

## Semen characteristics, scrotal size and libido of wool Malin crossbred rams

(Ciri semen, saiz skrotum dan libido biri-biri jantan kacukan Malin wul)

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Key words: semen characteristics, scrotal size, libido, Malin, wool Malin crossbred rams

### Abstrak

Sebanyak 49 ekor biri-biri jantan baka Border Leicester x Malin (BM, n=6), Corriedale x Malin (CM, n=7), Dorset Horn x Malin (DM, n=10), Suffolk x Malin (SM, n=17) dan Malin (n=9) yang berumur 15 bulan digunakan dalam kajian untuk menilai mutu semen, saiz skrotum dan status libido. Purata isipadu semen baka SM (0.67 mL) paling tinggi ( $p < 0.01$ ) antara baka dan ini mungkin berhubungkait dengan saiz skrotumnya yang besar. Baka Malin yang mempunyai badan dan skrotum yang kecil serta testis yang pendek menghasilkan semen yang kurang ( $p < 0.01$ ). Perbezaan kemotilitian sperma antara baka didapati tidak ketara, kecuali baka Malin yang mempunyai kemotilitian sperma yang paling rendah. Semua baka mempunyai sperma hidup yang melebihi 95%. Peratus sperma yang abnormal paling rendah pada baka CM ( $p < 0.05$ ) tetapi paling tinggi pada baka SM. Jenis keabnormalan yang kerap ditemui ialah bahagian tengah yang bengkok dan 'off-centered'. Walau bagaimanapun, keabnormalan bagi semua baka yang dikaji lebih rendah daripada kadar minimum 25% yang diperlukan untuk baka pejantan biri-biri mencapai tahap kesuburan yang memuaskan. Berdasarkan penemuan yang diperolehi, ciri semen empat baka biri-biri jantan kacukan Malin wul bermutu baik dan boleh menghasilkan kebuntingan induk biri-biri. Tiada perbezaan yang ketara antara masa yang diperlukan iaitu 23.45–38.52 saat untuk biri-biri jantan Malin dan kacukannya dalam menghasilkan pancutan mani. Libido biri-biri jantan yang dinilai adalah sama. Berdasarkan kajian ini, penggunaan baka kacukan sebagai baka pejantan dalam program pembiakan biasa mungkin menghasilkan kadar kejayaan yang memuaskan.

### Abstract

A total of 49 15-month-old rams comprising Border Leicester x Malin (BM, n=6), Corriedale x Malin (CM, n=7), Dorset Horn x Malin (DM, n=10), Suffolk x Malin (SM, n=17) and Malin (n=9) were used in this study to evaluate their semen quality, scrotal circumference and libido status. The mean ejaculate volume of SM (0.67 mL) was highest ( $p < 0.01$ ) among the five breedtypes and this could be related to their large scrotal circumference of 29.14 cm as compared with the other breedtypes. The smaller-sized indigenous Malin rams which had smaller scrotal circumference and shorter testes, produced significantly lesser ( $p < 0.01$ ) semen volume. Sperm concentrations were similar among BM, CM,

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DM and SM rams, and the values were significantly higher ( $p < 0.01$ ) than that for Malin rams. No significant differences in the sperm mass motility, which ranged between 4.11 and 4.36, were observed in the semen of wool Malin crossbreds. Malin rams recorded the lowest ( $p < 0.01$ ) sperm mass motility. All rams had live spermatozoa greater than 95%. Total sperm abnormalities were lowest ( $p < 0.05$ ) in CM rams but highest in SM rams. The common types of abnormalities of spermatozoa observed were bent and off-centered mid-pieces. However, the abnormalities for all breedtypes in this study were lower than the minimum value of 25% required for satisfactory ram fertility. Based on these findings, the semen characteristics of the four wool Malin crossbred rams evaluated are of good quality and should be able to settle down (impregnate) ewes. No significant differences were observed in the time taken by the Malin and wool crossbred rams to achieve ejaculation, which varied between 23.45 s and 38.52 s. The five ram breedtypes had similar libido status. Based on this study, it can be concluded that the utilization of any of these breedtypes in natural mating programmes may yield acceptable success rates.

## Introduction

Wool sheep breeds, namely, Border Leicester, Corriedale, Dorset Horn and Suffolk were introduced into Malaysia by MARDI in 1987 for evaluation as potential sire breeds in crossbreeding programmes to improve the productivity of the indigenous Malin sheep. The crossbreeding programmes have resulted in the production of four breedtypes viz., Border Leicester x Malin (BM), Corriedale x Malin (CM), Dorset Horn x Malin (DM) and Suffolk x Malin (SM). Evaluation studies of these breedtypes for adaptive and growth characteristics indicated that they are potentially better suited than the purebred as improver breeds under the hot and humid Malaysian environment. Thus, the formation of domestic nucleus units based on these crossbreds appear feasible.

