body gain of kids was improved in G_2 (92.3g), G_3 (93.2g) and G_4 (97.0g) by (7.33, 8.37 and 12.79% , respectively) compared with that of G_1 (86g). The mortality rate of kids decreased (23.1, 15.4, 13.3 and 6.67%) with increasing the level of Chufa tubers (0, 5, 10 and 15 g/h/d) in the four groups (G_1, G_2, G_3 and G_4, respectively). Thus, output measured as kilograms of kids produced per doe per year recorded the lowest value with the control group. Accordingly, the economic efficiency was higher due to using Chufa tubers at levels 5, 10 and 15 g/h/d compared with control one (0 g).

Keywords: Goats, Chufa tubers, rumen, blood, kids, productive performance**.**

INTRODUCTION

The use of medicinal herbs and plants with human is well known since the old civilizations time of ancient Egyptians, Chinese and Greek. Using medicinal herbs and seeds as feed additives to ruminants seem to be a recent global trend (Singh *et al.,* 1993).The use of herbal galactogogues is known to have beneficial effect on milk production (Singh *et al.,* 1991 and Tiwari *et al.,* 1993). It is well known that tubers of *Cyperus esculents* are considered as one of these galactopoietics. In Arabic, *Cyperus esculents L*. is named as Habb el-aziz, Habb el-zalam, Felfel essudan, Soqqait barari and Soqqait. In Egypt it is known as Habb el-aziz while in English, it is named as Earth almond, Edible Cyperus, Rush-nut and Tiger nut. All over the world, it is known under the Spanish name "Chufa " as reported by Watts and Breyer-Branwijk (1962). In the same time, Chufa tubers are not only a galactopoietic but they are also energetic compound. That is because, Chufa tubers contain 26.4% hydrolysable sugars, 7.8% protein, 13.0% crude fiber and 24.0-30.0 % lipid (mainly oleic acid) on DM basis (Gad and Osman, 1961, Ahmed, 1966 and Mokady and Dolev, 1970). Tiger nuts (chufa) have excellent nutritional qualities with a fat composition similar to olives and a rich mineral content especially phosphorous and potassium's. They are also gluten and cholesterol free and have a very low sodium content. But, the oil of the tuber was found to contain 18 % saturated (13.92 palmitic, 0.33 palmitoleic, 4.36 stearic) and 82 % unsaturated (71.76 oleic, 9.2 linoleic and 0.43 ά-linolenic) fatty acids. Each 100g oil contains 18.6 mg the antioxidant vitamin E (Zommara and El-Shaer, 2001) .

Literature on using Chufa tubers as feed additives in feeding pregnant goats during the late pregnancy and suckling periods is scarce . Therefore, the present study was carried to investigate the effect of adding Chufa tubers to pregnant goats rations during late pregnancy and suckling periods and their influences on production performance of Egyptian Zaraibi does and their new born kids and in turn the impact on some metabolic parameters.

MATERIALS AND METHODS

This study was conducted at El-Serw Experimental Research Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt. Twenty four pregnant Zaraibi goats in the 2 nd, 3rd and 4th seasons of lactation, aging 3-6 years and weighing on average 44.9 kg were divided according to body weight, parity and previous milk production into four similar groups, 6 goats each. They were selected from El-Serw Station Herd. The animals were in the late pregnancy period (4th month of pregnancy) and continued for 90 days after kidding (weaning of kids). Animals were weighed at the beginning and thereafter at two-weeks intervals. The animals were fed two weeks as a transitional period on the same rations before the start of the experimental work. The rations were

offered in two equal meals at 8 a.m. and at 3.0 p.m.. Water was available at all times and was measured as average for each group (per ml/h/d).

The four groups were assigned at random to receive the four experimental rations. Animals received diets in groups. Zaraibi does in groups G_1, G_2 ,G_3 and G_4 received daily (0,5 ,10 and 15g Chufa tubers/head, respectively). Feed additives as chufa tubers was mixed with approximately 10g of ground concentrate and spread daily over the concentrate feed mixture. Feeding allowances of protein and energy were calculated according to NRC (1981). The used CFM contained : undecortecated cotton seed meal (23%) , yellow corn (40%) , wheat bran (22%) , soybean meal (8%) , molasses(3.5 %) , limestone (2.0%) , common salt (1.0%) and minerals mixture (0.5%). Samples of feeds were analyzed according to the procedures of A.O.A.C.(1995). The chemical analysis of the feed ingredients consumed by Zaraibi does is shown in Table (1).

Changes of live body weight were recorded individually for the Zaraibi does and their kids every two weeks. Litter size (kids/doe), kidding rate (litter size x 100) and mortality rate also were also calculated.

Economic efficiency was calculated as total output to total input ratio according to the local price during the study (where 1 ton of BH costs 500 LE., ton of BS costs100 LE., 1 ton of CFM costs 1000 LE. and Chufa tubers cost 5 LE./kg, while selling prices of 1 kg live body weight of kid was 20 LE..

Table (1): Chemical analysis of feed ingredients and experimental rations during the late pregnancy and suckling periods.

Feeds	DM%	Chemical composition % on DM basis					
		OM	CF	CP	EE	NFE	Ash
Concentrate feed mixture, CFM	91.3	94.0	15.9	14.1	3.4	60.6	6.0
Berseem hay, BH	89.1	87.7	31.0	11.0	2.3	43.4	12.3
Bean straw, BS	90.5	85.9	38.1	5.3	1.4	41.1	14.1
Chufa tubers , CT	91.5	97.9	9.5	7.2	25.0	56.2	2.1
Chemical composition of experimental rations during late pregnancy							
50.4% CFM + 25.4% BH + 24.2% BS (G1)	90.55	90.45	25.10	11.18	2.63	51.54	9.55
50% CFM + 25.6% BH + 24.4% BS (G2)	90.54	90.41	25.19	11.16	2.63	51.43	9.59
49.5% CFM + 25.6% BH + 24.9% BS (G3)	90.53	90.35	25.30	11.12	2.62	51.31	9.65
48.5% CFM + 25.4% BH + 26.1% BS (G4)	90.49	90.30	25.52	11.01	2.60	51.17	9.70
Chemical composition of experimental rations during suckling period							
50.3% CFM + 25.2% BH + 24.5% BS (G1)	90.56	90.43	25.14	11.16	2.63	51.50	9.57
50.1% CFM + 25% BH + 24.9% BS (G2)	90.59	90.41	25.21	11.13	2.63	51.44	9.59
49.7% CFM + 25.2% BH + 25.1% BS (G3)	90.56	90.38	25.27	11.11	2.62	51.38	9.62
48.8% CFM + 24.8% BH + 26.4% BS (G4)	90.54	90.30	25.51	11.01	2.60	51.18	9.70

