OBSERVATIONS ON GESTATION AND PARTURITION IN GOAT- CAPRA HIRCUS

BY

K. K. KURIAKOSE

THESIS

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DECLARATION

I hereby declare that this thesis entitled "OBSERVATIONS ON GESTATION LENGTH AND PARTURITION IN GOAT - CAPRA HIRCUS" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, followship, or other similar title, of any other University or Society.

Mannuthy
31-7-1987.

K.K. KUNIARAJU

CERTIFICATE

Certified that the thesis entitled "OBSERVATIONS ON GESTATION AND PARTURITION IN GOAT - CAPRA HIRCUS" is a record of research work done independently by Sri. K.K.Kurinkose, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

Mannuthy,
31-7-1981.

Dr. C.P. Neelakanta Iyer,
Associate Professor,
Department of Animal
Reproduction.

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INTRODUCTION

INTRODUCTION

The goat has for ages been a producer of milk, meat and valuable farm manure to several thousands of small farmers and rural agricultural labourers in India. With less capital involvement and resources, even the poorest landless agricultural labourer can keep a goat or two to give some milk for the family and provide additional income by sale of kids. Docile in nature and cleaner in habits than either cows or buffaloes, goats are popular as milch animals among the rural folks. In fact, backyard goatery is not an uncommon sight in Indian villages.

India is estimated to possess about one fourth of the global goat population of 383 millions. The goats contribute about 35.1 percent of the total meat production of about 355 million kg and three per cent of the total milk output of seven lakh tonnes in the country. Goat husbandry is an important livestock enterprise of the Kerala State also. According to the livestock census (1971) the goat population in the State is about 16 lakhs which stands next to cattle population. With reduction in arable land and with the availability of labour, there is great scope to develop goat husbandry into a small scale rural industry in the State.

Inspite of the numerical superiority over sheep, contribution of goats towards national economy by way of

milk and meat production cannot be considered adequate. The reason for this could be attributed to the inherently poor genetic makeup of the Indian goats coupled with the lack of concerted efforts to improve the goat by scientific breeding and sound management practices. The need to have an integrated project for improving the indigenous goat breeds and popularising them amongst the large number of small farmers to boost up goat farming in India has been realised only recently. This has resulted in the launching of the "National Co-ordinated Research Project on Goat for Milk/Meat"By the Government of India. One of the units of this ambitious project has been functioning in Kerala State at the Kerala Agricultural University with the declared objectives of producing different crosses of Malabari goats with exotic breeds such as Alpine and Saanen and testing their performances in respect of adaptability and total milk production.

It cannot be denied that attempt to increase the production potential in any species of livestock is directly related to the reproductive efficiency of the animals concerned. Increased emphasis placed on the accelerated production in goats, therefore, warrants urgent need for a better understanding of the chain of events in their reproductive processes. The reproductive traits of goats

described in literature are scanty and scattered and are based mostly on the studies carried out on the closely related species, sheep. Even the limited literature available in this regard is mainly confined to exotic breeds. Comparatively very little is known in respect of Indian breeds, much less so as applied to the crossbred goats.

The gestation and parturition are the two important and critical periods in the reproductive processes of females. From a perusal of literature it is seen that there is paucity of information on these two aspects in goats. Fundamental knowledge on gestation and stages of parturition is necessary for any surgical intervention at the appropriate time without risking the life of the dam and the offspring. The present investigation has been undertaken with this principal object in view.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Informations available on the gestation and process of parturition are scanty as far as the goats are concerned. However, a great deal of work has been carried out in this regard in sheep. A brief account of the salient observations so far made on these aspects is given below.

Gestation period

Hamin and Datta (1937) reported 146 days as the average gestation period in Jamnapari goats. Santiago (1946) observed that the gestation period of Saanen, Toggenburg, Anglonubian and native goats of Auga Branca was 152, 151, 148 and 145 days respectively. Asdell and Marquardt (1954) reported the gestation length to be in the range of 145 to 155 days with a mean of 150 days. The gestation period in Indian goats has been found to range from 147 to 150 days (Lal, 1954). According to Gupta and Som (1964) the average gestation length in Black Bengal goats was 144.33 ± 0.17 days. Roberts (1971) reported that the gestation period in goats was in the range of 148 to 156 days. The mean gestation period in Angora goats has been reported to be 148.51 days by Dadawy *et al.* (1972). In Malabari goats, Sudarsanan and Raja (1973) observed that the length of

gestation ranged from 142 to 152 days with a mean of 146.2 days. Peaker (1978) observed that the gestation length in British Saanen goats was 150 days within a range of 135 to 159 days. A mean gestation length of 150 days was recorded in goats by Bliss (1979). Bhatnagar et al. (1979) reported that the mean gestation length during the first and second conceptions was 149.00 ± 0.70 and 150.00 ± 0.70 days respectively in Beetal and Alpine x Beetal cross goats.

Mahajan et al. (1970) reported that male lambs were carried a little longer than female lambs. Thrift and Dutt (1972) also found slightly higher gestation period for male lambs, though the difference was not significant. However, Alfranca (1972) did not observe any variations in gestation length between sex of the lambs. Kaushish and Arora (1974) recorded lengthier gestation period for male lambs in Nali, Nellore x Nali and Mandhia x Nali breeds of sheep, but in Lohi breed of sheep the situation was found to be reverse. Nelson (1976) also reported lengthier gestation period in ewes which carried male lambs. Gill and Dev (1972) observed that the gestation periods undergone by the male kids were lengthier than those by female kids in Anglonubian goats, the variation being attributed to higher birth weight of male kids as compared to females.

According to Peaker (1978) the gestation length in goats decreased when litter size increased. However, Bhatnagar et al. (1979) reported that the gestation length of Alpine goats remained unchanged irrespective of whether the kids were born as single, twins or triplets.

Influence of season on the incidence of kidding

Gupta and Som (1964) observed that the rate of kidding was frequent in summer, lesser during winter and lowest during monsoon. Gill and Dev (1972) reported maximum kiddings during March in French Alpine and during February in Anglonubian. In Jamnapari goats Singh and Singh (1974) noticed significant difference in the kidding rate between months with 69.3 per cent of kidding occuring in October - December and none in April. Haumesser (1976) observed maximum kiddings in February - April among Red Sokato goats. In Jamnapari goats Wani et al. (1980) reported high rate of kidding during November - February. Mathai and Nair (1980) did not observe any significant difference in the rate of kidding between seasons in Malabari, Alpine x Malabari and Saanen x Malabari goats.

Incidence of multiple birth

Shanmughasundaram (1957) reported that out of the total kiddings in Malabari goats, 50 per cent were twins, 42 per cent were singles and 8 per cent were triplets and quadruplets. Wilson (1958) reported 77.6 per cent of multiple births in Black Bengal goats with a break up of 54 per cent twins, 20.9 per cent triplets and 2.7 per cent quadruplets. Tantawy and Ahamed (1960) reported that sequence of kiddings, age and weight of the dam affected the incidence of multiple births which increased upto fifth kidding. According to Mukundan and Rajagopal (1970) the percentage of incidence of single, twins and triplets in Malabari goats was 47, 42.4 and 10.6 respectively. Sudarsanan and Raja (1973) reported that the frequency of occurrence of single, twins and triplets in Malabari goats was 47.06 per cent, 35.29 per cent and 17.65 per cent respectively.

Signs of approaching parturition

Roberts (1971) reported that the signs of approaching parturition in goats and sheep were similar to those in cows. Relaxation of sacrosciatic ligaments has been observed as a prominent sign of approaching parturition in cows by Eubank (1963), Roberts (1971) and Madu and Maikini (1979).

A drop in body temperature was observed in the dairy cows nearing parturition by different workers (Volman and Volman, 1940; Pemsel, 1951; Graf and Petersen, 1953 and Ewbank, 1963). An observation similar to this has been recorded in the case of sheep by Winfield and Makin (1975). However, Jones and Hifton (1971) did not find any significant fluctuation in body temperature of goats during the last ten days of pregnancy.

Avitan (1979) stated that hollow flank, distended shining udder, swollen vulva and white vaginal discharge were the characteristic signs of approaching parturition in goats.

Stages of parturition

Roberts (1971) and Hafez (1974) divided the process of parturition in domestic animals into three distinct stages viz. first, second and third. Though no detailed observations appeared to have been made on the stages of parturition in goats, there are few reports available in this regard in respect of sheep. According to Roberts (1971) the first stage of parturition in the case of ewe lasted 2 to 6 hours. Kaushish and Arora (1974) reported that the duration of the first stage of parturition ranged from 288 to 463 minutes in the case of Nali and Lohi breeds of sheep and their crosses with Nellore and Mandhia. They

also observed significant differences in the duration of first stage of labour between the genetic groups in Chokla sheep. Bhaik and Kohli (1980) reported that the first stage of labour in male and female lambings of Chokla ewes averaged 77.0 ± 6.18 minutes and 46.14 ± 6.26 minutes respectively. The corresponding figures in respect of Magra ewes was 41.89 ± 2.80 and 46.35 ± 3.10 (Bhaik and Kohli, 1980).

Marshal and Halman (1932) and Salisbury and Van Demar (1961) reported that the duration of second stage of parturition in ewes was about 15 minutes. Tiwari et al. (1969) recorded the duration of the second stage of parturition of primiparous and multiparous ewes as 24.0 ± 6.0 minutes and 16.0 ± 3.15 minutes respectively. Kaushish and Arora (1974) observed that the second stage of parturition lasted from 33 to 39 minutes in ewes of different genetic groups. They also reported that the time taken for the expulsion of the foetus was inversely proportional to the weight of the lamb. The duration of the second stage of parturition in Chokla and Magra ewes as recorded by Bhaik and Kohli (1980) was 22.5 ± 2.3 minutes and 25.33 ± 2.06 minutes respectively. The lone report available on the duration of second stage of parturition in goats is that o Tiwari et al. (1969) who found it to be 22.8 ± 6.0 minutes

Tiwari et al. (1969) observed that the duration of the third stage of parturition was 220.0 ± 23.1 minutes and 154.0 ± 15.3 minutes respectively in primiparous and multiparous ewes. Roberts (1971) stated that the third stage of parturition lasted from 0.5 to 0.8 hours in ewes. Kaushish and Arora (1974) reported 124 to 155 minutes as the duration of third stage in ewes with male lambings consuming more time than the female lambings. They also found that the duration of the third stage had a negative correlation with the weight of the lamb. Bhatia and Kohli (1980) observed that the duration of the third stage of parturition in Chokla and Magra ewes was 203.0 ± 3.0 and 207.0 ± 4.0 minutes respectively. In goats Tiwari et al. (1969) found that the third stage of parturition lasted for 150.0 ± 4.5 minutes on an average.

