Fertility and prolificacy traits of Chios and Farafra sheep under Subtropical conditions in Egypt

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Introduction

Reproductive performance constitute is a major factor determining the economic efficiency of sheep production. Also, it is one of the most important criteria to be considered in planning for sheep improvement. Various measures of reproductive performance were cited in the literature. They fall into two main criteria, fertility and prolificacy measures. Fertility is one of the important characteristics in the reproductive measures. Fertility and Prolificacy traits were calculated in different ways in different reports (Aboul-Naga et al., 1989 and Matika et al., 2003).

Materials and methods

The present study was carried out at Mallawi Animal Production Research Station, belonging to Animal Production Research Institute (APRI), Agriculture Research Center (ARC), Ministry of Agriculture. The aim of this study was to evaluate reproductive traits of Chios and Farafra sheep.

Chios is a highly productive animal, originating from island of Chios, Greece. Chios flock was imported at the end of 1986. Farafra flock was introduced to Mallawi Research Station in 1992, Farafra is a local sheep dominate in El-Farafra Oasis of the Egyptian western desert, New Valley. (Hamdon,1996). The sheep flock was managed under an accelerated lambing system that permits the ewe to lamb three times each two years. During the mating season ewes were randomly divided into groups of 30 – 35 ewes, ewes were 1st mated at about 1.5 years old of age. Each group was joined with fertile ram for a period of 45 days, which change in case of disorder during one week. Animals were fed according to recommendation of APRI (2000). The ewe reproductive performance traits studied in two years including six mating seasons to measure two main categories (Aboul-Naga et al., 1989). The first category was related to ewe fertility, Ewe lambed per ewe joined (EL/EJ), Lambs born per ewe joined (LB/EJ), Lambs weaned per ewe joined (LW/EJ), Kilogram born per ewe joined (KB/EJ), Kilogram weaned per ewe joined (KW/EJ), While the second measurements, related to ewe prolificacy and included, Lambs born per ewe lambed (LB/EL), Lambs weaned per ewe lambed (LW/EL), Kilogram born per ewe lambed (KB/EL), Kilogram weaned per ewe lambed (KW/EL), Number of records involved were 1030 for the two breed group.

Results and discussion

Fertility traits: The results presented in Table (1) show that the Farafra ewes were more fertile than Chios ewes (0.67 vs. 0.49), the differences due to genotype were highly significant ($P< 0.01$). The estimates of (LB/EJ), (LW/EJ), (KB/EJ) and (KW/EJ) were 0.86, 0.72, 2.94 and 8.86 for Farafra ewes, and 0.63, 0.43, 2.36 and 5.71 for Chios ewes, respectively. Results showed that Chios ewes had lower performance than Farafra ewes in all studied parameters and the differences due to genotype, were highly significant ($P< 0.01$). These results may be attributed to inbreeding within small Chios flock, habitat and ecological conditions. These estimates are lower than those reported by Hadjipanayiotou (1988) who found that Chios ewes in Cyprus, ewe lambed per ewe joined (EL/EJ) was 79%. These results are in agreement with Marzouk (1997) working on Ossimi, Chios and their crosses, found that genotype of ewe had a higher significant effect ($P< 0.01$) on conception rate (EL/EJ). Ewes mated in September had higher EL/EJ, LB/EJ, LW/EJ, KB/EJ, and KW/EJ, than May and January mating seasons (Table,1). The differences due to mating season were highly significant ($P< 0.01$). September mating season had the best performance (0.71, 0.96, 0.78, 3.43 kg and 9.58 kg) followed by May season (0.65, 0.80, 0.66, 2.72 kg and 8.12 kg) and the poorest performance was shown in January mating season (0.50, 0.62, 0.51, 2.10kg and 6.46kg), respectively. Also, Aboul-Naga et al., (1989) reported that seasonal variations in all reproductive traits studied was statistically highly significant ($P< 0.001$), and autumn mating (September) had significantly

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Table (1): Least-squares means ±SE of factors affecting fertility traits of Farafra and Chios ewes.

