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Some Factors Affecting Production and Composition of Milk in Giza White Rabbits

G.A.R. Kamar, A.M. El-Borady, M.A.M. Kicka, S.A. Riad, S.M.T. El-Tantawy and F.A.A. Ibrahim

Animal Production Department, Faculty of Agriculture, Cairo University, Egypt.

A NUMBER of 21 does of the Giza white rabbits in the second parity were used to evaluate production and composition of milk. The peak of milk production was reached at the end of the third week of lactation. Weekly milk yield increased in does injected daily with 0.5 IU oxytocin, while it decreased in those injected daily with a greater dose of oxytocin (2.5 IU).

Six youngs per dose were the best number to ensure regularly complete milking. Does weighed between 2.7 to 2.9 kg produced the highest milk yield. Adding seeds of trigonella to the does feed showed not only lactogenic effect but also an increase in fat and total solids percentages. There are negative relation between the milk yield and its component of fat, protein, and total solids.

In rabbits, dose lactate for a period of six to eight weeks depending upon many factors. Abu-El-Ezz *et al.* (1981) reported that female rabbits in their second and third parity produced more milk per lactation than those in the first parity, while no significant differences were found between milk yield in the second and third parity. Lukefahr *et al.* (1981) obtained a correlation coefficient of 0.96 between litter size and milk yield at 21 days of lactation. Cowie (1969) and Abu-El-Ezz *et al.* (1981) reported that the doe body weight at parturition was positively correlated with lactation performance. Ghoneim (1964) stated that adding seeds of trigonella to the does ration promoted lactation in nursing mothers.

Few studies were carried out concerning milk composition in rabbits. Cowie (1969) found that rabbit's milk contains 15-17% fat, 11% protein and 1.8-2.0% lactose in the first three weeks of lactation. These values were 25-30%, 18-20% and 0.5% respectively during the period from 3-6 weeks of lactation.

The present study aimed to evaluate production and composition of milk in Giza rabbits.

Material and Methods

This work was carried out in the Poultry Research Center. Animal Production Department, Faculty of Agriculture, Cairo University, during the period from December 1983 to April 1984. A number of 21 does of Giza white rabbits in the second parity were used in two experiments. One for evaluating milk yield and the other for milk composition.

In the first experiment, 17 does were used to determinate the effect of oxytocin administration, doe feeding, doe weight and litter size during the suckling period on milk yield.

On the first day after pregnancy, the does were divided at random into two groups according to the feeding treatment. The does in group one were fed a concentrated ration and used as control. Does in group two were fed a diet containing the concentrated ration with adding 4% ground seeds of trigonella. The concentrated ration contained 20% crude protein and 2600 k. cal. ME.

Each group was divided to three sub-groups according to the hormonal dosage. The first sub-group was injected with a saline solution as the hormonal dosage and kept as control. The second and the third sub-groups were intramuscularly injected from the *2nd* day to the 51*st* day of lactation with oxytocin 0.5 IU/day and 2.5 IU/day respectively.

On the first day after parturition the youngs were removed from mothers which were allowed to suckle their youngs only one time daily according to Zarrow *et al.* (1965). Before nursing, mothers were weighed and intramuscularly injected by oxytocin. They were placed in the nesting boxes and their youngs were allowed to suckle them. The youngs of each mother were weighed daily in the period from the *2nd* to the 51*st* day of lactation before and after suckling which extended till emptying the mammary glands in 5-15 min.

The youngs were entirely dependent on their mother's milk through the first 28 days. After that they were given supplementary food and water but not in quantities that would blunt their eagerness to suckle.

In the second experiment, four does were used to study the effect of adding ground seeds to trigonella to the ration on the chemical composition of milk. On the first day after pregnancy, the does were divided at random into two equal groups according to feeding treatment. The does in group one were fed the concentrated ration and used as control. Does in group two were fed diet containing the concentrated ration with adding 4% ground seeds of trigonella.

