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Effects of Progesterone – PMSG Administration on Lambing Rate and Prolificacy of Awassi Sheep

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Abstract :A flock of 146 adult Awassi ewes was available at Abu-Graib area (central of Iraq, Latitude 33.7 N) to study the effect of using 30 mg Acetoxy Progesterone (Cronolone) vaginal sponges administered for 12 days together with PMSGH injections at sponges withdrawal on fertility and prolificacy in these animals. Ewes were allocated to five groups (1,2,3,4 and 5) and injected with O (control) 600,800,1000 and 1200 IU PMSGH respectively .Mating rates following natural mating ,using 1:10 ram ewe ratio ,were 73,93,86,96 and 100% respectively.Conception rates to treated (and mated) ewes were 69.2(94.7), 50(53.6), 60(69.3), 43.3(44.8) and 40%(40%) respectively. Number (and%) of experimental groups lambing twins were 4(26.7), 6(33.3), 3(23.1) and 4(33.3%) respectively, as compared with 2 (11.1%) in the control, while number (and%) of ewes lambing triplets were 2(13.3) ,2(11.1) ,3(23.1) and 2(16.7%) as compared with only one (5.6%) in the control. Only one ewe (5.6%) yielded one set of quintuplets in the group which received 800 IU PMSGH. Increasing PMSGH doses beyond 800 IU may depress, rather enhance conception, lambing and prolificacy rates. More research is recommended under good nutrition and management using optimum ram: ewe ratio of 1: 5 during normal and autumn breeding seasons.

Key words: Exogenous hormones , conception rates , lambing rates , prolificacy, awassi sheep

Introduction

Exogenous hormones administration had been previously and currently used to improve reproduction efficiency in lab, experimental and farm animals since the thirties of the last century (Cole and Hart, 1930; Hammond *et al.*, 1942 and Robinson, 1950).

The first work on progesterone application as an oestrual synchronizer in sheep was done by Hammond *et al.* (1942), following by Dutt and Casida, (1948) and O'mary *et al.*, (1950). Progesterone and PMSGH have been used on a large scale to investigate and improve puberty and fertility , reduce barrenness and to increase % of animals lambing multiple births in sheep and goats (Markotic *et al.*, 1976; Al-Wahab *et al.*, 1981; Al-Wahab and Khudayeer, 1981; Harb, 1994 and Al-Wahab, 2002).

Other hormones ie: Oestradiole, Prostaglandins and other Horse Anterior Pituitary Hormones (HAP) or a mixture of PMSGH with Prostaglandins or with other Gonadotrophine Releasing H. (Gn-RH) are also used. Moreover, Human Chorionic Gonadotropin (HCG) was used and mixed with PMSGH to increase and augment fertility and prolificacy. The first FAO programme was conducted in Arab country and administered at Jazeera desert in north west of Iraq by Markotic *et al.* , (1976). They succeeded in increasing fertility in Awassi sheep under harsh conditions of hard management and food scarce of sub-tropical environments. From these results and other information, the idea of this project has come to study the effects of using Progesterone-PMSG manipulations on Awassi sheep in the centre of Iraq under normal conditions of husbandry to improve fertility and reproductive capacity in this native breed.

Materials and Methods

This experiments was conducted at Abu-Graib area, Iraq, (Latitude 33.7 N). 146 Awassi ewes were available during early summer mating season of 1993. They were allocated to 4 experimental groups of 30 ewes each (groups 2,3,4 and 5) plus one control group consists of 26 ewes (group 1).

Experimental animals in all these groups were treated with (Cronolone) vaginal sponges containing 30 mg Acetexy Progesterone, which remained for 12 days.

Four experimental groups (2,3,4 and 5) were treated with PMSGH, animals of these groups were injected intra-muscularly at sponge withdrawal with doses of 600, 800, 1000 and 1200 IU PMSGH . Fertile rams were introduced to treated ewes at the ratio 1:10, which stayed with them for 2 weeks only. Animals were nutritionally flushed for a month before and during mating period using ½ Kg / head concentrates of 15% protein plus grazing post harvest barley, wheat and alfalfa pastures. Feeding the same rate of concentrates was also administered in late pregnancy (during the last 4 weeks). Lambing was practiced indoors, inside the same semi-opened sheep kennels, which were used to house sheep after their return from grazing.