DM: Dry matter, OM: Organic matter; CF: Crude fiber; CP: Crude protein; EE: Ether extract and NFE: Nitrogen free extract.

Rumen fluid samples were taken from 3 does of each group during the two experimental periods using stomach tube before feeding (0 time) and at 3 and 6 hour post-feeding. The samples were filtered through 3 layers of gauze and directed immediately to the determination of pH value. The samples were kept for the determination of ammonia nitrogen (NH3-N) concentration according to Conway (1957) method and volatile fatty acids (TVF's) according to the technique described by Warner (1964).

Blood samples were taken once during the last month of pregnancy and first month of lactation from 3 does of each group via the jugular vein just before feeding (0 time). Whole blood was immediately used for hematological estimations, other blood samples were centrifuged at 4000 rpm for 20 minutes, separated serum was used for enzymes and hormone determination while the other part was frozen at-20^{0}C until the other biochemical analysis. Commercial kits were used for all blood measures (table 6) except globulin which was calculated by difference .

Data were statistically analyzed using SAS (2003). The significant differences among means were assigned according to Duncun (1955).

RESULTS AND DISCUSSION

Feed intake :

The effect of dietary supplementation of Chufa tubers (CT) at levels of 5, 10 and 15 g/h daily on average daily feed intake during late pregnancy and suckling periods are presented in Table (2).

Table (2): Daily dry matter intake* (DM) by Zaraibi does during the two experimental periods (late pregnancy and suckling).

Item	Groups			
	G1	G2	G3	G4
Daily DM intake (g/h) during late pregnancy:				
From CFM	**813**	**821**	**829**	**835**
From BH	**410**	**420**	**429**	**437**
From BS	**390**	**401**	**416**	**449**
Total DM intake	**1613**	**1642**	**1674**	**1721**
DM intake, % of BW	**3.24**	**3.31**	**3.38**	**3.46**
DM intake, g/kg w0.75	**86.16**	**87.81**	**89.71**	**91.84**
Roughage: concentrate (R/C) ratio.	**50 : 50**	**50 : 50**	**50 : 50**	**51 : 49**
Daily DM intake (g/h) during suckling period				
From CFM	**863**	**870**	**875**	**884**
From BH	**432**	**434**	**443**	**449**
From BS	**420**	**431**	**442**	**479**
Total DM intake	**1715**	**1735**	**1760**	**1812**
DM intake, % of BW	**4.01**	**4.04**	**4.05**	**4.13**
DM intake, g/kg w0.75	**102.0**	**103.4**	**104.0**	**107.0**
R/C ratio	**50 : 50**	**50 : 50**	**50 : 50**	**51:49**

*** Group feeding**

During late pregnancy period, daily feed intake as BW% and g/kg w 0.75 tended to increase with using CT especially G3 (3.38 and 89.71, respectively) and G4 (3.46 and 91.84, respectively) compared with the control , G1 (3.24 and 86.16, respectively). The same trend was observed also with daily DM intake during suckling period among the tested treatments as shown in Table (2). The highest daily DM intake (BW% and g/kgw0.75) during suckling period was recorded with G4 (4.13 and 107.0, respectively) while the lowest value was detected with G1 (4.01 and 102.0, respectively). Similar results were observed by Shehata et al. (2004) and Maged (2012) with using some medicinal herbs in goats rations during late pregnancy and

lactation periods. Generally, the values of feed intake in this study was approximately . Similar with the obtained values by Ahmed et al. (2008) and Maged (2012). During the two experimental periods (late pregnancy and suckling).

On the other hand, the daily DM intake expressed as BW% and g/kg w 0.75 during suckling period was higher than that consumed during the late pregnancy period in all treatments as shown in Table (2). This may be attributed to the increased rumen size of the animals after parturition and being free of the graved uterus stress on the rumen. It may be also attributed to the higher requirements for milk production during suckling period.(Ahmed et al., 2001 and Shehata et al., 2007a).

The results showed also that the R/C ratio was 50/50 in all groups except G4 during both experimental periods (51/49) and this may be attributed to the effect of higher level of Chufa tubers (15g/ h /day) on daily intake of roughage especially bean straw as shown in Table (2).

Water consumption :

Data of water consumption of Zaraibi does during pregnancy and suckling periods are presented in Table (3). The daily water consumption noticeably decreased with increasing Chufa tubers (CT) level (0, 5 , 10 and 15 g /h /d) in pregnant goats rations being 7.04, 6.10, 5.41 and 4.95 L/h/day, respectively. Also, the decrease in water consumption was noticeable when related to metabolic body size and dry matter intake as well as shown in Table (3). Generally, the daily water consumption ml/g DM intake) during gestation with control ration (G1) was higher by 33.9 % than that with the high level of Chufa tubers (G4) . The same trend was also observed between treatments during the suckling period as shown in Table (3).

Table (3): Daily water consumption by* Zaraibi does during the two experimental periods (late pregnancy and suckling).