The collection of milk was stated at the second day of suckling. Before nursing, the doe was intramuscularly injected with 2.5 IU oxytocin according to Coates *et al.* (1964). By rently massaging the mammary gland, milk was ejected and samples were collected for chemical analysis. The amount obtained was about 15-20 gm/doe. Sample of milk was collected once weekly/doe till 51*st* day of lactation. Eight samples were obtained from each doe through the lactation period. Chemical analysis of the milk collected was carried out according to the A.O.A.C. (1960). The chemical analysis comprised total solids, protein, fat, lactose and ash.

Statistical analysis contained the least squares method of Harvey (1960) and the Duncan multiple range test (1955).

Results and Discussion

I. *Milk Yield*

The mean values of weekly milk yield/doe are presented in Table 1. It is clear that the average of milk yield reaches its maximum after three weeks from delivery while it declines gradually from the 4*th* to the 7*th* weeks of lactation. In respect of increasing milk yield the result obtained is in agreement with that reported by Cross (1955), Donevan and Bosch (1957) and Cowie (1969).

In the present study (Table 1) the milk yield during the third week (1276.8 gm) was intermediate between those reported in the literature. Cowie (1969) and Cross (1955) reported higher values (1890 gm and 1575 gm respectively), while Donovan and Bosch (1957) recorded a lower value (840 gm).

TABLE 1. Least squares means and standard errors of weekly yield / doe (gm) of Giza white rabbits affected by oxytocin, does feeding and does weight.

Treatment	No doe	Milk Yield per Doe per week							
		1st	2nd	3rd	4th	5th	6th	7th	Total
Milk yield / doe		639.2 ± 9.5	1071.8 ± 16.4	1276.8 ± 35.5	1012.0 ± 40.1	725.1 ±22.1	570.0 ±18.5	501.4 ±16.1	5796.3 ±107.9
Oxytocin dose:									
0.0 IU	8	638.1 ±16.1 b	978.0 ± 27.7 b	1059.3 ± 60.1 b	897.1 ± 68.0 b	643.0 ±37.5 b	538.2 ±31.4 b	452.9 ±27.2 b	5216.6 ±183.0 b
0.5 IU	5	738.2 ±37.4 a	1172.6 ± 64.5 a	1610.5 ±139.8 a	1325.7 ±158.0 a	920.8 ±87.2 a	655.8 ±72.8 a	618.2 ±63.3 a	7041.8 ±425.4 a
2.5 IU	4	541.3 ±35.4 b	1064.8 ± 61.1 b	1150.5 ±132.4 b	817.9 ±143.6 b	611.4 ±32.6 b	515.9 ±69.0 b	433.2 ±59.9 b	5135.0 ±402.8 b
Does feeding:									
Control	8	555.8 ±23.1 b	1068.8 ± 39.9 a	1209.7 ± 86.5 b	915.4 ± 97.8 b	664.1 ±53.2 b	524.6 ±45.1 b	447.1 ±39.2 b	5385.5 ±263.1 b
Cont.+trigonella	9	722.5 ±19.8 a	1074.4 ± 34.2 a	1343.8 ± 74.2 a	1108.6 ± 83.8 a	786.0 ±46.3 a	615.4 ±38.7 a	555.8 ±33.6 a	6206.5 ±225.1 a
Does weight:									
2.4- 2.6 kg	5	513.0 ±40.1 c	980.0 ± 69.1 c	956.4 ±149.9 c	670.0 ±169.5 d	519.8 ±93.5 c	484.8 ±78.6 c	426.1 ±67.9 c	4550.1 ±456.2 d
2.7- 2.9 kg	3	975.9 ±58.4 a	1280.5 ±100.7 a	1641.7 ±218.3 a	1405.5 ±246.8 a	899.5 ±136.2 a	680.8 ±131.9 a	644.1 ±98.8 a	7528.0 ±664.3 a
3.0- 3.2 kg	5	675.8 ±38.1 b	1083.5 ± 65.8 b	1452.7 ±142.6 b	1121.4 ±161.2 b	830.1 ±88.9 a	591.1 ±74.4 ab	534.2 ±64.6 b	6288.8 ±433.9 b
3.3 or more	4	392.0 ±47.0 d	943.2 ± 81.2 c	1056.1 ±176.0 c	851.1 ±198.9 c	650.9 ±109.8 b	523.9 ±91.8 bc	401.3 ±79.6 c	4818.5 ±535.4 c

Means followed by different letters differ significantly from each other ($P \leq 0.05$).