Chi^2 analysis was used to analize mating and lambing

data.

Results and Discussion

Mating: Results of Table 1 indicate that the majority of treated ewes have shown oestrus and mated in response to Progesterone – PMSGH treatment. The no. and percentage of mated ewes in group (5) which were administered with 1200 IU PMSGH was %100 compared with only 73% in non-PMSG treated group (control). Chi² analysis showed significant differences ($P<0.01$) between experimental groups in no. of ewes mated to rams and no. of ewes lambing ($P<0.05$). Differences between control and other experimental groups are listed under Table 1. It is clear from these results that the differences between the control (group 1) and groups 2,3,4 and 5 in no. of mated and lambed ewes were significant at 5,1,1and 0.1% respectively. Jalhoom (1983) found only 71% mating rate in Awassi flock treated with Progesterone alone compared with only 43% in a control flock. These low mating rates may presumably due to either no. of rams used or to the adverse effects of summer mating (long days) and barrenness relationships, although Awassi sheep is well known to show a very long breeding season or some times is called (non-seasonal) ,nevertheless no. (and %) of ewes with silent heats during long day length months (May and June) is ranging between 5-10% (Al-Wahab *et al.*, 1982) . Juma and Al-Wahab (1987) treating two flocks of barren ewes with Progesterone and 500 IU PMSG at the end of summer mating season .They found mating rates ranging between 73-75% and 76-81% respectively. Lubbadeh (1986) treating Awassi sheep with Progesterone and 750 IU PMSG and keeping rams with ewes for 2 months (July-August) resulting in mating rates ranging between 84.9-91.9%.

Lambing Rate: No. of lambing ewes to mated ones(%) were rather low,They were ranging between 43% (in group (5)) to 69% (in group(3)) although group(5) received 1200 IU PMSG nevertheless their lambing rate was lower than that group received 800 IU only. These results were relatively low comparing with control group which had much higher rate (94%), the reason for these differences is probably due to the short period of keeping rams with experimental ewes which some of them may presumably have returned to oestrus, with no chance for re-mating them with rams comparing

Table1: No.of treated ,mated and lambed ewes(and %) with no of lambs born and aborted

Groups	(1)	(2)	(3)	(4)	(5)	X^2 - value
PMSG doses (I U)		600	800	1000	1200	----
No. of treated ewes	26	30	30	30	30	16.5
No. mated ewes	19	28	26	29	30	**
	(% 73)	(% 93)	(% 86)	(% 96)	(%100)	
No. lambing and	L A	L A	L A	L A	L A	11.7
aborted ewes	15 3	13 2	16 2	11 2	11 1	*
	(% 94)	(% 53)	(% 69)	(% 45)	(% 43)	
No. ewes with singles	13 2	7 2	7 2	6 1	1 6	--
No. ewes with twins	1 1	4 --	6 --	2 1	4 --	
No. ewes with triplets	1 --	2 --	2 --	3 --	1 1	
No. ewes with Quadruplets	-- --	-- --	-- --	-- --	-- --	
No. ewes with Quintuplets	---	---	1 --	-- --	-- --	
Total lambs born and aborted	18 4	21 2	30 2	19 3	17 3	
	22	23	32	22	20	
Average lambs born /ewe	1.2	1.6	1.8	1.7	1.5	

Differences between treated and mated animals = ($P<0.01$), Chi²V. = 16.5
Differences between mated and lambed animal = ($P<0.05$), Chi²V. = 11.7
Differences between control (gr.1) and gr.2 (treated and mated) = ($P<0.01$), Chi²V. = 11.0
Differences between control (gr.1) and gr.3 (treated and mated) = ($P<0.01$), Chi²V. = 9.8
Differences between control (gr.1) and gr.4 (treated and mated) = ($P<0.001$), Chi²V. = 12.3
Differences between control (gr.1) and gr.2 (mated and lamb) = ($P<0.05$), Chi²V. = 6.4
Differences between control (gr.1) and gr.3 (mated and lamb) = ($P<0.01$), Chi²V. = 7.7
Differences between control (gr.1) and gr.4 (mated and lamb) = ($P<0.01$), Chi²V. = 8.3
Differences between control (gr.1) and gr.5 (mated and lamb) = ($P<0.01$), Chi²V. = 8.5