Items	Groups			
	G1	G2	G3	G4
During the gestation:				
L/ head / day	7.04	6.10	5.41	4.95
ml / kg BW	142	123	109	99.4
ml / $kgw^{0.75}$	376	326	290	264
ml / g DM intake	4.36	3.71	3.23	2.88
During the suckling period:				
L/ head / day	8.25	7.93	7.25	6.97
ml / kg BW	166	160	146	140
ml / $kgw^{0.75}$	441	424	389	372
ml / g DM intake	4.81	4.57	4.12	3.85

*** Group feeding**

These results are in accordance with those of Zeid (1998) , who indicated that water intake was decreased with addition of some herbs such as chamomile (112.9 ml/ kg w0.82) . Similarly, El-Saadany et al .(2003) found also that drinking water/1 kg milk was noticeably reduced by 36.51 % as a result to using of chamomile in lactating animals rations. Similar results were observed also by Maged (2012) with using of some medicinal herbs in goats rations such as Rosemary . Generally, these results indicate that using

some medicinal herbs such as chamomile and Rosemary (as reported by Zeid, 1998 and El- Saadany et al.,2003 and Maged, 2012) and Chufa tubers (as reported by the present study) in ruminant rations seems more suitable for desert conditions where water resources are somewhat restricted .

Ruminal fermentation parameters :

Table (4) illustrates the data collected for some rumen fermentation parameters of goats under investigation. The minimum pH values and the maximum total VFA's values were recorded 3 hrs post-feeding. The same trend was obtained by Gabr *et al .* (1999), Shehata *et al.* (2006) and Sadek (2011). Moreover, ruminal ammonia-N concentration were greatly higher post-feeding than before-feeding and that maximum values of NH_3-N in the rumen were reached at 3hrs post-feeding then decreased with all dietary treatments. Similar results were observed by Ahmed (1999) and Zeid *et al.* (2009).

Table (4): The effect of experimental rations on some rumen parameters of Zaraibi does during the late pregnancy and suckling periods.

Item		pH			NH_3 (mg/100ml RL)			TVF's (mequ./100ml RL)		
		0	3	6	0	3	6	0	3	6
G1		6.97	6.38	6.55	14.05	23.32	21.07	9.85	10.70^{c}	10.50^{c}
G2		7.05	6.37	6.43	14.08	23.60	20.97	9.82	11.33^{b}	11.27^{ab}
G3		6.92	6.27	6.45	13.50	23.53	20.40	9.83	11.53^{ab}	11.37^{ab}
G4		6.93	6.25	6.42	13.53	22.73	20.17	9.63	11.97^{a}	11.62^{a}
SEM		0.17	0.10	0.11	0.41	0.50	0.40	0.27	0.20	0.29
Sig.		NS	NS	NS	NS	NS	NS	NS	*	*
Pregnancy		7.02	6.37	6.52	13.95	23.61	21.63^{a}	9.68	11.10^{b}	10.66^{b}
Suckling		6.92	6.27	6.41	13.63	22.98	19.67^{b}	9.88	11.67^{a}	11.72^{a}
SEM		0.12	0.07	0.08	0.29	0.35	0.28	0.19	0.14	0.21
Sig.		NS	NS	NS	NS	NS	**	NS	*	*
Pregnancy	G1	7.03	6.47	6.63	14.23	23.50	22.47	9.80	10.37	10.03
	G2	7.10	6.40	6.47	14.10	24.00	21.80	9.67	11.10	10.67
	G3	6.93	6.30	6.50	13.73	23.53	21.27	9.77	11.33	10.83
	G4	7.00	6.30	6.47	13.73	23.40	21.00	9.50	11.60	11.10
Suckling	G1	6.90	6.30	6.47	13.87	23.13	19.67	9.90	11.03	10.97
	G2	7.00	6.33	6.40	14.07	23.20	20.13	9.97	11.57	11.87
	G3	6.90	6.23	6.40	13.27	23.53	19.53	9.90	11.73	11.90
	G4	6.87	6.20	6.37	13.33	22.07	19.33	9.77	12.33	12.13
SEM		0.24	0.15	0.15	0.57	0.71	0.56	0.38	0.28	0.41
Sig		NS	NS	NS	NS	NS	NS	NS	NS	NS

a- c: Means in the same column for each category with different superscripts are significantly different ($P \leq 0.05$)

The effect of the experimental treatments on ammonia-N concentration were not significant at all hours as shown in Table (4). Data show also, that ammonia concentration tended to decrease with the high level of chufa tubers (G_4) compared to G_1 (control) at all hours. The same trend was observed by Mohamed *et al.* (2003) and Maged (2004). They suggested that these results might be attributed to the action of some medicinal herbs as a buffer. Rumen NH_3-N was affected by the physiological phases since it increased in late pregnancy than in suckling period. This is in

agreement with the finding of El-Shaer *et al.* (1982) who found that ruminal ammonia was higher in late pregnancy than early lactation with both does and ewes.

As regard to ruminal total VFA's concentration, it could be noticed that the effect of the experimental treatments on ruminal VFA's concentrations post-feeding were significant as shown in Table (4). Rumen total VFA's concentrations post-feeding (3 and 6 hrs.) were significantly lower with the control group compared with other groups (G_2, G_3 and G_4). The highest values of ruminal VFA's post-feeding were recorded with the high level of CT (G_4) followed by G_3 while the lowest values were detected with the control group (G_1) . Similar results were reported by Ibrahim *et al.* (2007). They reported that Chufa tubers stimulated the proper production of the energy precursers in the rumen and this effect may possibly be related to the high gross energy content of the Chufa tubers.

The decrease in total VFA's during the late pregnancy, may be due to the decrease in daily feed intake per kg $w^{0.75}$ and/or as a response to the physiological (gestation) stress. The same result was observed by Sadek (2011) with Rahmani ewes during late pregnancy and suckling periods. Generally, it seems that ruminal VFA's took the reverse trend of ruminal ammonia-N, since they were affected by the physiological status as shown in Table (4).

Blood parameters:

Hematological parameters:

Data of hematological parameters of does fed different experimental rations during late pregnancy and early lactation periods are presented in Table (5). The results indicated that most hematological parameters tended to decrease during the last pregnancy period then in the suckling period and the differences were only significant in Hb, RBC's and MCHC.