Placental studies

Tiwari et al. (1969) reported an average placental weight of 0.37 ± 0.07 kg in the case of goats. Prasad and Pandey (1981) observed that the mean weight of placenta in single and twin births of Barbari goats was 0.207 ± 0.123 kg and 0.380 ± 0.158 kg respectively. The weight of the foetal membranes differed significantly between single and twin births (Prasad and Pandey, 1981).

Martin (1904) observed 88 to 96 maternal caruncles arranged in four rows in the case of goats. Bhasin et al. (1951) observed an average of 102 foetal cotyledons in goats. Lyngsot (1968) reported that the whole uterus contained 120 to 125 caruncles. According to Tiwari et al. (1969) the average number of medium sized foetal cotyledons was 92.5 equally distributed on the placenta of single as well as twin kids. Nair and Raja (1973) observed that in goats the distribution of maternal caruncles was usually regular appearing in four rows, but it might occur sometimes irregularly. According to them the maternal caruncles were usually round or somewhat elliptical but with the advancement of gestation they would assume flat and elongated shape. The number of cotyledons was found to range from 65 to 130 with a mean of 104.09 (Nair and Raja, 1973). Prasad and Pandey (1981) observed that the total number of foetal cotyledons in single and twin pregnancies was 104.24 $\pm$ 0.95 and 111.21 $\pm$ 3.44 respectively

In cattle, Kadu and Kaikini (1975) and Rao and Rao (1979) found significant positive correlation between the weight of the placenta and birth weight of calf. However, similar studies appeared to have not been made in goats.

MATERIALS AND METHODS

MATERIALS AND METHODS

A total of 85 does comprising of 27 Malabari, 33 Alpine x Malabari crosses and 23 Saanen x Malabari crosses were selected to study the gestation length, process of parturition and the placental details. The animals were maintained under identical conditions of feeding and management at the unit of "All India Co-ordinated Research Project on Goats for Milk" jointly sponsored by Indian Council of Agricultural Research and Kerala Agricultural University at the College of Veterinary and Animal Sciences, Mannuthy. In addition, 583 breeding particulars gathered from the registers maintained at the Project were also utilised for assessing the gestation length and incidence of multiple births.

Gestation length

The gestation length was calculated as the interval between the date of effective service and the date of kidding inclusive of one day only. The data on the gestation length were statistically analysed to determine the variations, if any, between genetic groups, between parity, between sex of kid and between seasons of kidding (Snedecor and Cochran, 1967). To study the effect of parity and sex of the kid, only single pregnancies were considered. To evaluate the seasonal effect, the year was

divided into three seasons as indicated below following Mathai and Raja (1976).

Summer : February to May

Rainy : June to October

Winter : November to January

Signs of approaching parturition

All the 85 does were closely watched thrice a day, one month prior to the expected day of parturition. The propartum changes in the external genitalia and pelvic ligament were recorded. Special attention was given to the changes of udder and teat, degree of tumefaction of vulva, relaxation of pelvic ligaments and extent of liquifaction of cervical seal. In addition, the rectal temperature of ten randomly selected does from each genetic groups was recorded daily in the morning and evening from day 135 of the gestation till the onset of parturition.

Stages of parturition

The duration of parturition was arbitrarily divided into three stage viz. first stage or dilatation of cervix, second stage or expulsion of foetus and third stage or expulsion of foetal membranes following Hafez (1974).

The period between the commencement of the labour pain and the rupture of the first water bag was reckoned

as the first stage of labour.

The period from the rupture of the first water bag to the expulsion of the first foetus was considered as the second stage of parturition in single births and the interval between the rupture of the water bag of the first foetus and expulsion of all foetuses in multiple births. The duration of the second stage was noted in sequence as the rupture of the first water bag to appearance of amniotic sac (phase 1), the appearance of the hooves and muzzle in the intact aminiotic sac (phase 2), rupture of aminiotic sac (phase 3) and the expulsion of the body (phase 4). The interval between the expulsion of two successive foetuses in multiple births was also recorded. In addition, presentation, position and posture of the foetus in single and multiple births were noted. The birth weight of the kids was recorded using a spring balance immediately after delivery.

The third stage of parturition was considered as the interval between the expulsion of the foetus and the expulsion of the foetal membranes in single birth. In the case of multiple births, the interval between the expulsion of last foetus and the expulsion of all placenta was reckoned as the duration of third stage.

The data on different stages of parturition were

analysed to study the variations, if any, between genetic groups (Snedecor and Cochran, 1967).

Placental details

Forty eight placentae of single birth and 37 placentae of twin births from the three genetic groups were used to study the placental details. The weight of the placenta was recorded using a pan balance. The placentae were spread out on a work bench and the number and size of cotyledons present in the gravid and non gravid horns were separately noted. The size of the cotyledons was classified as large (above 3 cm), medium (between 1 to 3 cm) and small (below 1 cm). The data were analysed to study the variations in the total number of cotyledons in different genetic groups and correlation between birth weight of kid and placental weight and birth weight of kid and number/size of the cotyledons (Snedecor and Cochran, 1967). The number of cotyledons were also classified according to gravid and non gravid horns on single and multiple pregnancy and analysed.

RESULTS

RESULTS

Gestation lengths of goats of different genetic groups are presented in table-1. The overall gestation length was found to be 146.66 ± 0.53 days within the range of 132 to 165 days. The gestation length of Malabari, Alpine x Malabari and Saanen x Malabari does in single births was observed as 146.25 ± 0.35, 146.76 ± 0.35 and 148.80 ± 0.78 days respectively. The corresponding values in respect of multiple births were 145.98 ± 0.31, 145.80 ± 0.65 and 147.55 ± 0.75 days in the above order. Analysis of the data revealed that there was no significant difference in the gestation length between the genetic groups both in single and multiple births (Table-2 and 3).

The data furnished in tables 4 and 5 showed that parity had no significant influence on the length of gestation in does, the mean values for the first, second and third kiddings being 146.18 ± 0.68, 146.88 ± 0.51 and 147.44 ± 0.40 days respectively.

The mean gestation period of goats carrying male and female kids was noted to be 146.56 ± 0.34 days and 146.84 ± 0.33 days respectively (Table-6), the difference in the values being non significant (Table-7).

The data pertaining to seasonal influence on gestation length are set out in table-8. The mean gestation length during summer, rainy and winter seasons was found to be 146.48 ± 0.27, 146.95 ± 0.31 and 147.10 ± 0.33 days respectively. Analysis of the data showed that season did not exert any significant influence in the gestation length in goats (Table-9).

The frequency of occurrence of single, twin and multiple births was observed to be 50.75 per cent, 45.06 per cent and 4.19 per cent respectively. The percentage of kidding during day (6 a.m. to 6 p.m) and night (6 p.m. to 6 a.m.) was found to be 69.41 and 30.59 respectively.

Signs of approaching parturition

Tumefaction of vulva, udder engorgement and relaxation of the pelvic ligaments were the prominent symptoms observed (Table-10). At day seven prior to parturition, majority of the animals revealed only slight to moderate degree of these changes. There was a progressive increase in the intensity of the signs in does nearing parturition. On the day prior to delivery, majority of the animals showed high degree of vulval tumefaction (57.64%), udder engorgement (77.64%) and relaxation of the pelvic ligaments (63.52%). Colostrum was observed for the first time in 30 (35.29%) animals at day

four prior to parturition. The presence of colostrum was evident in all the animals two days before kidding. Though liquifaction of the cervical mucus was observable only in ten animals on day six prior to parturition, visible flow of cervical mucus was detectable in 75 does on day two prior to delivery and in all, 24 hours before kidding. There was no significant fluctuation in the rectal temperature during the prepartum period (Table-11 and 12).

Stages of parturition

The data on the duration of the stages of parturiti of does of different genetic groups in single births are set out in tables- 13 to 17. The mean duration of the first stage of parturition in Malabari, Alpine x Malabari and Saanen x Malabari was observed to be 175.90 ± 21.33, 204.20 ± 17.70 and 224.58 ± 45.56 minutes respectively i single births (Fig. 1). The corresponding values for th second stage were 23.63 ± 2.75, 20.40 ± 1.42 and 20.60 ± 1.80 minutes in the above order (Fig. 2).

The duration and the various phases of second stage parturition in single births are furnished in table-18 an figures 3 to 10. The mean durations of the first, secon third and fourth phases in Malabari goats was observed t

5.82 ± 0.87, 2.91 ± 0.46, 6.27 ± 0.96 and 8.64 ± 0.93 minutes respectively. In Alpine x Malabari and Saanen x Malabari the corresponding values were recorded as 4.28 ± 0.33, 2.32 ± 0.16, 6.0 ± 0.51 and 7.8 ± 0.58 and 4.25 ± 0.43, 2.33 ± 0.31, 5.58 ± 0.61 and 7.83 ± 0.73 minutes respectively. The does were in recumbancy in 83.3 per cent of kidding and in standing position (Fig. 11) in the remaining.

The duration of the third stage in Malabari, Alpine x Malabari and Saanen x Malabari averaged 161.36 ± 18.43, 125.20 ± 5.78 and 150.83 ± 21.56 minutes respectively in single births (Fig. 12). The total duration of parturition in single births was noted as 360.91 ± 30.85, 358.20 ± 16.67 and 395.42 ± 40.09 minutes in Malabari, Alpine x Malabari and Saanen x Malabari goats respectively.