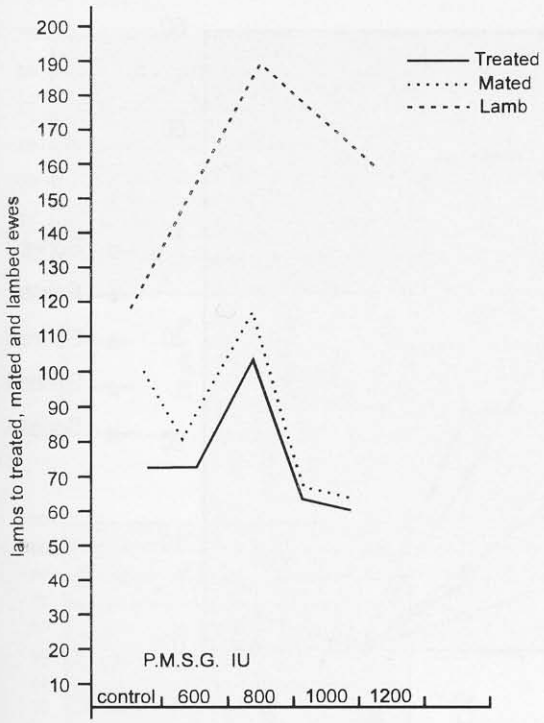


Fig.1: No. of lambs born to treated, mated and lambed and ewe

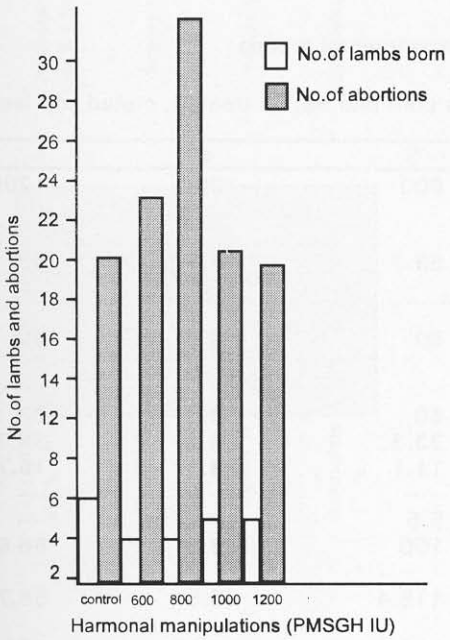


Fig.2: Frequency histogram indicates no. of lambs born and abortions

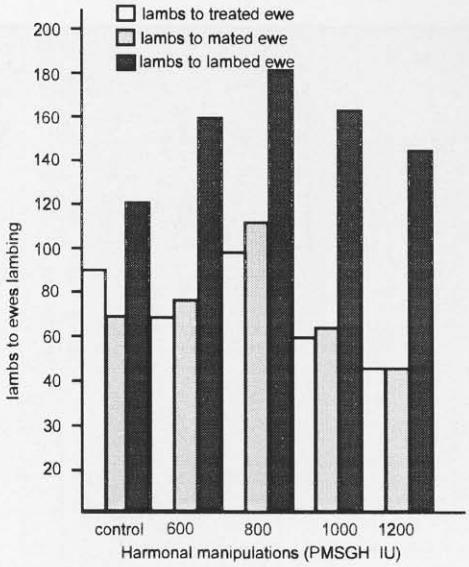


Fig.3: Frequency histogram lambs born to treated and mated ewes

with control ewes where rams were kept with them continuously.

Markotic *et al.*, (1976) treated four groups of Awassi sheep at Jazeera desert in Iraq with Progesterone sponges and 600, 700, 800 and 1000 IU PMSGH, lambing rates in their experiments were 73,63,63 and 54% respectively compared with 33-63% in control groups, they referred these low rates to mal nutrition and harsh desert conditions facing their animals during that season. Similar results were obtained by Lubbadeh (1986) using Progesterone and 750 IU PMSG hormones in Jordanian Awassi ewes, lambing rates resulted from first mating ranged between 50.7-68.9%.Higher lambing rates were obtained by Juma and Al-Wahab (1987)from two barren Iraqi breeds administered with Progesterone and with 700 or 500 IU PMSGH they ranged between 76-79.4% respectively.