Changes in the values of the erythrogram (RBC'S, Hct and Hb) before parturition may be attributed to the mild stress response as reported by Schalm, (1961), Ahmed (1999) and Sadek (2011) .

The present findings are in agreement with those reported by Hafez *et al.* (1983).They observed that the RBC's, Hb, Hct and WBC's decreased with the advance of pregnancy especially during the last week and thereafter tended to increase after parturition till they approach the values of the control group (non pregnant and non lactation) 6 weeks post-partum. The same authors found that the nutrophils count was significantly higher during pre-partum period than in post-partum period. The same trend was observed by El-Fadly and Radwan (1992) with Hct and Hb . Additionally, Baranowski (1995) mentioned that the values of both Hb concentration and Hct percentage in ewes were affected by physiological stages (pregnancy and lactation) but not by the litter size.

Table (5): The effect of experimental rations on some hematological parameters of Zaraibi does during the late pregnancy and suckling periods.

Item		Hb (g/dl)	Hct (%)	RBC's ($x10^3$/ul)	MCV (Fl)	MCH (pg)	MCHC (%)	WBC's ($x10^3$/ul)	Lympho cyts, (%)	Nutro phils, (%)	Mono cytes, (%)	Platelets ($x10^3$/ul)
G1		10.75	35.47	13.50	20.9	5.8	30.05^{c}	10.28	55.67	37.3	5.92	445
G2		11.00	35.12	13.50	21.3	5.8	30.60^{bc}	10.27	56.33	38.0	5.67	462
G3		11.05	34.50	13.85	19.9	6.2	32.03^{ab}	10.07	57.83	36.2	5.75	467
G4		11.33	34.10	14.07	19.9	6.4	33.27^{a}	10.03	63.12	34.0	4.67	492
SEM		**0.33**	**0.95**	**0.24**	**0.58**	**0.35**	**0.55**	**0.38**	**2.58**	**2.55**	**0.62**	**14.19**
Sig.		**NS**	**NS**	*	**NS**	**NS**	*	**NS**	**NS**	**NS**	**NS**	**NS**
Pregnancy		10.64^{b}	34.75	13.33^{b}	20.4	5.9	30.65^{b}	10.23	57.33	37.6	5.63	455
Suckling		11.43^{a}	34.84	13.96^{a}	20.6	6.1	32.33^{a}	10.10	59.17	35.2	5.38	479
SEM		**0.23**	**0.67**	**0.17**	**0.41**	**0.25**	**0.39**	**0.27**	**1.82**	**1.80**	**0.44**	**10.03**
Sig.		**NS**	**NS**	*	**NS**	**NS**	*	**NS**	**NS**	**NS**	**NS**	**NS**
Pregnancy	**G1**	10.43	35.57	12.97	20.9	5.6	29.37	10.30	54.67	38.3	6.00	434
	G2	10.40	35.20	13.10	21.1	5.7	29.53	10.30	54.33	39.7	6.00	452
	G3	10.73	34.33	13.50	19.9	6.1	31.27	10.17	56.33	37.3	5.83	458
	G4	11.00	33.90	13.73	19.7	6.3	32.43	10.13	64.00	35.0	4.67	475
Suckling	**G1**	10.07	35.37	13.33	20.8	5.9	30.73	10.27	56.67	36.3	5.83	457
	G2	10.60	35.03	13.90	21.4	6.0	31.67	10.23	58.33	36.3	5.33	474
	G3	11.37	34.67	14.20	19.9	6.2	32.80	9.97	59.33	35.0	5.67	477
	G4	11.67	34.30	14.40	20.1	6.4	34.10	9.93	62.33	33.0	4.67	510
SEM		**0.46**	**1.34**	**0.34**	**0.82**	**0.50**	**0.78**	**0.54**	**3.64**	**3.60**	**0.88**	**20.07**
Sig.		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

a, c: Means in the same column for each category with different superscripts are significantly different ($P \leq 0.05$)

Concerning the effect of experimental treatments, the obtained results indicated that the values of most hematological parameters were low with G_1(control) compared with the other groups .The obtained results indicated that the values of RBC's and MCHC were significantly affected by tested experimental treatments as shown in Table (5). The highest value of Hb was recorded with G_4 (11.33) followed by G_3 (11.05) and the lowest values were detected with G_1 (10.75). The same trend was also observed with values of MCH and platelets. As for lymphocytes, G_4 recorded the highest value (63.35%) whereas , the lowest value was recorded with G_1 (55.67%) and the differences were not significant. Moreover, nutrophils and monocytes cells were reduced as a result to addition of Chufa tubers especially in G_3 and G_4 compared with the control group (G_1).

Similar results were observed by Maged (2004) and Shehata *et al.* (2004) with (sheep and goat). In this respect, Abdelhamid *et al.* (2002) observed that adding some medicinal herbs (thyme, safflower, ginger, black cumin and garlic) increased lymphocytes percent in blood liquid and consequently improved immunity of the animals. Moreover, Tawfik *et al.* (2005) reported that some hematological parameters such as Hb, MCHC, and lymphocytes were significantly increased as a result to adding of

chamomile flowers as a medicinal herbs to aflatoxins contaminated diet (AF) and thus, AF induces immune suppression and increased WBC's but adding medicinal herbs (chamomile) overcame this effect and increased lymphocytes percentage. In general, the obtained data indicate that all estimated values for measured parameters were within the normal range as reported by Ahmed *et al.*(2008) and Sadek (2011).

Biochemical parameters :

Data of biochemical parameters of does fed experimental rations during late pregnancy and suckling periods are presented in Table (6) .