The results from the study of parturition involving 37 multiple births are furnished in tables 19 to 23. The mean durations of the first stage were found to be 190.0 ± 21.19 (65-345), 205.0 ± 24.51 (99-325) and 202.27 ± 21.48 (130-340) minutes respectively in Malabari, Alpine x Malabari and Saanen x Malabari goats. While the durations of the second stage averaged 31.0 ± 1.95, 32.20 ± 2.61 and 29.63 ± 2.08 minutes in Malabari, Alpine x Malabari and Saanen x Malabari goats respectively, the values in respect of the third stage were noted to be 138.12 ± 11.03, 120.6 ±

8.93 and 136.82 ± 9.96 minutes in that order. The total durations of parturition was 359.12 ± 26.15, 357.20 ± 32.23 and 368.73 ± 24.03 minutes respectively in the three genetic groups. The interval between the expulsion of two successive foetuses was found to be 12.12 ± 0.88, 12.90 ± 0.93 and 11.82 ± 0.90 minutes in Malabari, Alpine x Malabari and Saanen x Malabari goats respectively.

Analysis of the data showed that there was no significant variation between genetic groups in the duration of different stages of parturition both in single and multiple births.

Placenta

The weight of placenta and number/size of cotyledons of does in different genetic groups in single and multiple births are presented in tables 24 to 27 and figures 13 and 14. The mean weight of placenta in Malabari, Alpine x Malabari and Saanen x Malabari goats was found to be 251.82 ± 13.85, 277.60 ± 9.49 and 270.42 ± 14.54 gm respectively in single births. The total number of cotyledons in the above genetic groups was observed as 99.73 ± 2.86, 101.32 ± 1.68 and 103.54 ± 2.47 respectively. The weight of placenta in Malabari, Alpine x Malabari and Saanen x Malabari was observed to be 343.44 ± 10.70,

365.00 ± 14.53 and 363.64 ± 16.18 gm respectively in multiple births. The total number of cotyledons in the above genetic groups was 107.94 ± 2.24, 107.20 ± 3.01 and 111.82 ± 2.99 in the respective genetic groups. Analysis of the data showed that the weight of the kids was positively correlated to the weight of the placenta, number of large, medium and total number of cotyledons and negatively correlated to the small sized cotyledons.

The total number of cotyledons in the gravid and non gravid horns were respectively noted as 58.91 ± 1.90 and 41.00 ± 1.28 in Malabari; 56.56 ± 0.98 and 44.68 ± 0.92 in Alpine x Malabari and 62.25 ± 1.98 and 41.25 ± 1.08 in Saanen x Malabari goats (Table-28). Analysis of the data showed that the total number of cotyledons in the gravid horns was significantly higher than that of non gravid horns. It was also observed that the weight of placenta as well as the number of cotyledons in multiple pregnancy were significantly higher than those in single pregnancy in all the genetic groups (Table-29).

FIGURE - 1

Duration of first stage of parturition in single and multiple births of different genetic groups.

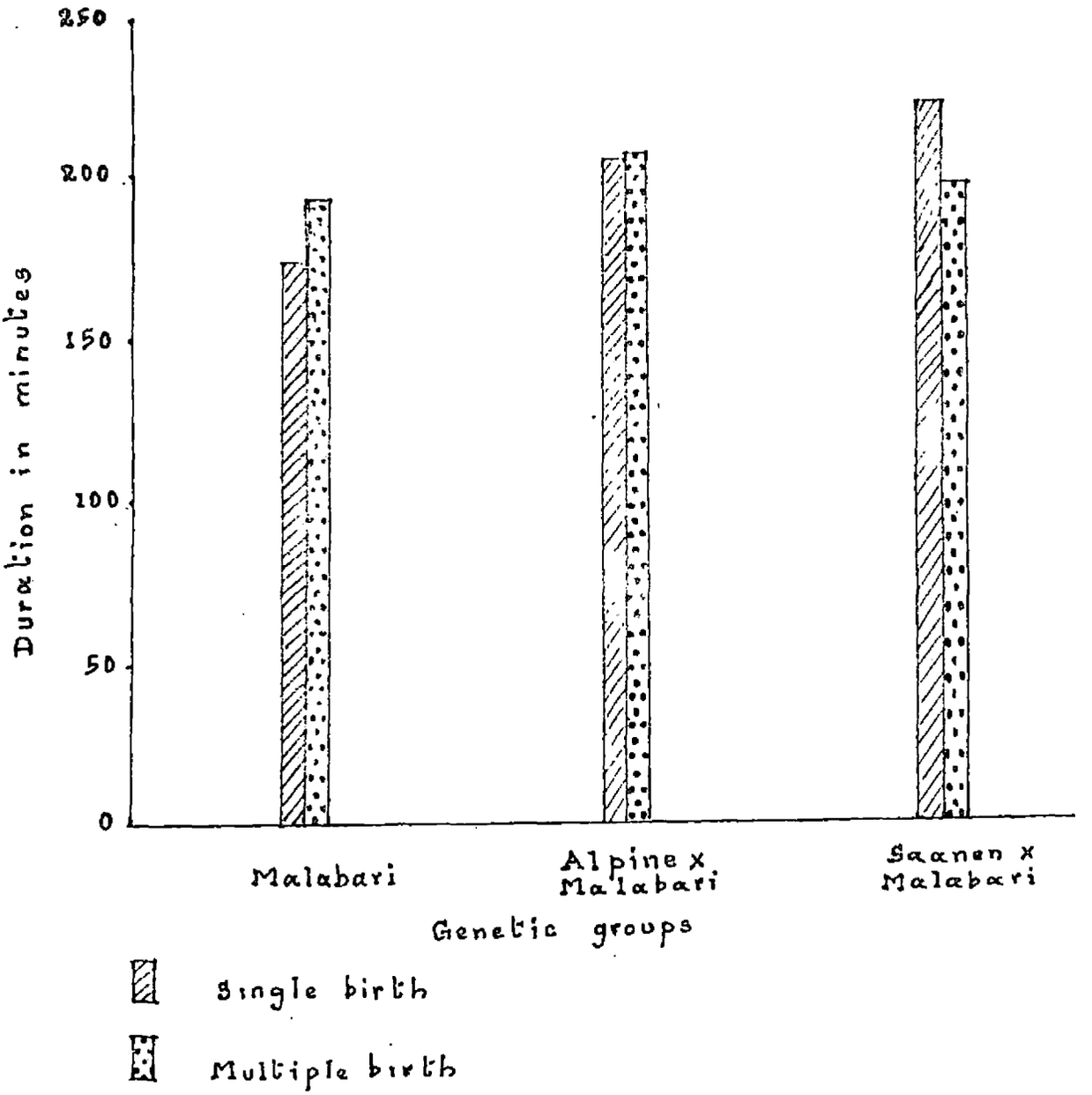

FIGURE - 2

Duration of second stage of parturition in single and multiple births of different genetic groups.

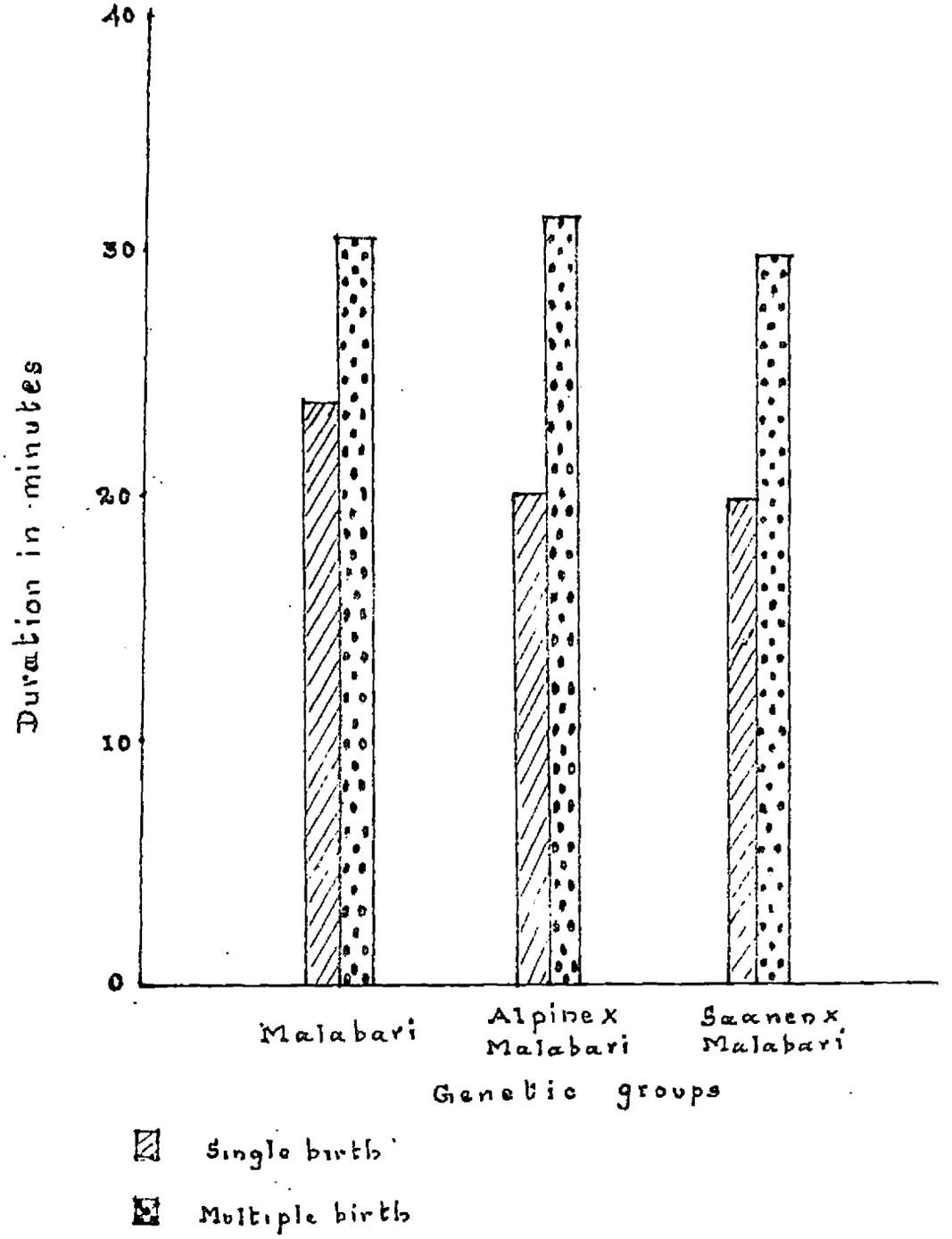

Fig. 3. Animal showing acute straining with arched back and raised tail.

