ACCELERATED LAMBING THROUGH ZERO WEANING IN WEST AFRICAN DWARF EWES IN THE HUMID TROPICS OF NIGERIA[1]/

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Resumen

Fueron estudiadas 25 ovejas preñadas para observar los efectos sobre el peso en placenta, peso al nacer, peso al destete y el intervalo de concepción de exponerlas a un carnero a 0, 4, 8, 12 y 14 semanas después del parto.

No se notaron diferencias significativas en las variables estudiadas entre los cinco lapsos indicados, lo que se supone que una oveja lactante puede aparearse inmediatamente después del parto, sin que el cordero recién nacido se afecte y sin diferencia en el lapso necesario para ser preñada de nuevo.

En otra prueba que se hizo con 20 ovejas poliperas, se les permitió andar libremente durante dos años con carneros. Al terminar los dos años, todas las ovejas habían experimentado tres partos, y la cuarta gestación estaba al 50%. No se observaron diferencias en las variables de peso antes mencionadas, lo que indica que las ovejas pueden parir tres veces en dos años, si andan libremente con carneros, en otras palabras, una producción acelerada en ovejas West African Dwarf podría producirse a través de la eliminación del período del destete, pero tal proyecto debe acompañarse de un plan de manejo y de una alimentación adecuada para obtener buenos resultados.

Introduction

Dickerson (5) noted that the efficiency of meat production by sheep could be increased most effectively by an increase in the number of lambs marketed per ewe per year. Such an increase could be achieved by an increase in the number of live lambs born and weaned per ewe lambing, by an increase in the number of lambings per ewe per year or by a combination of the two techniques. Donald Reid (6) indicated that the number of lambs born per ewe lambing can be increased most readily through the use of highly prolific breeds such as the Finnish Landrace (Finn) in crosses, although Turner (19) has indicated that selection for lambing rate in less prolific breeds may also be successful. Increases in frequency of lambing may be achieved by judicious use of existing breed differences in timing and duration of the estrous season (7, 11 and 19) or potentially through selection (2, 13, 14). Thus far, most attempts to increase the number of lambs marketed per ewe per year have concentrated on the use of prolific crossbred ewes bred to lamb either twice per year (8, 12, 20, 21) or three times in two years (16). Systems of twice yearly lambing have generally met with limited success. Systems in which ewes lamb three times in two years have shown more promise. The West African Dwarf ewes have not been involved in any systems of accelerated lambing. Since the West African Dwarf sheep shows no period of anestrus during the year, it has a definite advantage over its temperate zone counterparts. This study was conducted on the hypothesis that West African Dwarf ewes in the humid tropics of Southern Nigeria can be bred three times in two years through zero weaning.

Materials and methods

Twenty five gravid West African Dwarf (WAD) ewes were assigned randomly in successive replicates to the following stages (*post partum*) of ewe exposure: a) 0, b) 4, c) 8, d) 12, and e) 14 weeks. With the zero week ewe exposure, the parturient ewe with its ewe lambs was exposed to the ram by days 2 or 3

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post partum. In the fourteenth week of ewe exposure, the nursing ewe was exposed to the ram by the end of fourteen weeks *post partum*. Each time the ram was put with the ewe, the dam with the offspring and the sire were allowed to stay together until the end of the second trimester of the ensuing pregnancy, when lactation had since stopped. In the other stages, rams were introduced precisely at weeks 4, 8, and 12 *post partum*. The variables measured were birth weight, and conception interval.

In a second trial, twenty open but polyparous ewes were allowed to run freely with one potent ram, which was replaced every two weeks to ensure continuity of good libido and fertile sperm cells. Reproductive records of each were kept for two years, and each ewe's performance was subsequently assessed. The same variables as in the first trial were measured, except conception interval. The two trials used a one – way design. Data were subjected to analysis of variance, and means comparison using Duncan's new multiple range test (18). The two trials were conducted on the University of Ife Teaching and Research Farm.