During the late pregnancy period, the concentration of creatinine, cholesterol, alkaline phosphates and thyroid hormones of T3 and T4 significantly increased compared with during the suckling periods. The same trend was observed with serum urea-N, triglyceride and activities of serum AST and ALT as shown in Table (6). Whereas, blood glucose as well as serum calcium, phosphorus and magnesium were higher during suckling period compared with late pregnancy period. Similar results given by Ahmed (1999) showed that serum protein, globulin, urea-N, creatinine, uric acid, total lipids, cholesterol and magnesium as well as thyroid hormones (T3 and T4) concentrations were higher during the last month of pregnancy than in the lactation months. The same study reported that activities of serum GOT, GPT, ALP and LDH increased with the advance of pregnancy especially during the last month. Hafez *et al.* (1983) observed that activities of serum GOT, GPT and ALP were higher with the advance of pregnancy especially during the last week with buffaloes. The same authors reported that enzymatic activity (GOT, GPT and ALP) decreased after parturition. The present results indicated that most of the tested blood constituents were not significantly affected by adding Chufa tubers (CT) to Zaraibi does rations. In the same time, the values of total protein tended to increase in animals given the two high level of CT (G_3 and G_4) and the differences were not significant. The highest value of globulin was recorded with G_4 (2.90) followed by G_3 (2.85) then G_2 (2.65) and lastly G_1(2.47) and the differences were significant. Similar results were observed by Tawfik *et al* . (2005) and Maged (2012). Mohamed *et al.* (2003) observed that the supplementation of rosemary showed a significant elevation in alpha 1 and beta 2 globulin. The same authors observed that serum concentrations of total protein , alpha 1, alpha 2, beta 1, beta 2 and gamma 2 globulin were significantly higher as a result to the presence of chamomile flowers (500mg/kg LBW/d) in ewes rations.

The present study also indicated that serum urea-N and creatinine were lower with using of Chufa tubers in goats rations and the differences were significant for serum creatinine. The same trend was observed also with serum cholesterol and triglyceride concentrations. The obtained results indicated that the activities of enzymes (AST, ALT and ALP) were reduced with using the three tested levels of Chufa tubers (5, 10 and 15 g/h/d) than the control group and the differences were significant in ALP only.

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The effect of experimental rations on concentration of thyroid hormones T3 and T4 were not significant as shown in Table (6). Whereas, the effect of tested rations on serum phosphorus were significant. Similar results were observed by Shehata *et al.* (2004) and Priolo *et al.* (2007) with lactating does and ewes, respectively. Mohamed *et al.* (2003) found that serum alkaline phosphates activity significantly decreased in rosemary supplemented ewes as compared with the control. Finally, Maged (2012) reported that serum protein and globulin concentrations improved while, the concentration of cholesterol and the activity of ALP and ALT were reduced as a result of adding some medicinal herbs on goat rations.

Generally, the obtained data showed that most serum parameters were slightly differed among the test groups, though some differences were significant but, all values within the normal range as reported by Kaneko (1989), Maged (2004) Sadek (2011) and Ahmed *et al.* (2012) with both goats and sheep.

Body weight changes of does :

Table (7) presents changes in live body weight (LBW) of Zaraibi goats during late pregnancy and suckling periods. There were no significant ($P \geq 0.05$) differences among treatments for does at any interval. The main initial LBW (at the 4^{th} month of gestation) was approximately equal in all groups and ranged from 44.50 to 45.50 kg. The LBW of does increased to the maximum before parturition and recorded the highest values (ranged from 53.9 to 55.0 kg) then sharply decreased (post-parturition) to the minimum at day 90^{th} (weaning) in all groups (45.3-46.1kg). The same trend was observed by Ahmed *et al.* (2012) with Zaraibi does during the late pregnancy and lactation periods. Devendra (1979) recorded a decline in body weight of high milk yielding goat during the first month post-partum .

In another study on Zaraibi does during late pregnancy and lactation periods, Shehata et al (2007_a) observed that the LBW of does increased to the maximum before parturition (end of pregnancy) and recorded the highest values (ranges from 55.7 to 58.8 kg) then sharply decreased post- parturition to the minimum in suckling period, thereafter it tended to increase again (but very slowly) within all groups during the lactation period. Similar results were observed also by El-Shinnawy *et al.* (2010) with Rahmani ewes during the late pregnancy and suckling periods.

Concerning the effect of the treatments, the obtained results indicated that LBW tended to increase by medicinal herbs (Chufa tubers), especially with G_4 (55.0 kg) during the last month of pregnancy compared with G_1 (53.9 kg). The same trend was reported by Maged (2012). The average of LBW before parturition were 53.9, 54.2, 54.5 and 55.0 kg and the corresponding values at weaning (90^{th} days) were 41.6, 41.9, 42.8 and 43.3 kg for G_1, G_2, G_3 and G_4, respectively. Generally, LBW tended to increase as a result to adding some medicinal herbs (chamomile and thyme) in Zaraibi doe rations (Zeid and Ahmed, 2004). They found that the averages of LBW before parturition were 57.2, 58.7, and 58.3 kg and the corresponding values at weaning were 36.8, 38.2 and 37.5 kg , whereas at the day 270^{th} (9 month) were 37.9, 39.7 and 38.9kg for control, chamomile and thyme, respectively.

However, considerable improvements in daily weight gain , feed conversion ratio and feed intake were obtained when phytogenics were included in the feed of different species of farm animals (Steiner, 2010 and Maged 2012).

Table (7): Live body weight changes of Zaraibi does during late pregnancy and suckling periods.

Days	Groups			
	G1	G2	G3	G4
Initial weight (at 90 days of pregnancy)	45.5	45.1	44.5	44.5
At 120 days of pregnancy	48.7	48.9	48.5	49.1
At 150 days of pregnancy (last mounth of pregnancy)	53.9	54.2	54.5	55.0
Weight at kidding	45.3	45.4	46.0	46.1
Weight at 30 days post kidding	43.9	44.0	44.1	44.4
Weight at 60 days post kidding	42.7	43.1	43.7	43.9
Weight at 90 days post kidding at (weaning)	41.6	41.9	42.8	43.3
Weight at 90 days as % of weight at kidding	91.8	92.3	93.0	94.0

- No significant differences were recorded among groups for all intervals.