Fig. 4. The animal with arched back and raised tail revealing part of the intact amniotic bag at the vulva.

FIGURE . 3

FIGURE . 4

FIGURE - 3

FIGURE - 4

FIGURE . 3

FIGURE . 4

FIGURE . 5

FIGURE . 6

Fig. 7. Amnion more exposed - appearance of hooves within the intact amnion.

Fig. 8. Intact amnion with head and hooves inside.

FIGURE - 7

FIGURE - 8

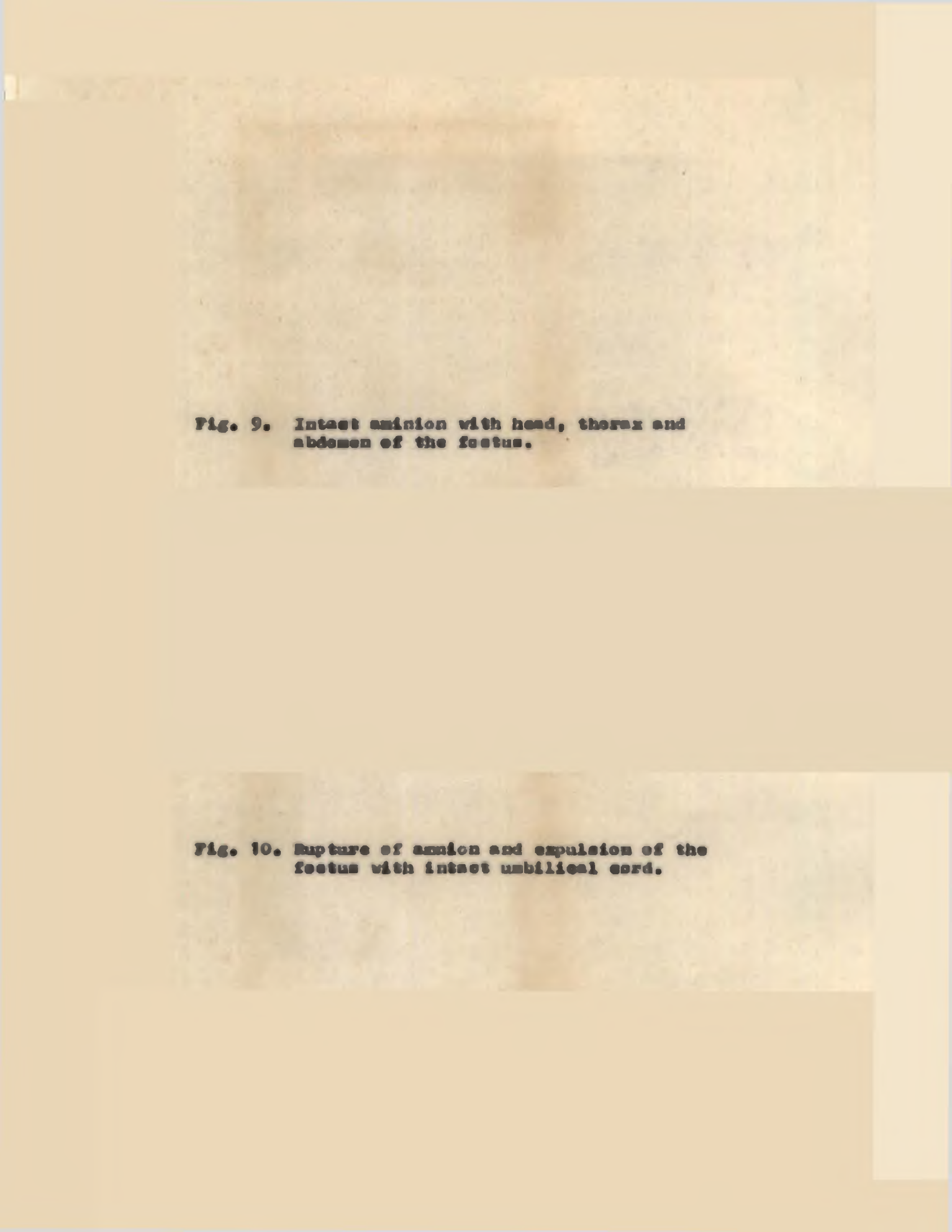

Fig. 9. Intact amnion with head, thorax and abdomen of the foetus.

Fig. 10. Rupture of amnion and expulsion of the foetus with intact umbilical cord.

FIGURE - 9

FIGURE - 10

Fig. 11. Expulsion of the foetus in the standing position.

FIGURE - 11

FIGURE .12

Duration of third stage of parturition in single and multiple births of different genetic groups.

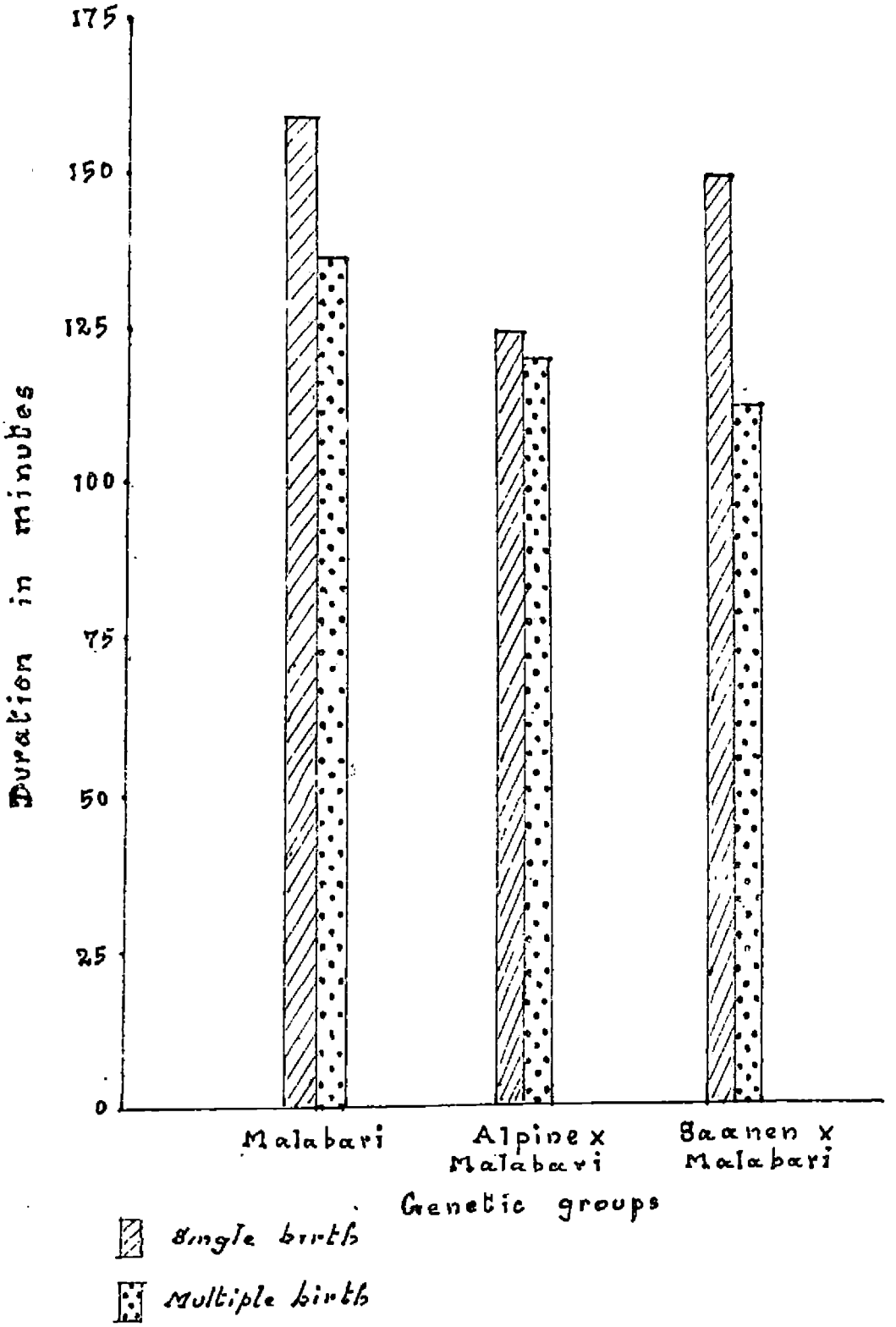

FIGURE-15

Weight of placenta in single and multiple births in different genetic groups.