Results

Table 1 shows no significant ($P > 0.05$) difference among the sources of variation of the different stages (*post partum*) of ewe exposure to the ram in terms of birth weight, placental weight, weaning weight or conception interval. Comparison of the means in the five stages of ewe exposure in each of the four variables measured (Table 2) indicated no significant ($P > 0.05$) difference using Duncan's new multiple range test. Table 3 indicates (in column four) that as the stage of ewe exposure goes beyond four weeks *post partum*, the total duration for three lambings in two years and the expected lambing intervals increase, and therefore the probability of three lambing in two years decreases for the second trial. Table 4 showed no significant ($P > 0.05$) effect of three lambings in two years on birth weight, weaning weight and placental weight. Table 5 compares the means of each of the three variables measured in each of the three sets of lambings, with no significant ($P > 0.05$) difference among the three lambings for any of the three variables measured.

Table 1. Mean squares of analysis of variance of the effect of different stages (*post partum*) of ewe exposure on birth weight (1), placental weight (2), weaning weight (3) and conception interval (4).

Sources of variation	df	1	2	3	4
REP	4	0.18^{ns}	0.0025^{ns}	3.23^{ns}	14.76^{ns}
Trt	4	0.3^{ns}	0.0055^{ns}	2.60^{ns}	32.14^{ns}
Error	16	0.18^{ns}	1.74	3.36	76.79

ns = Not significantly ($P > 0.05$ different.

Table 2: Duncans new multiple range test on the effect of different stages (*post partum*) of ewe exposure on mean birth weight, placental weight, weaning weight and conception interval.

Variables	Stage 0	4	8	12	14
Birth weight (kg)	2.14^{a}	2.08^{a}	2.4^{a}	2.14^{a}	2.22^{a}
Placental weight (kg)	0.29^{a}	0.27^{a}	0.25^{ab}	0.31^{a}	0.26a
Weaning weight (kg)	8.50^{a}	8.12^{a}	9.00^{a}	9.31^{a}	9.33^{a}
Conception Interval (days)	48.80^{a}	45.40^{a}	48.80^{a}	47.00^{a}	42.80^{a}

Means with the same superscript in the same row are not significantly ($P > 0.05$) different.

Table 3: Lambing interval and total time taken for three lambings in two years in the first trial.

1 Stage Weeks (Days)	2 Conception interval (Days)	3 Expected lambing interval (Days)	4 Total Duration for 3 lambings in 2 years (730 Days)
0	48.8^{a}	195.8^{a}	587.4^{a}
4 (28)	45.4^{a}	220.4^{a}	660.0^{a}
8 (56)	48.8^{a}	251.0^{ab}	755.4^{ab}
12 (84)	47.0^{a}	278.0^{b}	834.0^{b}
14 (98)	42.8^{a}	287.80^{b}	863.4^{b}

Each figure in column 4 = Each figure in column 3 x 3.

Means with the same superscript in the same column are not significantly ($P > 0.05$) different.

Discussion

Tables 1 and 2 show that breeding the ewes by 0, 4, 12 and 14 weeks *post partum* does not adversely affect birth weight, placental weight, weaning weight or conception interval. Table 3, column four indicates that breeding after four weeks increases the lambing interval and duration for three consecutive lambings

to the extent that the possibility of three lambings in two years will be difficult to realise.

Accelerated lambing means lambing more frequently than once per year. Most temperate zone ewes are pregnant approximately five months of the year, nurse lambs efficiently for three months and can be considered idle for four months of the year (15).

In temperate regions, breeding of ewes during early lactation (4 to 6 weeks) may require early weaning and hormonal control of reproduction (15). Hormones for estrus synchronization use many costly chemical compounds which influence the endocrine glands. In a Third World country like Nigeria, the use of hormones or their synthetic equivalents for induction of ovulation and estrus is not advisable; instead breeds that cycle year round and which have adapted over centuries are recommended.

In the humid tropics of southern Nigeria, comprising the eastern and western regions, the indigenous West African Dwarf sheep show no period of anestrus. Therefore, hormones are not needed to induce ovulation or estrus, and the problems of out-of-season lambing may not arise.

Zero weaning means that the lambs were not physically separated from their dams until it was observed that the offspring had no need of the dam. That was about the end of the second trimester of the ensuing pregnancy.

In the University of Ife Teaching and Research Farm, it has been the usual practice to wean lambs at 14 weeks *post partum*. Table 3 shows that it will be impossible to breed these ewes more than two times in two years. By weaning at 14 weeks *post partum*, the immense reproductive potential of the WAD ewes is underused. In a profit-oriented sheep enterprise, breeding at 14 weeks *post partum* will lead to slow multiplication and make the venture uneconomical.