More recently Abdullah Husein and Kridli (2002) using different types and doses of Progesterone and PMSGH on 3 flocks of Awassi sheep under Jordanian arid (Badia) conditions Lambing rates were significantly greater in flock (1) of their exp. Than other flocks; They were 94% compared with only 41 and 35% respectively, These differences were attributed to several factors including ram: ewe ration, flock fertility and nutrition and doses of PMSG; The flock receiving 600 IU had the higher lambing rate than others. More over Al-Wahab (2002) has found relatively high lambing rates of 93.3% over 2 years from Jordanian Awassi ewes administered with Progesterone and 500 IU PMSGH, compared with 90% in control groups.

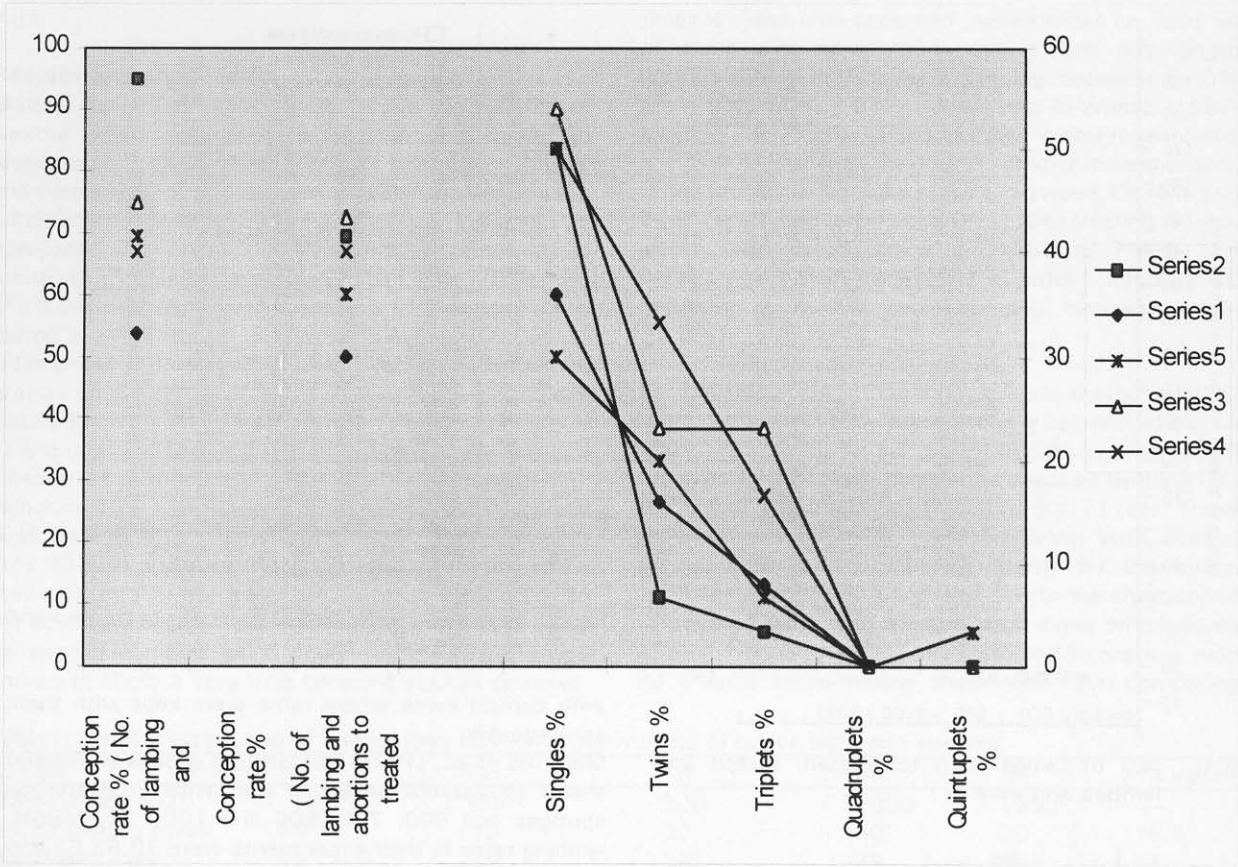
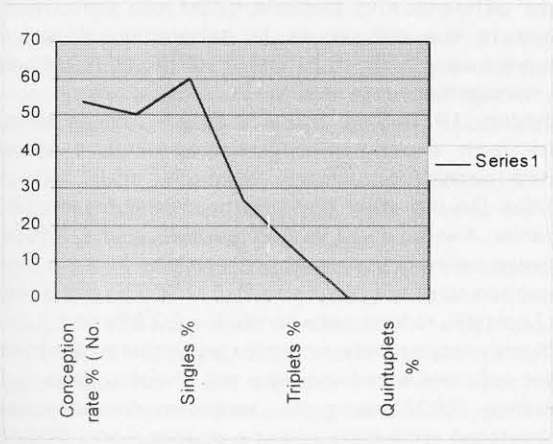