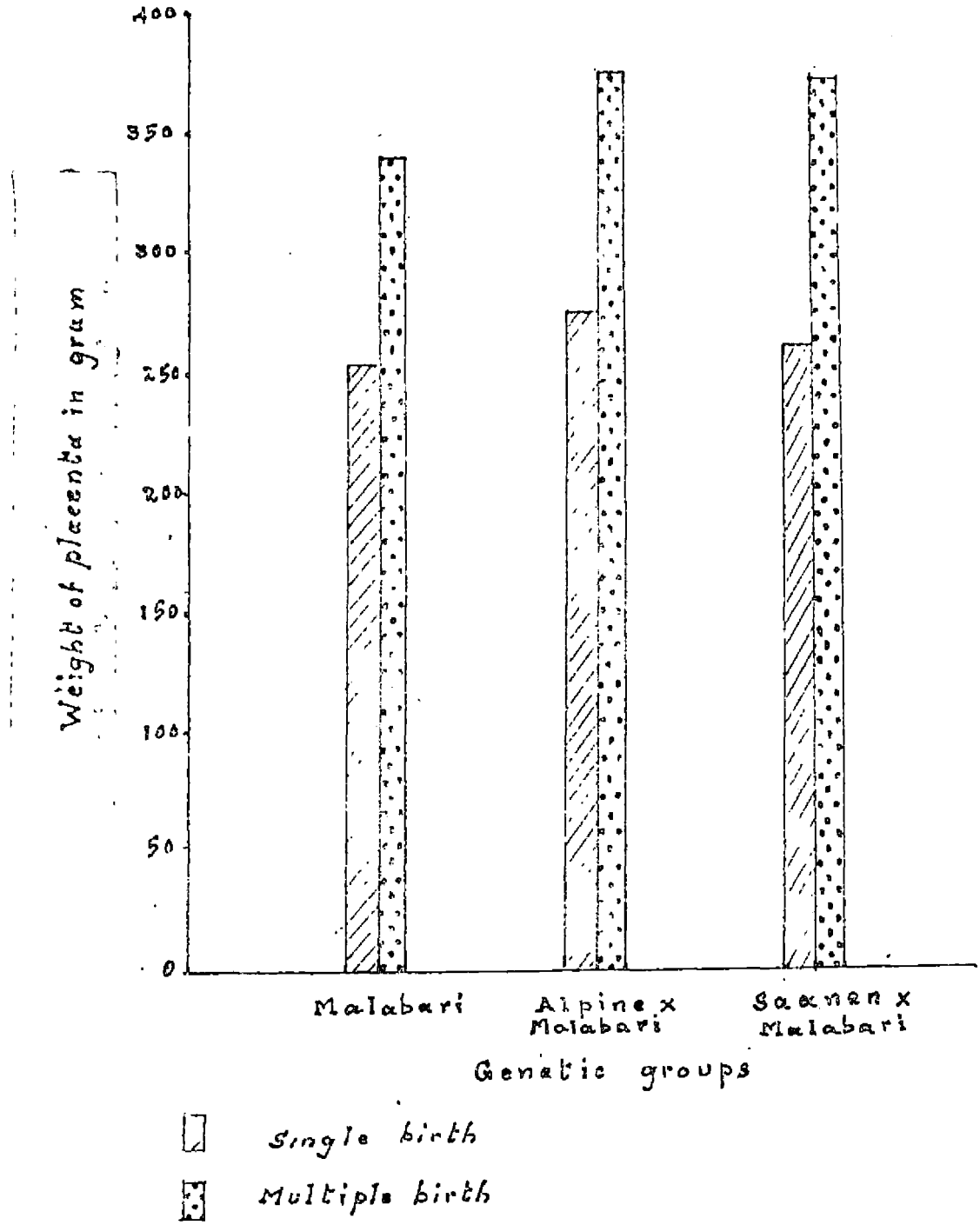

FIGURE-14

Number of cotyledons in single and multiple births in different genetic groups.

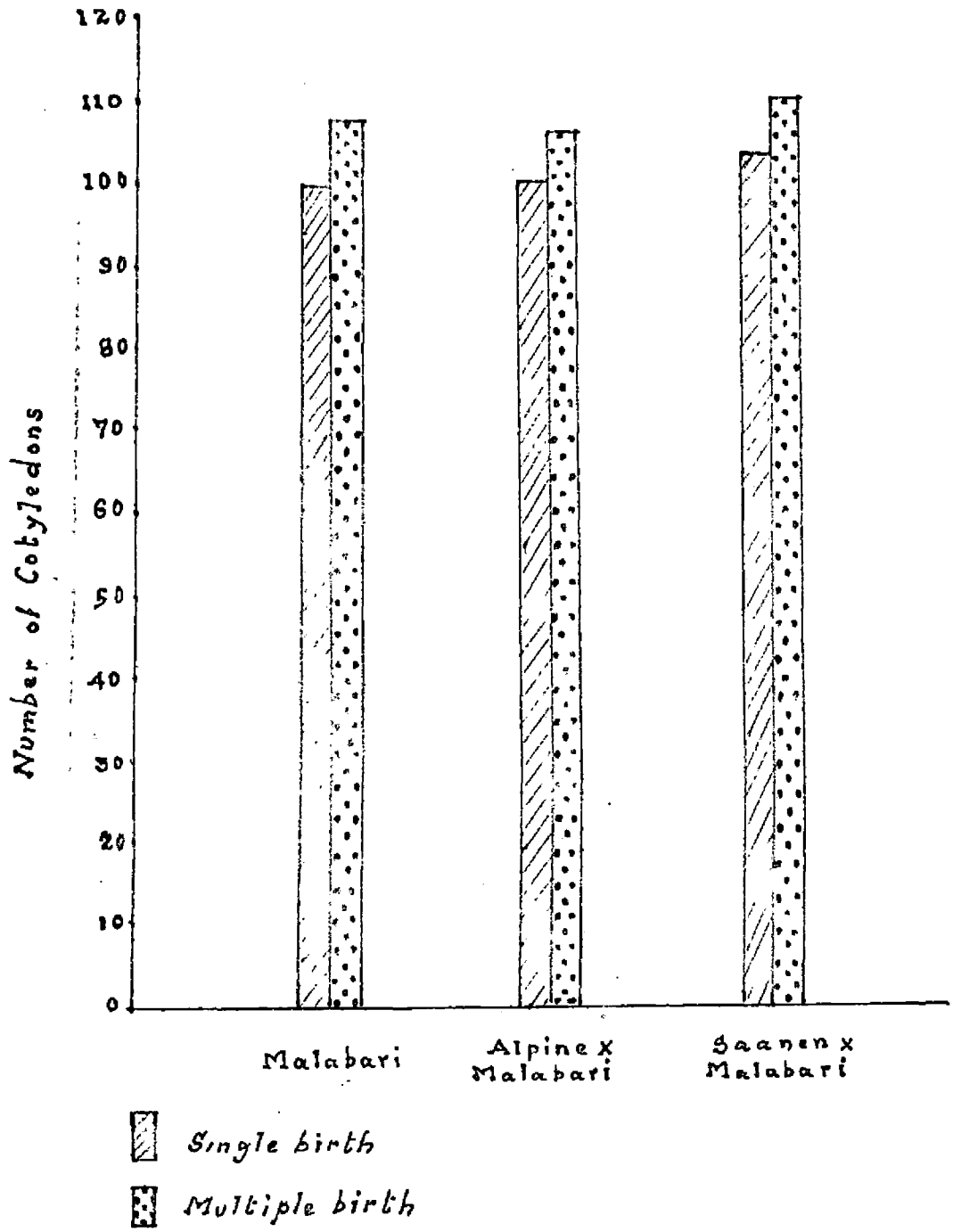

Table 1. Gestation length of does of different genetic groups (days)

Type of births	Malabari			Alpine x Malabari			Saanen x Malabari			Total		
	No	Range	Mean	No	Range	Mean	No	Range	Mean	No	Range	Mean
Single birth	174	133-162	146.25 ± 0.35	125	132-160	146.76 ± 0.35	40	134-165	148.80 ± 0.78	339	132-165	146.74 ± 0.88
Multiple birth	223	137-160	145.98 ± 0.31	46	138-159	145.80 ± 0.65	60	138-160	147.55 ± 0.75	329	137-160	146.58 ± 0.75
Total	397	133-162	146.10 ± 0.35	171	132-160	146.50 ± 0.62	100	134-165	148.05 ± 0.58	668	132-165	146.66 ± 0.53

Table 2. Gestation length

Analysis of variance - Single birth

Source	DF	SS	MS	F
Between genetic groups	2	396.0230	198.0115	2.61 NS
Error	336	25482.9563	75.8421	- -
Total	338	25878.9793	- -	- -

NS - Not significant

Table 3. Gestation length

Analysis of variance - Multiple birth

Source	DF	SS	MS	F
Between genetic groups	2	126.5297	63.2649	0.84 NS
Error	326	24470.0174	75.0614	- -
Total	328	24596.5471	- -	- -

NS - Not significant

Table 4. Gestation length and parity (Single birth)

Parity	Gestation length (days)		
	No. of observations	Range	Average
1st kidding	153	134 - 157	146.18 ± 0.68
2nd kidding	60	133 - 157	146.88 ± 0.51
3rd kidding	126	134 - 162	147.44 ± 0.40
Total	339	133 - 162	146.72 ± 0.83

Table 5. Gestation length and parity (single birth)

Analysis of variance

Source	DF	SS	MS	F
Between parity	2	109.421	54.7106	2.84 NS
Error	336	6460.037	19.2263	- -
Total	338	6569.458	73.9369	- -

NS - Not significant

Table 6. Gestation length and sex of kid (single birth)

Sex of kid	Gestation length (days)		
	No. of observations	Range	Mean
Male	185	132 - 165	146.56 ± 0.34
Female	154	137 - 160	146.84 ± 0.33
Total	339	131 - 165	146.76 ± 0.68

Table 7. Gestation length and sex of kid (single birth)

Analysis of variance

Source	DF	SS	MS	F
Between sex	1	6.6315	6.6315	0.35 NS
Error	337	6420.5956	19.0522	- -
Total	338	6427.2271	25.6837	- -

NS = Not significant

Table 8. Gestation length in relation to season of kidding

Season	Gestation length (days)		
	No. of observations	Range	Mean
Summer (February-May)	293	132 - 165	146.48 ± 0.27
Rainy (June-October)	191	133 - 160	146.95 ± 0.31
Winter (November-January)	184	131 - 160	147.10 ± 0.33
Total	668	131 - 165	146.77 ± 0.53

Table 9. Gestation length in relation to season of kidding

Analysis of variance

Source	DF	SS	MS	F
Between season	2	51.3883	25.6942	1.24 NS
Error	665	13821.8497	20.7847	- -
Total	667	13873.2380	45.4789	- -