The total milk yield/doe in the first six weeks after parturition was 5294.9 gm (Table 1). This value was also intermediate between those reported by Cowie (1969), who found that the total milk yield/doe of New Zealand White and Dutch rabbits in the first six weeks after parturition was 6940 and 3820 gm respectively.

In this study there were four major factors affecting milk yield; oxytocin administration, doe feeding, doe weight and litter size during the suckling period.

a. *Oxytocin administration*

It is evident from Table 1 that the weekly milk yield per doe increased significantly in the group injected with 0.5 IU oxytocin daily more than in the group injected with 2.5 IU oxytocin daily and the control group. However, the dose 2.5 IU oxytocin daily caused a slight decrease (82 gm) in the total milk yield in the first seven weeks after parturition than the control group (Table 1).

It can be concluded that injecting does 0.5 IU oxytocin daily improved milk yield in all stages of lactation. Similar results was obtained by Cowie (1969) on New Zealand white rabbits.

On the other hand, injecting does with a greater dose of oxytocin (2.5 IU) daily caused disturbance and decrease of the milk yield. Donker *et al.* (1954) concluded that exogenous oxytocin may depress milk yield by interfering with the release of endogenous oxytocin resulting in incomplete milking. Accordingly it can be suggested that suckling stimulus is less effective as a glactopiotic factor when exogenous oxytocin is administered before milking, although this is still to be explored.

b. *Type of doe feeding*

It could be observed from Table 1 that the weekly milk yield/doe was higher significantly in the group fed control ration with adding trigonella than in the group fed control ration only. This indicates that adding seeds of trigonella to the normal ration promote lactation in nursing mothers. Similar results were obtained on diary cattle by El-Ridi and El-Shahat (1944) and Ghoneim (1964).

The lactogenic factor, which helps in metabolic chemical processes of mammary glands, residues in the fat of the trigonella seeds (Ghoneim, 1964) and more specifically in the fixed oil or the unsaponifiable fraction (El-Ridi and El-Shahat, 1944).

c. *Doe weight at parturition*

Data in Table 1 shows that the average yield of milk was the highest in does with weight from 2.7 to 2.9 kg followed by those from 3.0 to 3.2 kg, from 3.3 kg or more and from 2.4 to 2.6 kg. Thus, the differences in the levels of lactation between does would appear to be related simply to their body weight. These results are in agreement with those reported by Cowie (1969) and Abu-El-Ezz *et al.* (1981).

d. *Litter size*

It could be observed from Table 2 that the weekly milk yield/doe raised with increasing the number of sucklings from two, five to six litters, while it decreased for mothers having seven or eight litters. The milk production/doe increased again with increasing the litter size to nine, but it did not reach the level of mothers having six litters (Table 2).

The effect of litter size on the weekly milk yield per doe was significant in all stages of lactation.

The results revealed that six youngs were the best number to empty all the mammary glands. This finding was in agreement with those obtained by Cowie (1969), who reported that this number was adequate to ensure regularly complete milking.

II. *Milk composition*

1. *Fat*

Data in Table 3 show that the level of fat was about 18% at the second day of lactation, but gradually it decreased to reach 15% in the 23*rd* day at the peak of milk yield. After that and till the 51*st* day of lactation the fat content increased while the milk yield declined (Tables 1 and 3). Similar results were found by Davies *et al.* (1964) and Cowie (1969).

Table (2): Least squares means and standard errors of weekly milk yield / doe (gm) of Giza white rabbits affected by litter size.