Fig.4: Conception and lambing rates with relation to prolificacy in experimental groups

Table 2: Mating and conception rates with relation to no. Of lambs born and no. Of treated, mated and lambed ewes

Groups	1	2	3	4	5
Items/ PMSG dosage (I U)	----	600	800	1000	1200
Conception rate % (No. of lambing and abortions to mated ewes)	94.7	53.6	69.3	44.8	40
Conception rate % (No. of lambing and abortions to treated ewes)	69.2	50	60	43.3	40
% ewes lambing:					
Singles %	83.3	60	50	53.9	50
Twins %	11.1	26.7	33.3	23.1	33.3
Triplets %	5.6	13.3	11.1	23.1	16.7
Quadruplets %	----	----	----	----	----
Quintuplets %	----	----	5.6	----	----
% of lambs born to treated ewes	69.2	70	100	63.3	56.6
% of lambs born to mated ewes	94.7	75	115.4	65.5	56.7
% of lambs born to lambing ewes	120	161.5	187.5	172.7	154.5

$$\text{* Conception rate \%} = \frac{\text{No. of lambings and aborting ewes}}{\text{No. of mating ewes}}$$



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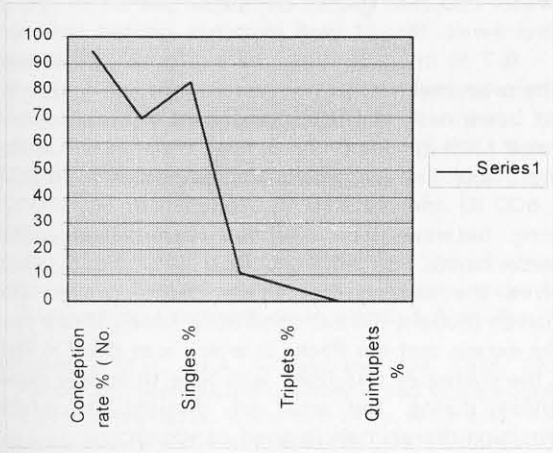

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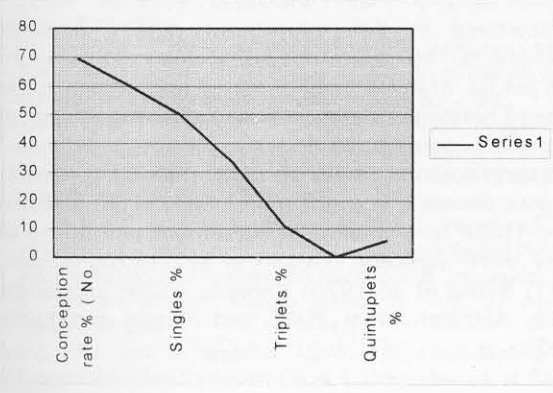

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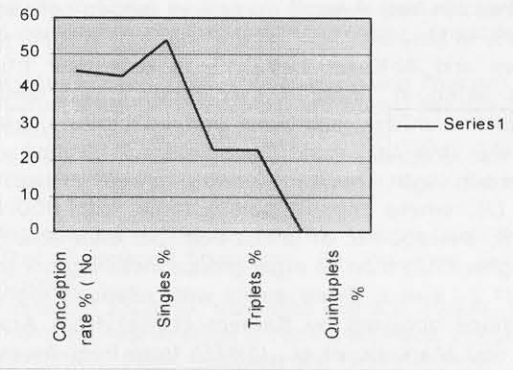