NS - Not significant

Table 10. Signs of approaching parturition

Days prior to parturition	Vulval tumefaction			Udder engorgement			Relaxation of pelvic ligaments			Colostrum	Liquifaction of cervical mucus
	S	M	I	S	M	I	S	M	I	Present	Observed
7	52.94% (45)	36.47% (31)	10.58% (9)	14.12% (12)	80.00% (68)	5.88% (5)	35.29% (30)	55.29% (47)	9.41% (8)	NIL	NIL
5	40.00% (34)	37.64% (32)	15.29% (13)	11.76% (10)	80.00% (68)	8.23% (7)	30.58% (26)	51.76% (44)	17.64% (15)	NIL	11.76% (10)
4	31.76% (27)	45.88% (39)	22.35% (19)	4.70% (4)	77.64% (66)	17.64% (15)	24.70% (21)	52.94% (45)	22.35% (19)	NIL	23.52% (20)
3	22.35% (19)	47.05% (40)	30.58% (26)	--	72.94% (62)	27.05% (23)	20.00% (17)	55.29% (47)	24.70% (21)	35.29% (30)	37.64% (32)
2	12.94% (11)	43.52% (37)	43.52 (37)	--	60.00% (51)	40.00% (34)	12.94% (11)	52.94% (45)	34.11% (29)	70.58% (60)	64.70% (55)
1	4.7 (4)	37.64% (32)	57.64% (49)	--	49.41% (42)	50.58% (43)	7.05% (6)	48.23% (41)	44.70% (38)	100.00% (85)	88.23% (75)
[illegible]				--	22.35%	77.64%	3.52%	32.94%	63.52% (54)	100.00% (85)	100.00% (85)

Table 11. ** Rectal temperature prior to parturition

Days prior to parturition	Mean temperature - Farenheit		
	Malabari	Alpine x Malabari	Saanen x Malabari
7	103.54	103.78	103.66
6	103.52	103.70	103.54
5	103.62	103.86	103.64
4	103.64	103.74	103.82
3	103.56	103.58	103.82
2	103.64	103.70	103.82
1	103.78	104.66	103.74

** Number of animals = 10 from each genetic group

Table 12. Rectal temperature prior to parturition

Analysis of variance

Source	DF	SS	MS	F
Between days	6	0.4617	0.0769	0.91 NS
Error	63	5.3240	0.0845	- -
Total	69	5.7857	- -	- -

NS - Not significant

Table 13. Duration of stages of parturition in single birth

Genetic Group	No. of observations	Duration of stages in minutes							
		1st stage		2nd stage		3rd stage		Total	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean
Malabari	11	55-270	175.90 ± 21.33	12-43	23.63 ± 2.75	70-260	161.36 ± 18.43	207-548	360.91 ± 30.85
Alpine x Malabari	25	45-350	204.20 ± 17.17	10-40	20.40 ± 1.42	50-170	125.20 ± 5.75	202-522	358.20 ± 16.67
Saanen x Malabari	12	65-355	224.58 ± 45.56	12-32	20.00 ± 1.80	65-290	150.83 ± 21.56	210-663	395.42 ± 40.09

Table 14. Duration of stages of parturition in single birth

Analysis of variance - Ist stage

Source	DF	SS	MS	F
Between genetic groups	2	13697.487	6845.743	0.98 NS
Error	45	313747.826	6972.173	- -
Total	47	327445.313	- -	- -

NS - Not significant

Table 15. Duration of stages of parturition in single birth

Analysis of variance - 2nd stage

Source	DF	SS	MS	F
Between genetic groups	2	97.371	48.686	0.88 NS
Error	45	2480.545	55.123	- -
Total	47	2577.916	- -	- -

NS - Not significant

Table 16. Duration of stages of parturition in single birth

Analysis of variance - 3rd stage

Source	DF	SS	MS	F
Between genetic groups	2	11904.267	5952.133	2.26 NS
Error	45	118720.212	2638.227	- -
Total	47	130624.479	- -	- -

NS - Not significant

Table 17. Duration of stages of parturition in single birth

Analysis of variance - Total duration

Source	DF	SS	MS	F
Between genetic groups	2	21169.2134	10584.6067	0.82 NS
Error	45	580921.2657	12909.3615	- -
Total	47	602090.4791	- -	- -

NS - Not significant

Table 18. Duration of different phases of second stage of parturition in single birth

Genetic Group	No. of observations	Phase I	Phase II	Phase III	Phase IV	Total
Malabari	11	5.82 ± 0.87	2.91 ± 0.46	6.27 ± 0.96	8.64 ± 0.93	23.64 ± 2.75
Alpine x Malabari	25	4.28 ± 0.33	2.32 ± 0.16	6.00 ± 0.51	7.80 ± 0.58	20.40 ± 1.49
Saanen x Malabari	12	4.25 ± 0.43	2.33 ± 0.31	5.58 ± 0.61	7.83 ± 0.73	20.00 ± 1.80

Phase I - Rupture of the first water bag until appearance of the spherical aminiotic sac at vulva (minutes)

Phase II - From first appearance of aminiotic sac to appearance of the hooves and muzzle in the intact aminiotic sac (minutes)

Phase III- From the appearance of the hooves and muzzle in the aminiotic sac to its rupture uncovering the head and limb (minutes)

Phase IV - From the rupture of aminiotic sac to the complete expulsion of the foetus (minutes)

Table 19. Duration of stages of parturition in multiple births

Genetic Group	No. of observations	Duration of stages in minutes									
		1st stage		2nd stage		Interval between expulsion of two foetuses		3rd stage		Total	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Malabari	16	65-345	190.00 ±21.19	23-55	31.00 ±1.95	8-15	12.12 ±0.38	85-280	138.12 ±11.03	196-526	359.12 ±26.15
Alpine x Malabari	10	95-325	205.00 ±24.51	25-53	32.20 ±2.61	9-25	12.90 ±0.95	80-160	120.60 ± 8.95	228-503	357.20 ±38.23
Saanen x Malabari	11	130-340	202.27 ±21.48	18-42	29.63 ±2.08	7-15	11.82 ±0.90	95-210	136.82 ± 9.96	302-517	368.73 ±24.03

Table 20. Duration of stages of parturition in multiple births

Analysis of variance - 1st stage

Source	DF	SS	MS	F
Between genetic groups	2	1711.5479	855.774	0.14 NS
Error	34	212568.1818	6252.805	- -
Total	36	214279.7297	- -	- -

NS - Not significant

Table 21. Duration of stages of parturition in multiple births

Analysis of variance - 2nd stage

Source	DF	SS	MS	F
Between genetic Groups	2	34.6111	17.3057	0.30 NS
Error	34	1974.1455	58.0631	- -
Total	36	2008.7566	- -	- -

NS - Not significant

Table 22. Duration of stages of parturition in multiple births

Analysis of variance - 3rd stage

Source	DF	SS	MS	F
Between genetic groups	2	2269.6407	1134.820	0.80 NS
Error	34	47357.3864	1392.864	- -
Total	36	49627.0271	- -	- -

NS - Not significant

Table 23. Duration of stages of parturition in multiple births

Analysis of variance - Total duration

Source	DF	SS	MS	F
Between genetic groups	2	849.6574	424.828	0.01 NS
Error	34	321501.5318	9455.927	- -
Total	36	322351.1892	- -	- -

NS - Not significant

Table 24. Placental weight, weight of kid and number of cotyledons in single birth

Sl No	Genetic Group	No. of observations	Placental Wt. (g)		Wt. of kid (kg)		No. of cotyledons						Total	
							Large		Medium		Small			
			Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
1	Malabari	11	180-315	251.82 ± 13.85	0.6-3.0	1.86 ±0.20	2-14	9.18 ± 1.06	58-91	82.00 ± 2.67	5-17	8.73 ± 1.09	82-116	99.73 ± 2.86
2	Alpine x Malabari	25	215-365	277.60 ± 9.49	1.0-3.5	2.32 ± 0.15	5-17	11.08 ± 0.76	59-97	77.28 ± 1.85	6-25	12.96 ± 1.01	83-119	101.32 ± 1.68
3	Saanen x Malabari	12	205-340	270.42 ± 14.54	1.0-3.0	2.32 ± 0.19	6-19	12.00 ± 1.08	60-89	78.50 ± 2.46	7-20	13.00 ± 1.24	82-119	103.54 ± 2.47

Table 25. Placental weight, weight of kid and number of cotyledons in single birth

No	Correlation	Correlations		
		Malabari	Alpine x Malabari	Saanen x Malabari
1	Between wt. of kid and wt. of placenta	r = 0.7907**	r = 0.817**	r = 0.834**
2	Between wt. of kid and no. of large cotyledons	r = 0.9023**	r = 0.897**	r = 0.784**
3	Between wt. of kid and no. of medium cotyledons	r = 0.8863**	r = 0.397*	r = 0.807**
4	Between wt. of kid and no. of small cotyledons	r = -0.722*	r = -0.569**	r = -0.779**
5	Between wt. of kid and no. of total cotyledons	r = 0.9277**	r = 0.581**	r = 0.757**

*Indicates significance at 5% level

**Indicates significance at 1% level

Table 26. Placental weight, weight of kids and number of cotyledons in multiple birth

Sl No	Genetic Group	No. of observations	Placental Wt. (g)		Wt. of kid (kg)		No. of cotyledons						Total	
							Large		Medium		Small			
			Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
1	Malabari	16	280-430	343.44 ± 10.70	1.4-4.4	2.84 ± 0.23	5-14	8.12 ± 0.68	69-98	89.44 ±1.97	6-19	10.97 ±0.83	88-123	107.94 ± 2.24
2	Alpine x Malabari	10	295-410	365.00 ±14.53	2.5-7.0	3.94 ±0.40	5-14	8.90 ±0.86	74-99	90.90 ±2.35	5-9	7.40 ±0.45	89-121	107.20 ± 3.01
3	Saanen x Malabari	11	285-440	363.64 ±16.18	1.5-7.0	3.74 ±0.43	6-20	11.00 ±1.21	69-97	88.72 ±2.86	7-16	12.09 ±1.03	95-130	111.82 ± 2.99

Table 27. Placental weight, weight of kids and number of cotyledons in multiple birth

Sl No	Correlation	Correlation		
		Malabari	Alpine x Malabari	Saanen x Malabari
1	Between wt. of kid and wt. of placenta	r = 0.846**	r = 0.768**	r = 0.876**
2	Between wt. of kid and no. of large cotyledons	r = 0.665**	r = 0.862**	r = 0.893**
3	Between wt. of kid and no. of medium cotyledons	r = 0.877**	r = 0. 685*	r = 0.678*
4	Between wt. of kid and no. of small cotyledons	r = -0.456	r = -0.691**	r = -0.747**
5	Between wt. of kid and no. of total cotyledons	r = 0.872**	r = 0.796**	r = 0.755**