Table 4: Analysis of variance of the effect of three lambings in two years on birth weight (1), weaning weight (2) and placental weight (3).

Sources of variation	df	1	2	3
Trt	2	0.005^{ns}	1.26^{ns}	12475.4^{ns}
Error	57	0.17	2.30	467.00

ns = Not significantly ($P > 0.05$) different

Table 5: Duncan's new multiple range test on mean birth weight, weaning weight and placental weight under three lambings in two years.

Variable	Sets of Lambings 1	2	3
Birth weight	2.10^{a}	1.86^{b}	2.08^{a}
Weaning weight	10.38^{a}	10.67^{a}	11.03^{a}
Placental weight	0.27	0.23^{b}	0.29^{a}

Means with the same supercript on the same row are not significantly ($P > 0.05$) different

Table 3 tells us that, in order to avoid affecting any of the reproductive variables (Table 2), breeding should take place between 0 and 4 weeks *post partum*. This will ensure a reproduction rate of three times in two years in business oriented sheep production, to meet the country's protein requirements. However, because of the physiological stress of pregnancy, any programme for accelerated lambing through zero weaning will have to ensure adequate management by improving feeding regime to include adequate energy, protein, vitamins, minerals, etc. (9, 17).

The traditional setting, the villages where these sheep thrive and multiply, has been extensively discussed (4). Nursing or dry ewes usually run with rams every day, except when farms around the villages are being cultivated and sheep and goats are restrained to prevent destruction of crops (4). Even when sheep and goats are being restrained, rams or bucks are put with their female counterparts and breed without any special human control. This traditional method is the means by which the bulk of our sheep and goats are produced in Nigeria. With its zero weaning, it is expected to provide the additional advantage of maintaining the dam's maternal influence on the lambs, thus correcting the post-weaning stress which usually causes lamb weight loss.

Analysis of variance and comparison of means by Duncan's new multiple range test (Tables 1, 2, 4 and 5) showed no significant ($P > 0.05$) differences in birth weight, placental weight, weaning weight or conception interval among the various stages of ewe exposure. This indicates the WAD ewe can readily by rebred with no recourse to hormonal treatment for induction of ovulation and concomitant estrus.

Several factors generally affect the fertility of the ewe: 1) nutrition; 2) fertility of the ram; 3) stress; 4) parasites and diseases; 5) ewe association with ram; 6) parturition and lactation; 7) age of ewe; 8) heredi-

ty; 9) age of puberty and 10) weather conditions, such as light, temperature and relative humidity which vary by season. The degree of sexual activity in the ewe depends on the type of anestrus. Three main types of anestrus are observed in ewes: lactation anestrus, *post partum* anestrus and seasonal anestrus (15). The marked seasonal variation found in temperate zones leads to detectable depressed gonadal activity, and the ewe fails to manifest estrus. This is interpreted as seasonal anestrus. Therefore, in the temperate areas, the light/dark regulations of the hypothalamo-hypophysial-gonadotropic function is a recognised general physiologic law to which programmes for livestock production are usually adapted.

The WAD sheep in this part of the globe appear to be photo-and thermoneutral to naturally prevailing light/dark ratio, and seasonal anestrus does not appear to exist. Therefore, any continuous or accelerated breeding programme has a very good chance of success without detracting from the reproductive traits measured here, some of which are in keeping with other findings (1, 3).

There is, in general, considerable variation in birth weight and weaning weight with WAD sheep. Birth weight in this trial ranged from 1 kg to a little over 2.5 kg, while weaning weight ranged from 5.6 kg to 14 kg. This further underscores the need for selection in WAD sheep.

Fitzhugh and Bradford (10) have further highlighted the importance of African hair sheep with regard to their prolificacy, meat availability and small scale sheep farming. Zero weaning as described here is essential for WAD sheep production and to contribute to the protein supply so necessary in this country.

Summary

Twenty-five gravid ewes were used to study the effect of exposing ewes to rams at 0, 4, 8, 12 and 14 weeks *post partum* on birth weight, placental weight, weaning weight and conception interval. No significant differences in the variables analyzed were noted among the five stages of *post partum* ram introduction. This means that a nursing ewe can be exposed as early as zero weeks *post partum* without any detriment to the lambs or difference in the time it will take the ewe to become pregnant. In a second trial, twenty polyparous ewes were allowed to run with rams for two years. All the ewes had completed three parturitions and had gone at least halfway into the fourth gestation by the end of the two years. Analysis showed no significant differences among birth weight, weaning weight and placental weight with parity, indicating that the ewes can be bred at least three times in two years, if ewes are allowed to run freely with rams. In other words, accelerated lambing in West African Dwarf ewes is possible through zero weaning; it is envisaged that an improved feeding and management regime will by necessary for this programme to succeed.