Items	No.	LSM ±SE				
		EL/EJ	LB/EJ	LW/EJ	KB/EJ	KW/EJ
Overall means	1030	0.63±0.45	0.81±0.68	0.66±0.65	2.82±2.29	8.23±8.03
Breed		**	**	**	**	**
Farafra	825	0.67±0.01	0.86±0.02	0.72±0.02	2.94±0.08	8.86±0.29
Chios	205	0.49±0.03	0.63±0.05	0.43±0.04	2.36±0.18	5.71±0.58
Mating season		**	**	**	**	**
September	381	0.71±0.02^{a}	0.96±0.03^{a}	0.78±0.03^{a}	3.43±0.12^{a}	9.58±0.45^{a}
May	383	0.65±0.02^{a}	0.80±0.03^{b}	0.66±0.03^{b}	2.72±0.11^{b}	8.12±0.41^{b}
January	266	0.50±0.03^{b}	0.62±0.04^{c}	0.51±0.04^{c}	2.10±0.14^{c}	6.46±0.50^{c}
Mating year				**		**
2001	459	0.66±0.02	0.86±0.03	0.75±0.03	2.89±0.11	9.40±0.41
2002	571	0.61±0.02	0.77±0.03	0.60±0.02	2.76±0.11	7.29±0.34
Age of ewe at mating		**	**	**	**	**
<2years	206	0.65±0.03^{ab}	0.77±0.04^{b}	0.62±0.04^{b}	2.64±0.15^{b}	7.37±0.52^{b}
2-<4 years	420	0.58±0.02^{b}	0.72±0.03^{b}	0.58±0.03^{b}	2.52±0.11^{b}	7.17±0.38^{b}
4-<6 years	87	0.71±0.04^{a}	1.01±0.08^{a}	0.91±0.08^{a}	3.47±0.28^{a}	11.33±1.02^{a}
6-<8 years	117	0.75±0.04^{a}	1.00±0.06^{a}	0.86±0.06^{a}	3.52±0.22^{a}	10.81±0.82^{a}
>8 years	200	0.61±0.03^{b}	0.84±0.05^{b}	0.69±0.05^{b}	2.95±0.19^{b}	8.49±0.67^{b}
Weight of ewe at mating		**	**	**	**	**
<35 kg	271	0.69±0.02^{a}	0.83±0.04^{a}	0.69±0.03^{ab}	2.74±0.12^{a}	8.45±0.47^{a}
35-<40 kg	281	0.66±0.02^{a}	0.85±0.03^{a}	0.71±0.03^{a}	2.92±0.12^{a}	8.71±0.44^{a}
40-<45 kg	231	0.62±0.03^{ab}	0.84±0.05^{a}	0.68±0.04^{ab}	3.10±0.17^{a}	8.54±0.58^{a}
45-<50 kg	119	0.50±0.04^{b}	0.66±0.06^{ab}	0.50±0.06^{bc}	2.40±0.24^{ab}	6.44±0.79^{ab}
> 50 kg	28	0.36±0.09^{c}	0.50±0.14^{b}	0.36±0.11^{c}	1.82±0.51^{b}	4.62±1.38^{b}
Breed × mating season		**	**	**	**	**
F × Sep.	300	0.71±0.02^{a}	0.96±0.04^{a}	0.79±0.04^{a}	3.40±0.14^{a}	9.62±0.50^{a}
F × May	304	0.72±0.02^{a}	0.90±0.03^{a}	0.77±0.03^{a}	3.01±0.12^{a}	9.44±0.46^{a}
F × Jan.	221	0.53±0.03^{b}	0.65±0.04^{b}	0.56±0.04^{b}	2.21±0.15^{b}	7.02±0.56^{b}
C × Sep.	81	0.68±0.05^{a}	0.95±0.08^{a}	0.72±0.08^{ab}	3.54±0.30^{a}	9.43±1.06^{a}
C × May	79	0.34±0.05^{c}	0.41±0.06^{c}	0.24±0.05^{c}	1.58±0.27^{b}	3.07±0.73^{c}
C × Jan.	45	0.40±0.07^{c}	0.47±0.09^{bc}	0.27±0.06^{c}	1.60±0.30^{b}	3.67±0.92^{c}

a, b, c: means in the same column within classification with different superscript for each factor differ ($p<0.05$) of all pairwise testes of breed × mating season differences for interaction (PDIFF).

EJ = ewe joined, EL = ewe lambed, LB = lambs born, LW = lambs weaned, KB = kilograms born and KW = kilograms weaned.

F= Farafra ewes , C= Chios ewes.