* Indicates significance at 5% level
** Indicates significance at 1% level

Table 28. Distribution of cotyledons in gravid and Non-gravid horn of uterus

Sl No	Genetic Group	Gravid horn				Non-gravid horn				't' value
		Large	Medium	Small	Total	Large	Medium	Small	Total	
1	Malabari	6.00 ± 0.84	47.64 ± 1.66	5.27 ± 0.62	58.91 ± 1.90	3.18 ± 0.42	34.36 ±1.38	3.45 ±0.53	41.00 ±1.28	7.82**
2	Alpine x Malabari	7.08 ±0.54	43.16 ±0.98	6.40 ±0.55	56.56 ±0.93	4.00 ±0.29	34.52 ±0.98	6.56 ±0.56	44.68 ±0.92	8.86**
3	Saanen x Malabari	8.08 ±0.75	47.83 ±1.68	6.33 ±0.72	62.25 ±1.98	4.27 ±0.02	30.67 ±1.18	6.67 ±0.71	41.25 ±1.08	9.32**

* Indicates significance at 5% level

** Indicates significance at 1% level

Table 29. Weight of placenta and number of cotyledons in single and multiple birth

	Malabari			Alpine x Malabari			Saanen x Malabari		
	Single	Multiple	't'value	Single	Multiple	't'value	Single	Multiple	't'value
Weight of placenta	251.82 ±13.85	343.44 ±10.70	5.31**	277.60 ± 9.49	365.00 ±14.53	4.97**	270.42 ±14.54	362.64 ±10.18	4.29**
No. of cotyledons	99.73 ±2.86	107.94 ± 2.24	2.29**	101.32 ± 1.68	107.20 ± 3.01	1.80**	103.54 ± 2.47	111.82 ± 2.99	2.16**

* Indicates significance at 5% level

** Indicates significance at 1% level

DISCUSSION

DISCUSSION

The overall length of gestation period of does (146.66 ± 0.53) observed during the course of the present study was found to be well within the range of the values reported in the different breeds of goats by earlier workers (Santiago, 1946; Lal, 1954; Gupta and Som, 1964; Roberts, 1971; Dadawy et al. 1972; Sudarsanan and Raja, 1973 and Peaker, 1978). The gestation periods of Malabari, Alpine x Malabari and Saanen x Malabari crosses in single births and multiple births were noted respectively as 146.25 ± 0.33 and 145.98 ± 0.31 days, 146.76 ± 0.35 and 145.80 ± 0.65 days and 148.80 ± 0.78 and 147.55 ± 0.75 days. Analysis of the data revealed that there was no significant variation in the gestation length between the genetic groups both in single and multiple births (Tables- 2 and 3). The breed effect on the gestation period of goats has not been adequately reported in the literature. In the case of cattle the length of gestation has been found to differ between the breeds and certain hybrids (Roberts, 1971). It was further observed that the length of gestation in multiple pregnancy was slightly lower than that in single pregnancy. Similar observation has been made in goats by Peaker (1978). In contrast, the length of gestation in

Alpine goats was reported to have remained unchanged irrespective of the litter size (Bhatnagar *et al.* 1979).

According to Roberts (1971), young cows in their first and second gestation carry foetuses one or two days less than older ones. In the present study, the difference in the gestation period due to parity was found to be non significant (Table-5).

Sex of the kid had no influence on the gestation length of does (Table-7). The present study is akin to that recorded by Alfranca (1972) in sheep. However, Jancics (1965), Mahajan *et al.* (1970), Kaushish and Arora (1973), Nelson (1976) and Thrift and Dutt (1977) in ewes and Gill and Dev (1972) in does reported that the male foetuses were invariably carried a few days longer than the female foetuses. The variation was attributed to the higher birth weight by the male foetus as compared to that of the female kids (Gill and Dev, 1972).

The season of kidding did not have any significant effect on the gestation length of goats under study (Table-9). An observation similar to this has been made by Mathai and Nair (1980) in the case of Malabari goats and their crosses with Alpine and Saanen. However, several reports are available in the literature indicating definite

seasonal trends in the rate of kidding in goats of different breeds (Gupta and Som, 1964; Gill and Dev, 1972; Singh and Singh, 1974 and Wani et al. 1980).

Out of 668 births, 339 (50.75%) were single, 301 (45.06%) twins and 28 (4.19%) triplets. The present findings are essentially in keeping with the observations made in Malabari goats by Shanmughasundaram (1957). On the contrary, Wilson (1958) recorded as high as 77.6 per cent of multiple births in Black Bengal goats. Amble et al. (1964) reported the incidence of twinning, triplets and quadruplets as 63 per cent, 11.5 per cent and 1.5 per cent respectively in Beetal goats. The incidence of single and twin births in Malabari goats as recorded by Sudarsanan and Raja (1973) was much lower than the values obtained in the present study. The authors, however, recorded 17.67 per cent in triplets which was very high when compared to the data presently observed.

Fifty nine (69.41%) kiddings occurred during day time and 26 (30.59%) deliveries took place during the night. Information on diurnal variation of kidding appears to be scanty. In the case of sheep, the reports in this regard by various workers are conflicting. While Younis and

Gaboorg (1978) reported maximum lambing between 15.00 to 18.00 hours, Tomar (1979), Khushish et al. (1973) and Khushish and Sahni (1973) observed maximum lambing between midnight and 6 a.m. George (1970) observed that the distribution of lambing differed among breed with 37 per cent of Merino and 62 per cent of Dorset horn ewes lambing during day time. Sreeman Narayana (1981) recognised two peaks in the rate of lambing viz. between midnight and 6 a.m. and between 3 to 6 p.m. The percentage of calving in cattle was reported to be more during night (57.6%) than during day time (Baccari, 1978). However, Edward (1979) and Sreeman Narayana (1981) recorded more number of calving during day time than at night.

It was observed that 13.53 per cent of goats assumed standing position while the remaining (86.47%) were in recumbant position at the time of foetal expulsion. Investigation on posture of the does at the time of delivery appears to have not been recorded in the literature. According to Roberts (1971) the mare and cow usually lie out flat with legs extended whereas the cow, bitch and ewe are more likely to lie on their sternum.

The tumefaction of the vulva, engorgement of the udder and relaxation of the pelvic ligaments were observed to be

only moderate in majority of the does at seven day prior to parturition (Table-10). With advancement of kidding time, there was progressive increase in the intensity of all the above symptoms. On the day prior to kidding, most of the does exhibited high degree of vulval tumefaction, udder engorgement and relaxation of the pelvic ligaments. The present finding are in general agreement with those of Roberts (1971) and Arthur (1975) who reported that tumefaction of vulva, udder engorgement and relaxation of the pelvic ligaments are the most certain indications of approaching parturition in goats. Colostrum was observed for the first time on fourth day prior to kidding in 30 (35.29%) animals and in the remaining, two days before parturition. This is akin to the finding of Roberts (1971) and Arthur (1975) who reported that in most of the animals udder would undergo hypertrophy for a variable period and secrete milk 2-3 days before parturition. Visible flow of liquified mucus was detected in 75 does two days prior to kidding and in others 24 hours before the onset of parturition. The present finding are in general agreement with those recorded by Roberts (1971) and Arthur (1975). According to these authors, liquifection of the cervical mucus or seal which starts a couple of days before kidding is a characteristic sign of approaching parturition.

A drop in body temperature has been considered by many as a typical symptom of approaching parturition in the case of cows (Vollman and Vollman, 1942; Petersen, 1956 and Ewebank, 1963) and ewes (Winfield and Makin, 1975). However, no significant fluctuation in the body temperature of does at any stage of prepartum period was observedlin the present study (Table-12). This is in keeping with the observations of Jones and Nifton (1971) who recorded more or less the same body temperature in goats during the last ten days of pregnancy.

The duration of first stage of parturition in single and multiple births in Malabari, Alpine x Malabari and Saanen x Malabari was noted as 175.90 ± 21.33 and 190.00 ± 21.19 minutes, 204.20 ± 17.17 and 205.00 ± 24.51 minutes and 224.58 ± 45.56 and 202.27 ± 21.48 minutes respectively. There was no significant variation between genetic groups in the first stage of parturition both in single and multiple births (Table 14 and 20). In the case of sheep, Kaushish and Arora (1974) reported significant differences in the duration of the first stage of labour between genetic groups of ewes.

The duration of the second stage of parturition was reported to be very short in ewes (Marshal and Halman, 1932; Salisbury and Van Demarks, 1961; Tiwari et al. 1969;

Kaushish and Arora, 1973 and Bhaik and Kohli, 1980). In the present study the period of second stage of parturition in Malabari, Alpine x Malabari and Saanen x Malabari in single and multiple births were 23.63 ± 2.75 and 31.00 ± 1.95, 20.40 ± 1.42 and 32.20 ± 2.61 and 20.00 ± 1.80 and 29.63 ± 2.08. The mean value observed is in keeping with that reported by Tiwari et al. (1969) in does. There was no significant variation in the duration of the second stage of parturition between the genetic groups (Table-15 and 21).

The interval between the rupture of the first water bag and the appearance of the amniotic sac was found to be 5.82 ± 0.87, 4.28 ± 0.33 and 4.25 ± 0.43 minutes in Malabari, Alpine x Malabari and Saanen x Malabari respectively. The time gap between the appearance of the amniotic sac and the appearance of the hooves and muzzle in the intact amnion was noted to be 2.91 ± 0.46, 2.32 ± 0.16 and 2.33 ± 0.31 minutes respectively in the above order. From the appearance of the hooves and muzzle till the rupture of the amniotic sac it took 6.27 ± 0.96 minutes in Malabari, 6.00 ± 0.51 in Alpine x Malabari and 5.58 ± 0.61 minutes in Saanen x Malabari does. The interval between the rupture of the amniotic sac and the complete expulsion of the foetus in Malabari, Alpine x Malabari and

Saanen x Malabari was noted as 8.64 ± 0.93, 7.80 ± 0.58 and 7.83 ± 0.73 minutes respectively. The duration of the different phases of second stage of parturition is comparable to that reported by Kaushish and Arora (1974) in ewes.