Productive performance :

Data of the productive performance of Zaraibi does fed on the tested experimental rations are summarized in Tables (8 and 9). The results indicated that using the three levels of Chufa tubers (CT) as additives in goat rations had no adverse effect on doe performance during the late pregnancy period . No abortion cases happened during the late eight weeks of pregnancy . The obtained data showed that the still birth cases were noticeably higher in G_1 (33.3 %) compared with the other groups. These results are in accordance with those of Shehata *et al*. (2007_b), who reported that the still birth cases were lower as a result to using chamomile flowers in goat rations during the late pregnancy period. The same authors found that the percentage of still birth cases were reduced (30, 23 and 20 %) with increasing chamomile levels (0, 5 and 10 g/100 kg BW/d, respectively) in pregnant goats rations .

Table (8): Body weight changes of born Zaraibi kids as affected by the experimental rations.

Item	Groups			
	G1	G2	G3	G4
At 0 days (at birth)	1.60 ± 0.09^{b}	1.68 ± 0.10^{ab}	1.76 ± 0.09^{ab}	1.90 ± 0.10^{a}
At 15 days	3.14±0.16	3.43±0.18	3.53±0.15	3.65±0.20
At 30 days	4.37 ± 0.22^{b}	4.78 ± 0.22^{ab}	4.88 ± 0.20^{ab}	5.16 ± 0.23^{a}
At 45 days	5.75 ± 0.23^{b}	6.15 ± 0.29^{ab}	6.18 ± 0.24^{ab}	6.66 ± 0.31^{a}
At 60 days	7.23±0.20	7.62±0.21	7.72±0.23	7.90±0.35
At 75 days	8.33 ± 0.23^{b}	8.86 ± 0.24^{ab}	8.98 ± 0.27^{ab}	9.39 ± 0.40^{a}
At 90 days (at weaning)	9.34 ± 0.27^{b}	9.99 ± 0.26^{ab}	10.15 ± 0.33^{ab}	10.63 ± 0.48^{a}

a, b: Means in the same row with different superscripts are significantly different at $P \leq 0.05$.

From data in Table (9), it seems that incidence of twins parturition was high in Zaraibi does , hence , the kidding rate or litter size was high too. Litter size from 2.33 to 2.67 without more ked differences among treatments . Moreover, kidding rates were 233, 250 and 267 in CT groups (G_2 , G_3 and G_4 , respectively) versus 250 in control group. Similar values for litter size of Zaraibi does were obtained by Mousa (1996) and Ahmed (1999) while Maged (2012) found that it ranged from 2.33 to 3.0 with goats fed on some medicinal herbs.

Table (9): The effect of experimental treatments on productive performance of Zaraibi does.

Item	Groups			
	G1	G2	G3	G4
No. of does	6	6	6	6
Single kidding No.	1	1	1	1
Twins kidding No.	1	2	1	1
Triple kidding No.	4	3	4	3
Quadruplets kidding No.	0	0	0	0
Born kids	15	14	15	16
Still birth cases	2	1	0	1
Alive kids at 0 days	13	13	15	15
Alive kids at 15 days	12	13	14	15
Alive kids at 30 days	12	12	14	14
Alive kids at 45 days	11	12	14	14
Alive kids at 60 days	10	11	13	14
Alive kids at 90 days	10	11	13	14
Litter size	2.50	2.33	2.50	2.67
Kidding rate,%	250	233	250	267
Average birth weight, kg	1.60 ± 0.09^{b}	1.68 ± 0.10^{ab}	1.76 ± 0.09^{ab}	1.90 ± 0.10^{a}
Average weaning weight, kg	9.34 ± 0.27^{b}	9.99 ± 0.26^{ab}	10.15 ± 0.33^{ab}	10.63 ± 0.48^{a}
Daily body gain, kg	86.0 ± 4.41^{b}	92.3 ± 1.87^{ab}	93.2 ± 2.51^{ab}	97 ± 2.48^{a}
Kg kids born/doe	3.47±0.28	3.65±0.39	4.4±0.60	4.75±0.45
Kg kids weaned/doe	15.57 ± 1.93^{b}	18.32 ± 1.67^{ab}	22 ± 2.94^{ab}	24.80 ± 2.56^{a}
Mortality of kids, No.	3	2	2	1
Mortality of kids,%	23.10	15.40	13.30	6.67
Economic efficiency	1.77	2.02	2.35	2.56

a, b: Means in the same row with different superscripts are significantly different at ($P \leq 0.05$)

The present study indicated that does given CT in the experimental treatments during the last two months of pregnancy gave born kids with heavier weights at the birth and weaning then those fed control group (non - supplemented, G_1) and the highest values were recorded with G_4 (1.90 and 10.63 kg, respectively) and the lowest values were detected with G_1 (1.60 and 9.34 kg, respectively) and the differences were significant as shown in Table (9) .

Accordingly, output measured as kilograms produced per doe was better with G_4, followed by G_3 then G_2 and – lastly the control group. These positive effects may be attributed to the effect of the used Chufa tuber (CT) on average body gain at birth and weaning as reported by Shehata et al (2007_b) . They stated that output measured as kilograms produced per doe

per year improved significantly due to chamomile supplement. Similar results were observed by Maged (2012) with using some other medicinal herbs in goat rations during late pregnancy and suckling periods .

As for mortality cases of born kids, the obtained data indicated that the mortality cases decreased (3 , 2 , 2 and 1 case) with increasing CT levels (0, 5, 10 and 15 g /h/d) in goats rations as shown in Table (9) . Thus, the percentage of mortality recorded the highest values in control group (23.1 %) then G_2 (15.4 %) followed by G_3 (13.3%) whereas mortality rate was 6.67 % in G_4. Similar results were observed by El-Hosseiny *et al.* (2000) who observed that using medicinal herbs such as chamomile flowers in doe diets reduced mortality rate of born kids to zero during the suckling period compared with rate of 6.67 to 13.33 % for other medicinal herbs. Similarly, Shehata *et al.* (2007_b) observed that the mortality rate was markedly decreased with increasing chamomile levels (0, 5, and 10 g/100 kg BW/d) in goats rations. They observed that the incidence of diarrhea and bloat in born kids during suckling period were noticeably reduced with chamomile supplement and more decreased with increasing chamomile concentration. In this connection, Chufa is regarded as digestive, tonic, effective against flatulence and aphrodisiac, and so it is given for flatulence, indigestion, colic, diarrhea, dysentery, debility and excessive thirst (Chevallier, 1996).