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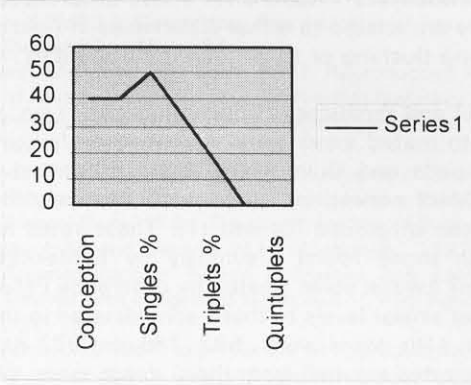

(5)

Reasonably good lambing rates were obtained from using different oestrus synchronization protocols together with 600 IU PMSGH. They were 75,82,75 and 58% in groups treated with 60 mg MAP, 30 mg FGA, 40 mg FGA and 60 mg Progesterone sponges respectively; Overall lambing rate of 72.3% was obtained from mating at both first and second oestrus. In general it seems clear from the results of most of researchers including of this experiment that the main causes are relating to the factors of duration of ram presence and ram : ewe relations which were in some cases 1:10 or 1:15 (Abdullah *et al.*,2002). Bryant and Tomkins (1975) had shown that the optimum ratio for British breeds mated during normal breeding season (in Autumn) was 1:6 ; However most Awassi breeders start their breeding seasons in May and June (Summer breeding), due to economical price policy,Where day length is long and there was a clear evidence that the

percentage of silent ovulations (Silent heats) and barrenness in Iraqi Awassi ewes was ranged between 5 – 10% in May and June of the year (Al-Wahab, Al-Muranni and Al-Kass, 1982), It is also clear from results listed in Table 1 that total no. of lambs produced (including abortions and stillbirths) were relatively low in most experimental groups in comparison with those of control group. However group (3), where animals administered with 800 IU PMSGH, average no. of lambs born per ewe lambing was higher (1.8) than all other groups including control group (1.2 / ewe). These results were relatively higher than those obtained by Kareem (1984) from Arabi sheep and Markotic *et al.*, (1976) from Iraqi Awassi ewes, at the same doses of treatments, their results ranged between 1.3 – 1.6 / ewe. These differences , presumably are related to either differences in feeding levels during flushing or to genotypic differences.

Conception and Prolificacy: Conception rates (no. of lambings to mated ewes) and no. of ewes lambing Twins, Triplets and Quintuplets % are presented in Table 2. Most conception rates were relatively low except those of groups (3) and (1). These rates are lower than those found previously by El-Mekkawi (1965) from Awassi ewes treated by difference PMSG doses rather similar levels to those administered in this experiment. (His doses were : 562, 768 and 972 IU); conception rates resulted from these doses were: 68, 86 and 73% respectively.

It is clear from results of Table 2, that control animals characterized mainly by 83% single births, 11.1% twins and only 5.6% (one ewe) produced one set of triplets. However percentages of twin lambings and triplets in the experimental groups 2,3,4 and 5 were 26.7,33.3,23 and 33.3 % and 13.3,11.1, 23 and 16.7% respectively, One ewe only (5.6%) produced a set of Quintuplets, (Fig. 2 and 3) .

Results of multiple births of this experiment seem to be reasonably good compared with those of El-Mekkawi (1963), since he had got low percentages of twins and triplets, they were 15,23 and 4% and 0,10 and 10% respectively in three experimental groups.

Markotic *et al.*, (1976) working on Iraqi Awassi under desert conditions using " Synchromate" and 750 IU PMSGH resulted in only 23% twining and only one ewe had lambed a set of triplets (5%), these low results of multiple births may be due mainly to, low feeding levels during matings , ram: ewe ratio (1:10) and presumably hormone administrations. Results of this experiment (of group 4) were lower than those found by Hadjicostis, (1980) from Chios sheep treated with 1000 IU PMSGH where 35% of treated ewes had lambed twins and only 8% triplets compared with 23.1% triplets in group (4) of this experiment.