Litter size	No doe	Milk Yield per Doe per week							
		1st	2nd	3rd	4th	5th	6th	7th	Total
2	2	325.4 d ± 35.5	684.7 a ± 61.3	810.4 f ±132.9	671.4 e ±150.2	457.3 d ± 82.9	368.8 c ± 69.4	354.1 c ± 60.2	3672.1 f ±404.5
5	3	759.8 b ± 35.2	1116.3 c ± 60.7	1403.2 c ±131.6	1002.9 c ±148.7	714.0 b ± 82.1	520.2 b ± 68.7	505.2 b ± 59.6	6021.6 c ±400.4
6	3	980.5 a ± 77.8	1428.0 a ±134.2	1788.8 a ±291.0	1433.5 a ±328.9	981.7 a ±181.5	688.5 a ±151.9	668.3 a ±131.7	7769.3 a ±885.4
7	5	601.3 c ± 28.1	1092.5 c ± 48.4	1212.7 d ±105.0	978.1 c ±118.7	606.5 c ± 65.5	516.3 b ± 54.8	444.1 cb ± 47.6	5451.5 d ±319.6
8	2	345.4 d ± 73.9	936.3 d ±127.5	910.9 e ±276.4	785.4 d ±312.5	677.3 cb ±172.4	566.7 b ±144.2	414.7 cb ±125.1	4636.7 a ±840.9
9	2	822.8 b ± 36.6	1273.1 b ± 63.1	1534.5 b ±136.9	1200.7 b ±154.7	813.6 a ± 85.4	659.4 a ± 71.5	622.2 a ± 62.0	7126.3 b ±416.6

Means followed by different letters differ significantly from each other ($P \leqslant 0.05$) .

It is evidect from Table 3 that adding trigonella to the doe feed caused an increase of 1.6% in fat percentage more than in the group fed only control diet. It could be concluded that providing trigonella to the doe feed showed not only lactogenic effect but also raising in fat percentage.

TABLE 3. Least squares means and standard errors of fat, protein, lactose, ash and total solids (%) of the milk of Giza white rabbits affected by the type of feeding.

Feed Type	Stage of Lactation (days)								
	2nd	9th	16th	23rd	30th	37th	44th	51st	Average
					Fat				
Control	18.8 ±1.6	17.0 ±0.8	15.0 ±0.3	15.5 ±1.3	21.1 ±1.3	21.0 ±0.4 b	23.3 ±0.8 b	24.7 ±0.4 b	19.5 ±0.4
Cont.+Trigo.	18.0 ±1.6	15.3 ±0.8	16.4 ±0.3	15.5 ±1.3	22.3 ±1.3	26.6 ±0.4 a	26.6 ±0.8 a	27.9 ±0.4 a	21.1 ±0.4
					Protein				
Control	11.9 ±0.7	11.6 ±1.1	11.4 ±0.6	12.7 ±0.5	15.1 ±0.3 a	19.3 ±0.4	22.0 ±0.8	21.8 ±0.6	15.7 ±0.1
Cont.+Trigo.	12.5 ±0.7	11.4 ±1.1	10.9 ±0.6	10.5 ±0.5	11.5 ±0.3 b	20.9 ±0.4	20.2 ±0.8	20.3 ±0.6	14.8 ±0.1
					Lactose				
Control	1.8 ±0.1	2.5 ±0.1	2.4 ±0.1	2.3 ±0.1	2.0 ±0.1	1.6 ±0.0	1.4 ±0.1	1.6 ±0.0	2.0 ±0.0
Cont.+Trigo.	1.9 ±0.1	2.6 ±0.1	2.5 ±0.1	2.2 ±0.1	2.0 ±0.1	1.6 ±0.0	1.5 ±0.1	1.6 ±0.0	2.0 ±0.0
					Ash				
Control	1.9 ±0.0	2.2 ±0.0	2.2 ±0.0	2.3 ±0.0	2.3 ±0.1	2.4 ±0.1	2.3 ±0.0	2.4 ±0.1	2.2 ±0.0
Cont.+Trigo.	2.0 ±0.0	2.2 ±0.0	2.2 ±0.0	2.3 ±0.2	2.3 ±0.1	2.3 ±0.1	2.4 ±0.0	2.4 ±0.1	2.2 ±0.0
					Total solids				
Control	34.3 ±1.1	33.4 ±1.8	31.0 ±0.5	32.7 ±2.5	40.5 ±1.4	44.2 ±0.6 b	49.0 ±0.9	50.4 ±0.8	39.5 ±0.4
Cont.+Trigo.	34.4 ±1.1	31.5 ±1.8	31.9 ±0.5	30.5 ±2.5	38.0 ±1.4	51.4 ±0.6 a	50.6 ±0.9	52.1 ±0.8	40.1 ±0.4

Means followed by different letters differ significantly from each other ($P < 0.05$).