Accordingly, the economic efficiency was noticeably higher (1.77, 2.02, 2.35, 2.56%) with increasing Chufa tubers levels (0, 5, 10 and 15 g/h/d) in does rations (G1, G2, G3and G4, respectively). Similar results were observed by Zeid and Ahmed (2004) and Ibrahim et al. (2007) with using of medicinal herbs in small ruminant rations. Generally, although some medicinal herbs such as chamomile showed the highest feed cost, yet , it also showed the highest economic return compared with control (Shehata et al. 2007_b) . The same authors found that the economic return was improved by about 17 and 29% with both chamomile (5 and 10 g/100kg BW/d, respectively) compared with non-supplemented control.

CONCLUSION

It could be concluded that using Chufa tubers in Zaraibi does rations during late pregnancy and suckling periods had a positive role in improving daily DM intake , some metabolic parameters and performance, without any adverse effect on blood profile or general health. This improvement was reflected on born kids performance and production of robust kids at weaning and consequently reducing mortality rate for born kids. Accordingly, output measured as kilograms kids produced per doe per year was improved due to the treatments. This had a good economic return on the herd of Zaraibi goats.

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الأداء الإنتاجي وقياسات سائل الكرش وصورة الدم للماعز الزرايبي المغذاة علي علائق مضاف لها حب العزيز أثناء فترتي الحمل المتأخر والرضاعة .

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هدف هذا العمل البحثي إلى دراسة تأثير إضافة درنات حب العزيز فى العلائق علي الأداء الإنتاجي لأمهات الماعز الزرايبي وجدائها المولودة بالإضافة لإجراء بعض قياسات سائل الكرش وصورة الدم أثناء فترتي التجربة (الحمل المتأخر والرضاعة) ولتحقيق هذا الهدف البحثي تم استخدام 24 عنزة زرايبي مع بداية الشهر الرابع من الحمل ، قسمت إلي 4 مجموعات متساوية (مج 1، مج2 ، مج3 ، مج4) وغذيت تبعا لمقررات NRC لعام 1981 مع إضافة صفر ، 5 ، 10 ، 15 جم من درنات حب العزيز لكل عنزة يوميا للمجموعات الأربع بالتوالي .

وقد أظهرت النتائج زيادة في المأكول اليومي منسوبا إلي الوزن و حيز الجسم التمثيلي حيث سجلت أعلى قيمة مع مج 4 (3.46 ، 91.84 علي التوالي) في حين كانت أقل قيمة مع مج 1 (3.24 ، 86.16 علي التوالي) وذلك أثناء فترة الحمل المتأخر وكانت نتائج المأكول اليومي أثناء فترة الرضاعة في نفس اتجاه فترة الحمل المتأخر تأثرا بالمعاملة . سجلت النتائج أيضا انخفاض في المأكول اليومي من المادة الجافة أثناء الحمل المتأخر مقارنة بمرحلة الرضاعة، أما فيما يتعلق بتأثير المعاملة علي الماء المستهلك فقد سجلت النتائج انخفاضا ملحوظا في كمية الماء المستهلك مع زيادة مستوي حب العزيز في العلائق خاصة أثناء فترة الحمل .

لوحظ بالنسبة لقياسات سائل الكرش أن تركيز الأحماض الدهنية الطيارة قد ارتفع لأعلي قيمة مع القيمة الأدنى لـpH وذلك أثناء الساعة الثالثة بعد الأكل ، أما عن تأثير المعاملة فقد سجلت بعض التأثيرات علي تركيز آمونيا الكرش وقيمة الpH لكنها كانت غير معنوية في حين كان تأثير المعاملة علي تركيز الأحماض الدهنية الطيارة واضحا ومعنويا وذلك لأن درنات حب العزيز مصدر عالي للطاقة .وفي نفس الوقت تأثرت قياسات سائل الكرش بالحالة الفسيولوجية للماعز (حمل أو رضاعة) ، فقد لوحظ انخفاضا ملحوظا في تركيز الأحماض الدهنية الطيارة أثناء فترة الحمل مقارنة بفترة الرضاعة في حين كان تركيز آمونيا سائل الكرش عكس ذلك.

فيما يتعلق بصورة الدم فقد أظهرت النتائج أن معظم القياسات لم تتأثر معنويا نتيجة لاستخدام العلائق المختبرة في حين اتضح أن بعض القياسات مثل : الهيموجلوبين ، كرات الدم الحمراء ومتوسط تركيز هيموجلوبين الخلية والبروتين الكلي والكالسيوم والفوسفور والمغنسيوم قد انخفضت معنويا أثناء فترة الحمل مقارنة بفترة الرضاعة وعلي عكس ذلك ارتفع تركيز الإنزيمات وهرمونات الدرقية أثناء فترة الحمل مقارنة بفترة الرضاعة .

فيما يتعلق بأداء الأمهات وجدائها فقد لوحظت نتائج ايجابية علي الأداء الإنتاجي للأمهات وجدائها المولودة فقد ارتفع معدل النمو اليومي للمواليد (86 ، 92.3، 93.2 ، 97 جم) مع زيادة مستوي المعاملة (صفر ، 5 ، 10 ، 15 جم) في العلائق (مج1 ، مج2،

مج 3 ، مج4 ،علي التوالي) مسجلة تحسين قدره 7.36 ، 8.40 ، 12.79 % في المعاملات الثلاثة (مج2 ، مج3 ، مج 4، علي التوالي) مقارنة بـ مج1 ، في حين سجل معدل النفوق انخفاضا ملحوظا مع استخدام المعاملة (15.4 ، 13.3 ، 6.67 %) في مج2 ، مج 3 ، مج 4 علي التوالي مقابل 23.1 % في مجموعة المقارنة وبالتالي حدث تحسن في عدد الكيلو جرامات المفطومة لكل أم مع استخدام المعاملة وقد سجلت أعلي قيمة مع مج 4 في حين كانت أقل قيمة في مج1 والاختلافات كانت معنوية ، مما انعكس ذلك علي تحسين الكفاءة الاقتصادية لكل من مج2 ، مج3 ، مج4 مقارنة بـ مج1 .