The duration of the third stage in Malabari, Alpine x Malabari and Saanen x Malabari averaged 161.36 ± 16.43 and 138.12 ± 11.03, 125.20 ± 5.78 and 120.60 ± 8.95 and 150.83 ± 21.36 and 136.82 ± 9.96 minutes respectively in single and multiple births which are comparable to the values reported by Tiwari et al. (1969) in goats and Kaushish and Arora (1974) in ewes. The variation in the duration of third stage between genetic groups was not significant (Table-16 and 22). There was also significant variations in total duration of parturition between genetic groups both in single and multiple births (Table-17 and 23).

The placental weight in Malabari, Alpine x Malabari and Saanen x Malabari in single and multiple births was observed to be 251.82 ± 13.85 and 343.44 ± 10.70; 277.60 ± 9.49 and 365.00 ± 14.53 and 270.42 ± 14.54 and 363.64 ± 11.18 g respectively. The overall weight of the placenta observed is akin to that reported in goats by earlier workers (Tiwari et al. 1969; Prasad and Pandey,1981).

The placental weight was also noted to be positively correlated with birth weights of the kid both in single and multiple kidding (Table-25 and 27). Similar findings have been reported earlier in cattle by Kadu and Kaikini (1975) and Rao and Rao (1979). The total number of cotyledons in Malabari, Alpine x Malabari and Saanen x Malabari in single and multiple births was found to be 99.73 ± 2.66 and 107.94 ± 2.24; 101.32 ± 1.68 and 107.20 ± 3.01 and 103.54 ± 2.47 and 111.82 ± 2.99 respectively. The values presently observed are akin to the findings of Prasad and Pandey (1981) in goats. A positive correlation between birth weight of the kid and the number of large, medium and total number of cotyledons was observed in single and multiple births (Table- 25 and 27) Rao and Rao (1979) observed a positive correlation between the weight of the calf and the number of large sized cotyledons in Ongole cattle and their crosses.

The number of cotyledons in the gravid horn was found to be significantly higher than that in the non gravid horn (Table-28). It was further observed that large sized cotyledons were higher in the gravid horn than in the non gravid horn as reported by Dahiya et al. (1975) in cattle.

Data presented in table - 29 revealed that the weight of the placenta as well as the total number of cotyledons were significantly higher in multiple than in single pregnancy in all the genetic groups. Similar findings were also made in Barbari goats by Prasad and Pandey (1981).

SUMMARY

SUMMARY

A systematic study involving the use of 85 does comprising of 27 Malabari, 35 Alpine x Malabari and 23 Saanen x Malabari crosses reared and maintained at Mannuthy, Kerala, under All India Co-ordinated Research Project on Goats for Milk was carried out in order to ascertain the gestation length, process of parturition and placental details. In addition 583 breeding particulars gathered from the registers maintained at the Project was also utilized for assessing the gestation length and frequency of occurrence of multiple births. The salient observations made and the valid inferences drawn are indicated below:

The overall gestation length of does of different genetic groups was found to be 146.66 ± 0.53 days. The gestation period of Malabari, Alpine x Malabari and Saanen x Malabari does was observed as 146.25 ± 0.35, 146.76 ± 0.35 and 148.80 ± 0.78 days respectively in single births and 145.98 ± 0.31, 145.80 ± 0.65 and 147.55 ± 0.75 days respectively in multiple births. As between genetic groups there was no variation in the length of gestation period both in single and multiple births. Parity of the dam did not have any influence on the

gestation length, the values for the first, second and third kiddings being 146.18 ± 0.68, 146.88 ± 0.51 and 147.44 ± 0.40 days respectively. Similarly the gestation length was not regulated by the sex of the kid, the mean values being 146.56 ± 0.34 days for pregnancy with male kids and 146.84 ± 0.33 days for that with female kids. The length of gestation during summer, rainy and winter was noted to be 146.48 ± 0.27, 146.95 ± 0.31 and 147.10 ± 0.33 days respectively. The variation in the gestation period between seasons of kidding was not significant. The percentage of single, twin and multiple births was observed to be 50.75, 45.06 and 4.19 respectively. The rate of kidding was more (69.41%) during day time than in the night (30.6%).

The signs of approaching parturition was assessed based on the degree of manifestation of such symptoms as tumefaction of the vulva, udder engorgement and relaxation of the pelvic ligaments. Initially the symptoms exhibited by the does were only moderate but on nearing parturition there was conspicuous increase in the intensity of these changes. Colostrum was present in all the animals two days prior to parturition. Visible flow of cervical mucus was evident in 75 does two days prior to kidding and in all, 24 hours before parturition. There was no

significant fluctuation in the body temperature of does during prepartum period.

The duration of the first stage of parturition viz. the period between the commencement of the labour pain and the rupture of the first water bag, in Malabari, Alpine x Malabari and Saanen x Malabari was respectively noted as 175.90 ± 21.33, 204.20 ± 17.17 and 224.58 ± 45.56 minutes in single births and 190.00 ± 21.19, 205.00 ± 24.51 and 202.27 ± 21.48 minutes respectively in multiple births. The second stage of parturition viz. the period from the rupture of the first water bag to the expulsion of the foetus in single birth and the interval between rupture of the water bag of the first foetus and the expulsion of all foetuses in multiple births, in Malabari, Alpine x Malabari and Saanen x Malabari was found to last 23.63 ± 2.75 minutes, 20.40 ± 1.42 minutes and 20.00 ± 1.8 minutes in single births and 31.00 ± 1.95 minutes, 32.20 ± 2.61 minutes and 29.63 ± 2.08 minutes in multiple births in the respective genetic groups. The third stage viz. the period from the expulsion of foetus/foetuses to the expulsion of foetal membranes averaged 161.36 ± 18.43 minutes, 125.20 ± 5.78 minutes and 150.83 ± 21.56 minutes respectively for Malabari, Alpine x Malabari and

Saanen x Malabari in single births and 138.12 ± 11.03, 120.60 ± 8.95 and 136.82 ± 9.96 minutes in multiple births in the same order. Analysis of the data revealed that the duration of different stages of parturition did not vary significantly between genetic groups either in single or in multiple births. The total duration of parturition in the three genetic groups was 360.91 ± 30.85, 358.20 ± 16.67 and 395.42 ± 40.09 in single births and 359.12 ± 26.15, 357.20 ± 32.23 and 368.73 ± 24.03 minutes in multiple births, the difference between genetic groups being not at variance.

The mean weight of placenta in Malabari, Alpine x Malabari and Saanen x Malabari was observed to be 251.82 ± 13.85 g, 277.60 ± 9.49 g and 270.42 ± 14.54 g respectively in single births and 343.44 ± 10.70 g, 365.00 ± 14.53 g and 363.64 ± 16.18 g respectively in multiple births. The number of cotyledons in the genetic group was 99.73 ± 2.86, 101.32 ± 1.68 and 103.54 ± 2.47 respectively in single births and 107.94 ± 2.24, 107.20 ± 3.01 and 111.02 ± 2.99 in multiple births in the above order. Statistical analysis showed that the weight of kid was positively correlated with the number of large and medium sized cotyledons. However, there was negative correlation between weight of kid and the number of small sized cotyledons.

The total number of cotyledons in the gravid horn was found to be 58.91 ± 1.90, 56.56 ± 0.98 and 62.25 ± 1.98 in Malabari, Alpine x Malabari and Saanen x Malabari goats respectively. In the non gravid horn, the number of cotyledons was 41.00 ± 1.28, 44.68 ± 0.92 and 41.25 ± 1.08 in the same order. The variation in the number of cotyledons between the gravid and non gravid horn was significant in all the genetic groups. The weight of placenta and the number of cotyledons were significantly higher in multiple pregnancy than in single pregnancy.

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OBSERVATIONS ON GESTATION AND PARTURITION IN GOAT- CAPRA HIRCUS

BY

K. K. KURIAKOSE

ABSTRACT OF A THESIS

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Faculty of Veterinary and Animal Sciences
Kerala Agricultural University

Department of Animal Reproduction
COLLEGE OF VETERINARY AND ANIMAL SCIENCES
Mannuthy - Trichur

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ABSTRACT

A systematic study involving the use of 85 does comprising 27 Malabari, 35 Alpine x Malabari and 23 Saanen x Malabari crosses reared and maintained at Mannuthy, Kerala, under All India Co-ordinated Research Project on Goats for Milk was carried out in order to ascertain the gestation length, process of parturition and placental details. In addition 583 breeding particulars gathered from the registers maintained at the Project also was utilized for assessing the gestation length and frequency of occurrence of multiple births. The salient observations made and the valid inferences drawn are indicated below.

The average gestation length of different genetic groups of goats was found to be 146.66 ± 0.53 days. There was no significant variation in the gestation period of does of different genetic groups both in single and multiple births. Parity had no influence on the gestation length in does. The variation in gestation length due to difference in the sex of kid was also not significant. Gestation period was not found to vary between seasons. The frequency of occurrence of single, twin and multiple births was found to be 50.75 per cent, 45.06 per cent and 4.19 per cent respectively.

Signs of approaching parturition was assessed based on the degree of manifestation of such symptoms as tumefaction of the vulva, udder engorgement and relaxation of the pelvic ligaments. The symptoms exhibited by the does were only moderate in the beginning but on nearing parturition there was conspicuous increase in the intensity of these changes. Colostrum was present in all the animals two days prior to parturition. Visible flow of cervical mucus was evident in 75 does two days prior to kidding and in all, 24 hours before parturition. There was no significant fluctuation of body temperature of does during prepartum period.

The total duration of parturition was 360.91 ± 30.85, 358.20 ± 16.67 and 395.42 ± 40.09 minutes in single births and 359.12 ± 26.15, 337.20 ± 32.23 and 368.73 ± 24.03 minutes in multiple births in Malabari, Alpine x Malabari and Saanen x Malabari goats respectively. The duration of parturition was not at variance between genetic groups both in single and multiple births. The weight of kid was positively correlated to the weight of placenta, total number of cotyledons and to the number of large and medium sized cotyledons. There was negative correlation between weight of kid and the number of small sized cotyledons. The number of cotyledons in the gravid horn was significantly higher than that in non gravid horn in all the genetic groups. Weight of the placenta as well as the total number of cotyledons was found to be more in multiple pregnancy than in single pregnancy.