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Notas y comentarios

Destapando los secretos genéticos del ajonjolí

El ajonjolí o sésamo (*Sesamum indicum*) debería ser un cultivo oleaginoso importante. Sus semillas contienen un 50 por ciento de aceite y son ricas en una proteína que es comparable con la carne molida y la caseína. Además, el aceite de ajonjolí no se descompone fácilmente pues contiene sesamol y semolina, que actuan como antioxidantes. Desgraciadamente, la planta no se comporta de una manera apropiada para la producción en gran escala. Investigadores en Israel están ahora dispuestos a alterar el código genético del ajonjolí para hacerlo más útil como cultivo.

La evidencia arqueológica sugiere que el ajonjolí es la más antigua semilla oleaginosa usada por el hombre. A diferencia de los cereales o leguminosas domesticados, ha permanecido fiel a su herencia genética: tiene un crecimiento indeterminado y dispersa sus semillas. Estas características son esenciales para la supervivencia en estado silvestre, pero los cultivadores modernos necesitan plantas con un crecimiento determinado, es decir plantas con un ciclo de vida fijo que maduran al mismo tiempo. Genetistas de Israel han resuelto este problema. Al finalizar este año, 1986, esperan llegar a combinar la indehiscencia, que mantiene cerrada la cápsula con semillas maduras para prevenir la pérdida del grano, con un hábito de crecimiento determinado de la planta.

En 1979, el profesor Amram Ashri y su equipo de investigadores de la Universidad Hebrea de Rehovot, "creó" un mutante de ajonjolí de hábito determinado mediante irradiación de semillas de esta especie. El hábito determinado resultó ser trasmisible por herencia monogenéticamente controlado, y recesivo, informó Ashri poco después. En diciembre de 1984, en una reunión de especialistas en ajonjolí en Roma, el Dr. Raymond Brigman, de la Universidad A&M de Texas, en Lubbock, informó que la variedad mutante israelí era estable en las condiciones del sur de los Estados Unidos. También es estable en el sur de la India, donde el Dr. S. Thanavelu la ha estado cultivando en la Tamil Nadu Agricultural University, en Vridhachalam.

Desde 1983, Ashri ha estado desarrollando líneas más vigorosas del mutante determinado, cruzándolo y recruzándolo con cultivares ampliamente divergentes para transferir ese gen único a variedades adaptadas a diversas condiciones. Se está estudiando cómo se comportaría ese gen en pareja con otro gen que previene la dispersión de las semillas, lo que todavía no se ha logrado. Como otros investigadores, ha concentrado sus esfuerzos con cultivares que contienen una mutación natural que ocurrió en 1942 en Venezuela, país en el que se ha estudiado el ajonjolí, principalmente en el Instituto de El Valle. Esta mutación, de un solo gen recesivo, consiste en la indehiscencia de sus cápsulas. Desgraciadamente, trae consigo muchos caracteres indeseables: no es muy fértil, produce pocas semillas de baja calidad y es sensible a varias enfermedades.

Ashri tiene esperanzas de reunir los dos caracteres benéficos sin las fallas del mutante venezolano espontáneo. Parece que en la segunda cosecha después del cruce (1a F22) han aparecido algunas plantas con ambos caracteres. En Revohot se ha plantado, en 1985, una hectárea con estas semillas en una prueba de progenie para encontrar una línea homozigota, según manifestó Ashri a Gamini Seveviratne (**New Scientist**, vol. 109, No. 1496, p. 25).

Todavía no está asegurado el éxito, pero el mutante determinado solo es ya un significativo paso adelante. Ashri y el Dr. Vichirt Benjasil, jefe del Crop Research Institute de Tailandia, comenzaron un proyecto cooperativo, basado en el mutante, a fines de 1985. Benjasil ha plantado ya las primeras líneas de un cruce del mutante con variedades tailandesas. Adalberto Gorbitz.