($P<0.001$) better reproductive performance than winter (January) and spring (May) mating, except for conception rate, where January mating was somewhat better. Table (1) showed that weight of ewe at mating (35- <40 kg) had higher EL/EJ, LB/EJ, LW/EJ and KW/EJ, than other weights of ewe at mating. Weight of ewe at mating had a highly significant ($P< 0.01$) effect on all fertility traits. But, interaction between breed and weight of ewe at mating had a highly significant ($P< 0.01$) effect on EL/EJ, LB/EJ and KB/EJ only but it had no significant for LW/EJ and KW/EJ.

Prolificacy traits: It is calculated as lambs born per ewe lambed (litter size, LB/EL), lambs weaned per ewe lambed (LW/EL), kilograms of lambs born per ewe lambed (KB/EL) and kilograms of lambs weaned per ewe lambed (KW/EL). Table (2) shows that the Chios ewes had slightly higher LB/EL (1.30) and KB/EL (4.83 kg) than Farafra ewes (1.28 and 4.39kg), respectively. However, the differences among breeds were not significant with LB/EL, but it were highly significant ($P< 0.01$) with KB/EL. Farafra ewes had higher LW/EL (1.08) and KW/EL (13.25 kg) than Chios ewes (0.89 and 11.71 kg), respectively. Moreover, the differences among breed were highly significant ($P< 0.01$) with LW/EL, and significant ($P< 0.05$) with KW/EL. The estimates of LB/EL, LW/EL and KB/EL of Farafra ewes were partly similar with those reported by Aboul-Naga et al., (1989) 1.22, 1.08, and 4.4 kg for Ossimi ewes, respectively and Morsy (2002) found 1.20, 1.11 and 5.5 kg for LB/EL, LW/EL and KB/EL in Ossimi ewes, respectively. These results are agree with those reported by Hadijipanayiotou (1988), Aboul-Naga et al., (1989), and Malik et al., (2000) where they found that genotype effects of ewe on all prolificacy studied traits were statistically significant. Table (2) show that ewes lambed in February (i.e. September mating season) had higher litter

size at birth and litter size at weaning than ewes lambed in October and June (i.e. May and January mating seasons, respectively). Moreover season of lambing had a highly significant (P< 0.01) effect on litter size at birth, but was non significant effect on litter size at weaning. February lambing season was the best season by considering values of KB/EL (4.83 kg), and KW/EL (13.49 kg) as compared with either the October or June lambing seasons (4.21 kg & 4.17 kg) and (12.60 kg & 12.81 kg), respectively. Lambing season had a highly significant effect (P< 0.01) on KB/EL, but was not significant for KW/EL. The increase in litter size at birth per ewe lambed at September mating seasons as compared with January and May mating seasons were 0.13 and 0.11 lamb, respectively. Prolificacy traits in the present study, showed higher performance of ewes in February (September mating) followed by October (May mating), while the poorest performance was in June (January mating) season. These results are in agreement with Aboul-Naga et al., (1989) who found that September mating season had a significant (P< 0.001) better prolificacy traits than January and May mating seasons.

Table (2): Least-squares means ±SE of factors affecting prolificacy traits of Farafra and Chios ewes.