2. *Protein*

Data in Table 3 show that at the second day of lactation the protein was about 12%. A slight decline occurred gradually till the 16*th* day of lactation. From the 30*th* day till the 51*st* day protein percentage increased, while the milk yield declined (Tables I and 3). Protein level in the average of both feed treatments through the lactation period was 15.25%. Similar result was obtained by Hafez (1970).

3. *Lactose*

The levels of lactose in the does milk were similar in both feed treatments (control and control + trigonella) (Table 3). They

were 1.8% and 1.9% at the second day of lactation, 2.5% and and 2.6 at the 9*th* day, 2.3% and 2.2% at the 23*rd* day and 1.6% for both at the 51*st* day respectively. Lactose level in the average for each of the two treatments though the lactation period was 2.0%. Similar trend of lactose percentage was showed by Cowie (1969) and similar value of lactose level in the average was found by Sadhu (1948).

4. *Ash*

The ash percentages in the milk were similar in both feed treatments (control and control + trigonella) (Table 3). They were 1.9% and 2.0% at the second day of lactation respectively, while they improved slowly after that till the 51*st* day of lactation to reach 2.4% for both (Table 3). Ash percentage in the average for each of the two treatments through the lactation period was 2.2%. Similar value was found by Hafez (1970).

5. *Total solids*

Total solids were 34.3% and 34.4% for diet control and diet control + trigonella at the second day of lactation respectively. After that till the 23*th* day (peak of milk yield) they decreased in general (Table 3). From the 23*th* day till the 51*st* day of lactation total solids percentages increased while the milk yield declined (Table 3).

It is evident from Table 3 that adding trigonella to the doe feed caused an increase of 1.6% in the total solids percentage more than in the group fed only control diet. Adding trigonella to the doe feed caused increasing the total solids from the 37*th* day to 51*st* day of lactation (Table 3).

It can be concluded that percentages of fat, protein and solids decreased in general from the second day to the 23rd day of lactation (peak of milk yield). After that and till the 51*st* day of lactation these components of milk increased in general while the milk yield declined. Thus, there are negative relations between the milk yield and its fat, protein and total solids contents. Adding trigonella to the doe feed caused an increase in both fat and total solids percentages.

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بعض العوامل المؤثرة على افراز اللبن وتركيبه الكيمـــائى فى أرانب الجيزة البيضاء

جمال قمر ، عبد الرحمن البردى ، مختار عبد الفتاح ، سوزان رياض ، شكرى محمد الطنطاوى وفاتن ابراهيم

كلية الزراعة ـ جامعة القاهرة

استخدم فى هذا البحث ٢١ أنثى من أرانب الجيزة البيضاء وكانت النتائج كما يلى :

١ ـ تفرز الأرانب أكبر كمية من اللبن فى نهـاية الاســبوع الثالث من الرضاعة .

٢ ـ حقن الاناث يوميا بهرمون اكسوتوكسين (٥ وحدة دولية) . يؤدى الى تنشيط وزيادة افراز اللبن .

٣ ـ أفضل عدد من الخلفة للام لانتظام افراز اللبن هو ٦ صغار .

٤ ـ الأمهات التى تتراوح أوزانها بين ٢ر٧ ، ٢ر٩ كجم تعطى أعلى كمية من اللبن خلال الرضاعة .

٥ ـ اضافة الحلبة الى علف الأرانب يؤدى الى زيادة افراز اللبن وزيادة محتواه من الدهن والمواد الصلبة .

٦ ـ يوجد ارتباط بين زيادة كميـــة اللبن فى الأرانب وكل من مكـوناته الدهنية والبروتينية والمواد الصلبة .