These differences in multiple births are presumably related to the differences in genotypes, doses of hormones ages of animals and to different nutritional and management regimes.

Lubbadeh (1986) had also a total of 23% twinning births from experimental Jordanian Awassi sheep treated with Progesterone sponges and 750 IU PMSGH. On the other hand Harb, (1994) treating 47 Jordanian Awassi ewes with Progesterone and PMSGH in Jordan valley over 4 years, although he had got high conception rates ranging from 91.5 – 100% but Twins and Triplets% ranged between 6.4 – 20.9% and 2.2 – 2.3% only respectively moreover as in this experiment he got only one ewe lambing a set of quintuplets.

Al-Wahab (2002) using 45 Jordanian Awassi ewes administered with Progesterone sponges and 500 IU PMSGH over two years found prolificacy rates ranging between 110.7 – 150% compared with 114.8% in control ewes. No. of twin lambings ranged between 3.3 – 6.7 % only. Summer mating in his experiment seems presumably affecting fertility and prolificacy%, since barrenness in treated and control groups were 6.6 and 13 % respectively. Similar low multiple births % were found in two flocks treated with 40 mg FGA and 600 IU administered by Abdullah *et al.*, (2002) ranging between 16 – 25%. Nevertheless 50% multiple births was obtained in a third group. They referred the seasons for these differences to the Jordanian drought (Badia) conditions facing those two flocks except that the flock (3) which was small in size and the owner of this flock was able to supply good nutrition during the year of drought in which maintaining the animals in good condition.

It is clear from the results shown in Table 2 and Figs. 1,2,3,4 and 5 that the best dose of PMSGH administered in this experiment ranged between 600–800 IU, since the no. and percentage of lambs born per no. of ewes treated, mated and lambed in this range of hormone treatment were higher than those of other doses administration.

Increasing doses of PMSGH beyond 800 IU may lead to a drastic decrease in conception rates and no. of lambs born. These results came in agreement with those of many other workers. (Larson *et al.*, 1970; Gordon, 1971; Botha *et al.*,1975; Kareem, 1984; Lubbadeh, 1986; Abdullah *et al.*,2002 and Husein and Kridli, 2002).

Conclusion

It is concluded from the results presented in Table 1 and 2, that Progesterone hormone application may synchronize oestrus perfectly and mate treated ewes up to 100% , but it is essential that ram: ewe ratio must not exceed the ratio 1:5 or 1:6 and fertile rams should stay with ewes (or replaced) for at least a

month (or two oestrus cycles) in order to mate returned ewes and increase conception and lambing rates especially if summer mating and out of season systems are used . Moreover, it seems that doses ranged between 600 – 8000 IU may cause better results of fertility and prolificacy.

It is also useful to emphasis on the beneficial effect of nutritional flushing on proposed treated ewes before, during and after mating.

Although that Awassi sheep seem to have , presumably limited capacities in lambing and prolificacy rates in response to hormones treatments under harsh conditions of drought, food scare and high ambient temperatures during summer season, nevertheless more research is recommended using hormone manipulations under good management of moderately good feeding, optimum ram: ewe ratio of 1:5 and administering these during normal and autumn breeding seasons.

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References

Abdullah, A.Y., M.Q. Husein and R.T. Kridli, 2002. Protocols for Estrus Synchronization in Awassi Ewes under Arid Environmental Conditions. Asian – Aust. J. Anim. Sci., 15: 957 – 962.

Al-Wahab, R.M.H., H.A. Al-Maali and I.M. Amin, 1981. Puberty and Reproductive Capacity in Iraqi Goats mated at Synchronized Heats. World Rev. Anim. Prod. 2:41- 48.

Al-Wahab, R.M.H. and A.N. Khudayeer, 1981. Determination of Puberty and Reproductive Capacity in Awassi Ewe lambs Treated with Progesterone . World Rev. Anim. Prod. 3:31- 39 .

Al-Wahab, R.M.H., W.K. Al-Murani and J.E. Al-Kass, 1982. Some Observation on The Breeding Season of the Awassi Breed in Iraq. World Rev. Anim. Prod. 3: 57 – 63.