من هذه الدراسة نلاحظ أن إضافة درنات حب العزيز في علائق الماعز الزرايبي أثناء الفترة الأخيرة من الحمل وفترة الرضاعة له تأثير إيجابي علي المأكول اليومي من المادة الجافة وتركيز الأحماض الدهنية الطيارة بالكرش وأداء الأمهات بدون أي تأثير عكسي علي التمثيل الغذائي الحيوان ، وقد انعكس ذلك علي تحسين أداء الولادات ، وانخفاض نفوقها ، وبالتالي تحسين واضح في إنتاجية الأمهات متمثلا في عدد الكيلو جرامات المفطومة لكل أم سنويا ، مما يحقق منفعة اقتصادية في قطعان الماعز الزرايبي.

قام بتحكيم البحث

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Table (6): The effect of experimental rations on some biochemical blood parameters of Zaraibi does during the late pregnancy and suckling periods.

Item		T.protei, g/ dl	Albumin, g/ dl	Globulin, g/ dl	Creatinine, mg/ dl	Urea-N, mlg/ dl	Cholesterol, ml/ dl	Triglyceride, m/ dl	AST, u/l	ALT, u/l	ALP, u/l	T3 ng/ml	T4 ng/ml	Glucose, ml/ dl	Calcium, ml/ dl	Phosphorus, ml/ dl	Magnesium ml/ dl
G1		6.17	3.70	2.47^{b}	0.95^{a}	16.82	92.33	49.17	76.17	23.00	123.50^{a}	119.17	6.78	58.00	9.55	4.27^{b}	2.53
G2		6.12	3.47	2.65^{ab}	0.93^{ab}	16.82	91.50	48.33	72.00	20.83	115.50^{b}	123.17	6.70	57.83	9.42	4.40^{b}	2.77
G3		6.33	3.48	2.85^{a}	0.83^{ab}	15.70	89.83	46.50	69.67	20.83	112.17^{b}	119.67	6.63	56.83	9.65	4.65^{ab}	2.70
G4		6.43	3.55	2.90^{a}	0.77^{b}	15.85	90.83	47.00	69.83	20.67	109.67^{b}	127.33	6.63	58.83	9.75	5.00^{a}	2.65
SEM		**0.15**	**0.13**	**0.10**	**0.05**	**0.41**	**2.58**	**2.58**	**3.50**	**1.46**	**2.45**	**7.06**	**0.47**	**3.92**	**0.33**	**0.15**	**0.16**
Sig.		**NS**	**NS**	*	*	**NS**	**NS**	**NS**	**NS**	**NS**	*	**NS**	**NS**	**NS**	**NS**	*	**NS**
Pregnancy		6.08^{b}	3.39	2.60^{b}	0.96^{a}	16.54	96.67^{a}	49.92	72.25	21.58	122.75^{a}	159.92^{a}	7.42^{a}	55.58	9.15^{b}	4.25^{b}	2.20^{b}
Suckling		6.45^{a}	3.62	2.83^{a}	0.78^{b}	16.05	85.58^{b}	45.58	71.58	21.08	107.67^{b}	84.75^{b}	5.96^{b}	60.17	10.03^{a}	4.91^{a}	3.13^{a}
SEM		**0.11**	**0.09**	**0.07**	**0.04**	**0.29**	**1.83**	**1.82**	**2.48**	**1.03**	**1.73**	**5.00**	**0.33**	**2.77**	**0.24**	**0.10**	**0.12**
Sig.		*	**NS**	*	*	**NS**	**	**NS**	**NS**	**NS**	**	**	*	**NS**	*	**	**
Pregnancy	**G1**	5.93	3.57	2.37	1.03	17.07	98.00	51.33	77.33	23.67	132.00	157.00	7.77	59.67	9.07	4.00	2.13
	G2	5.90	3.40	2.50	1.00	17.00	97.00	50.67	72.67	21.00	122.67	159.67	7.30	54.33	9.03	4.10	2.30
	G3	6.10	3.37	2.73	0.93	16.00	95.00	48.00	69.00	21.33	119.33	157.67	7.20	53.67	9.20	4.33	2.20
	G4	6.37	3.23	2.80	0.87	16.10	96.67	49.67	70.00	20.33	117.00	165.33	7.40	54.67	9.30	4.57	2.17
Suckling	**G1**	6.40	3.83	2.57	0.87	16.57	86.67	47.00	75.00	22.33	115.00	81.33	5.80	56.33	10.03	4.53	2.93
	G2	6.33	3.53	2.80	0.87	16.63	86.00	46.00	71.33	20.67	108.33	86.67	6.10	61.33	9.80	4.70	3.23
	G3	6.57	3.60	2.97	0.73	15.40	84.67	45.00	70.33	20.33	105.00	81.67	6.07	60.00	10.10	4.97	3.20
	G4	6.50	3.50	3.00	0.67	15.60	85.00	44.33	69.67	21.00	102.33	89.33	5.87	63.00	10.20	5.43	3.13
SEM		**0.22**	**0.19**	**0.14**	**0.08**	**0.58**	**3.65**	**3.65**	**4.96**	**2.06**	**3.46**	**9.99**	**0.66**	**5.55**	**0.47**	**0.21**	**0.23**
Sig.		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

a, b: Means in the same column for each category with different superscripts are significantly different ($P \leq 0.05$)