Items	No.	LSM±SE			
		LB/EL	LW/EL	KB/EL	KW/EL
Overall means	650	1.28±0.46	1.05±0.58	4.46±1.39	13.01±7.02
Breed			**	**	*
Farafra	550	1.28±0.02	1.08±0.02	4.39±0.06	13.25±0.29
Chios	100	1.30±0.04	0.89±0.06	4.83±0.16	11.71±0.84
Lambing Season		**		**	
February	269	1.35±0.03^{a}	1.09±0.03^{a}	4.83±0.09^{a}	13.49±0.46^{a}
October	247	1.24±0.02^{b}	1.03±0.03^{a}	4.21±0.09^{b}	12.60±0.43^{a}
June	134	1.22±0.03^{b}	1.02±0.05^{a}	4.17±0.11^{b}	12.81±0.61^{a}
Lambing year			**		**
2001	302	1.31±0.02	1.14±0.03	4.39±0.08	14.25±0.40
2002	348	1.26±0.02	0.98±0.03	4.53±0.08	11.94±0.39
Age of ewe at mating		**	**	**	**
<2 years	134	1.19±0.03^{c}	0.95±0.04^{c}	4.06±0.10^{c}	11.32±0.56^{c}
2-<4 years	345	1.24±0.02^{bc}	0.99±0.03^{bc}	4.31±0.08^{bc}	12.26±0.41^{bc}
4-<6 years	62	1.42±0.07^{a}	1.27±0.08^{a}	4.87±0.20^{a}	15.89±0.93^{a}
6-<8 years	88	1.32±0.05^{ab}	1.13±0.06^{ab}	4.63±0.16^{ab}	14.24±0.79^{ab}
>8 years	121	1.39±0.04^{a}	1.13±0.06^{ab}	4.88±0.15^{a}	14.04±0.76^{ab}
Weight of ewe at mating				**	
<35 kg	186	1.21±0.03^{a}	1.00±0.03^{a}	3.98±0.09^{c}	12.26±0.47^{a}
35-<40 kg	251	1.29±0.03^{a}	1.08±0.04^{a}	4.41±0.09^{bc}	13.17±0.47^{a}
40-<45 kg	144	1.35±0.04^{a}	1.10±0.05^{a}	4.97±0.13^{ab}	13.71±0.61^{a}
45-<50 kg	59	1.32±0.06^{a}	1.00±0.08^{a}	4.84±0.21^{ab}	12.99±1.05^{a}
> 50 kg	10	1.40±0.16^{a}	1.00±0.14^{a}	5.11±0.60^{a}	12.94±2.02^{a}
Breed × lambing season			**		**
F × Feb.	214	1.34±0.03^{ab}	1.10±0.04^{a}	4.74±0.10^{ab}	13.39±0.51^{a}
F × Oct.	220	1.25±0.03^{ab}	1.07±0.03^{a}	4.16±0.09^{bc}	13.04±0.44^{a}
F × Jun.	116	1.23±0.04^{ab}	1.07±0.05^{a}	4.20±0.13^{bc}	13.38±0.65^{a}
C × Feb.	55	1.40±0.07^{a}	1.06±0.09^{a}	5.22±0.21^{a}	13.89±1.14^{a}
C × Oct.	27	1.19±0.07^{b}	0.70±0.12^{b}	4.61±0.34^{bc}	8.98±1.62^{b}
C × Jun.	18	1.17±0.09^{b}	0.67±0.11^{b}	3.99±0.16^{c}	9.17±1.59^{b}

a, b, c: means in the same column within classification with different superscript for each factor differ (p<0.05) of all pairwise testes of breed × lambing season differences for interaction (PDIFF).

EL = ewe lambed, LB = lambs born, LW = lambs weaned, KB = kilograms born and KW = kilograms weaned.

F= Farafra ewes , C= Chios ewes.

Breed × season interaction effect was highly significant (P< 0.01) on litter size at weaning per ewe lambed (LW/EL) and litter weight at weaning per ewe lambed (KW/EL), but, it was no significant on litter size at birth per ewe lambed (LB/EL) and litter weight at birth per ewe lambed (KB/EL). Table (2) showed that differences in LW/EL and KW/EL were highly significant (P< 0.01). although, the effect of lambing year had no significant effect in LB/EL and KB/EL, it can also observed that, the 2001 lambing year was better than 2002 lambing year. These results may be attributed to management and environmental fluctuated conditions. All prolificacy traits tended to increased as age advanced of the ewe at mating up to 4 - <6 years

old then decreased with advancing age. The effect of age of ewe at mating on prolificacy traits were highly significant (P< 0.01). These results may be attributed to a significant increase in litter size as ewe aged due to the higher increase in ovulation rate, which was strongly correlated with litter size, with advanced age of ewe (Mukasa and Lahlou-Kassi, 1995). Table (2) showed that weight of ewe at mating had no significant effect on all prolificacy traits except for KB/EL that was highly significant (P< 0.01). The present results showed that all prolificacy traits tended to increase with increasing weight of ewe at mating up to 40- <45 kg then decreased with increasing weight. In agreement with the present findings.

Conclusion

It concluded that in Egypt, the temperature is higher during April till August than Cyprus. So, Chios ewes must be mated during September season only under subtropical Egyptian conditions, but may be mated each eight months, (September, May and January) and early weaning system more suitable for Farafra than Chios ewes. Also, Chios flock must to improve reproductive traits by import a good rams from Greece or Cyprus, import Chios semen to using artificial insemination, or by embryo transfer, regarding feeding and husbandry. Moreover, the selection program for Farafra flock should be continued and transformation Farafra ewes and rams from El-Farafra Oasis, New Valley.

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