Al-Wahab and M.H. Riyadh, 2002, Effects of Exogenous Hormone Application on Prolificacy Augmentation in Shami Goats and Awassi Sheep in South Jordan. Mu'tah Lil-Buhuth Wad-Dirasat, 17:9 – 25.

Botha, H.K., C.H. Van Niekerk and R.F.E. Pagel, 1975. Influence of Synchronization of the Oestrus Period-PMSG Administration and Flushing on Oestrus and Conception of S. African Mutton Merino Ewes. S. Afr. J. Anim. Sci.,5:231-233.

Bryant, M.J. and T.Tomkins, 1975. The Flock-Mating of Progestagen-Synchronized Ewes 1.The Influence of Ram-To-Ewe Ratio Upon Mating Behavior and Lambing Performance . Anim. Prod., 20: 381 – 390.

Cole, H.H. and G.F. Hart, 1930. Potency of Blood Serum of Maresin Progressive Stages of Pregnancy in Effecting Sexual Maturity of Immature Rats. Am. J. Physiology 39:57.

Dutt, R.H. and L.E. Casida , 1948. Alteration of the Oestrual Cycle in Sheep by Use of Progesterone and its Effect Upon Subsequent Ovulation and Fertility . Endocrinology 43: 208 – 217.

El-Mekkawi, F.M., 1965. Progesterone and Pregnant Mare Serum (PMS) In The Control of Lambing Percentages In Awassi Ewes. J. Vet. Sci., 1: 49 – 56.

Gordon , I., 1958. The Hormonal Augmentation of Fertility In The Ewe During The Breeding Season J. Agric. Sci. Camb. 50 : 123.

Hadjicostis, A.P., 1980. Control The Ovarian Cycle By The Use of Hormonal Stimulants . Sci. Rep., Vet. Services, Cyprus.

Hammond, J.J.N.R., J. Hammond and A.S. Parkes, 1942. Hormonal Augmentation of Fertility in Sheep. Induction of Ovulation Super Ovulation and Heat . J. agric. Sci., Cambridge, 32: 308 – 323.

Harb, M.,1994.The Use of Intravaginal Progesterone Sponges and PMSG in Controlling Reproduction of Awassi Sheep. Dirasat 21: 149 – 161.

Husein, M.Q. and R.T. Kridli, 2002. Reproductive Responses of Awassi Ewes Treated With either Naturally Occurring Progesterone or Synthetic Progestagen. Asian – Aust. J. Anim. Sci. 15: 1257 – 1262.

Jalhoom, A.G., 1983. Effect of Prostaglandins F2á and Progesterone Hormones on Reproductive Performance in Awassi Ewes. M.Sc. Thesis , University of Baghdad , Iraq.

Juma, F.T. and Riyadh M.H. Al-Wahab, 1987. Fertility Augmentation in Barren Hamadani and Karradi Ewes Treated with Exogenous Hormones. J. Iraqi Agric. Sci. 18: 331- 341.

Kareem, R.N., 1984. Improvement of Reproductive Efficiency of Arabi Ewes Using Hormonal Manipulations. MSc. Thesis, University of Basra , IRAQ.

Larson, W.M., E.D.Banbury and C.W. Spaeth, 1970. Effect of Previous Lambing Rate on Response to P.M.S.G. J. Anim. Sci., 3: 225.

Lubbadeh, Wadie F., 1986. The Use of Progesterone and PMSG in The Control of Estrus and Twinning in Awassi Sheep. Dirasat 8: 85 – 91.

Markotic, B., H.P. Mader, K. Al-Omary, N.A. Salah and A. Neimat,1976. Report On Effects of Synchromate and P.M.S. on Fertility and Prolificacy of The Awassi Ewe. F.A.O. Technical Report, No. 21, Baghdad, Iraq.

O'mary, C.C., A.L. pope and L.E. Casida, 1950. The Use of Progesterone in The Synchronization of The Oestrual Periods in a group of Ewes and The Effect on Their Subsequent Lambing Records. J. Anim. Sci., 9: 499- 503.

Steel, Robert, G.D. and H. Torrie James, 1981. Principles and Procedures of Statistics, Mc-Graw-Hill.