However, before the implementation of such a programme, the semen characteristics and libido of these prospective sire breedtypes should be critically evaluated. Woods et al. (1986) reported that fertility of bull could be predicted from sperm morphology. However, Smith et al. (1981) found no relationship between individual semen quality trait and fertility in bulls, but they indicated that fertility could be estimated by combining several factors such

as scrotal circumference, seminal quality and libido. There was positive correlation between testes size and sperm numbers (Hahn et al. 1969; Lino 1972). Mickelsen et al. (1982) found that rams with large scrotal circumference had higher percentage of normal cells as well as individual motility than rams with small scrotal circumference. Important relationships between scrotal circumference and testis weight have been reported (Knight 1977). The objective of this study was to evaluate the semen characteristics, testicular size and libido of BM, CM, DM, SM and Malin rams.

## Materials and methods

Forty-nine 15-month-old Malin and crossbred rams comprising BM (n=6), CM (n=7), DM (n=10), SM (n=17) and Malin (n=9) were used in this study. Rams were allowed to graze on *Setaria splendida* pastures and were supplemented with concentrate at 200–300 g/head daily (TDN = 76% and CP = 12%) during the day. At night, they were housed in a shed with raised slatted floor, about 2.0 m above ground level. Water and mineral salt licks were provided ad libitum.

Testicular size was estimated by measuring the scrotal circumference with a flexible metal tape at the point of maximum

Table 1. Least squares means and standard errors of means for semen characteristics of Malin and wool Malin crossbred rams

Breed-type*	Volume (mL)	Concentration (x 10 <sup>9</sup> )	Motility (0–5)	Spermatozoa (%)	
				Live	Abnormal
Malin	0.32 ± 0.04A	1.05 ± 0.11A	3.21 ± 0.20A	95.4 ± 1.26a	9.37 ± 2.6ab
BM	0.48 ± 0.05B	1.63 ± 0.13B	4.27 ± 0.25BC	96.5 ± 1.56a	11.91 ± 3.4ab
CM	0.45 ± 0.05B	1.48 ± 0.12B	4.11 ± 0.22BC	97.7 ± 1.38a	6.40 ± 4.2a
DM	0.49 ± 0.04B	1.71 ± 0.11B	4.36 ± 0.20C	95.4 ± 1.26a	12.84 ± 3.2ab
SM	0.67 ± 0.04C	1.56 ± 0.10B	3.99 ± 0.18B	96.4 ± 1.11a	15.29 ± 3.4b

\*BM = Border Leicester x Malin

DM = Dorset Horn x Malin

CM = Corriedale x Malin

SM = Suffolk x Malin

A, B, C – values with different letters within column are different at  $p < 0.01$ a, b, c – values with different letters within column are different at  $p < 0.05$ 

circumference of the paired testes (Notter et al. 1981). Both testes were gently pushed into the posterior region of the scrotal sac and the skin of the scrotum was stretched taut to get more accurate measurements of the scrotal circumference. Testis length was measured from the top of the testis to the bottom of the epididymis with a pair of vernier calipers. Assessment of the libido of each ram was based on the time taken to ejaculate upon exposure to a teaser ewe, and the number of mounts made by each ram to attain a single ejaculation. The observation lasted from the moment the ram was introduced to the teaser ewe until the first ejaculation was achieved. If the ram did not ejaculate within 5 min, the test was discontinued. To reduce bias in the result, the rams were familiarized with the libido testing procedure before the actual libido test was conducted.

Semen from each ram was collected into an artificial vagina at biweekly intervals for a period of 7 months. Gross semen examination to record semen/ ejaculate volume and mass motility, and microscopic evaluation for sperm concentration, live percentage and abnormalities was done as recommended by Elliott (1978) and Sorenson (1979).

The data were analyzed using the Statistical Analysis System (SAS for PC) package to obtain least squares means of each variable and to compare the differences

between the various breedtypes. Breedtype differences for testicular size, libido and semen characteristics were compared after adjusting for the effects of age (in days) and sampling period (in weeks).

### Results and discussion

The semen volume, sperm concentration, mass motility, percentage of live spermatozoa and percentage of abnormal spermatozoa are shown in *Table 1*. The mean seminal volume of SM rams was highest ( $p < 0.01$ ) among the five breedtypes, and this could be related to their larger scrotal circumference compared with those of the other breedtypes (*Table 2*). Besides seminal volume, testes size is also related to body size (Land and Sales 1977; Semplicio et al. 1982). Thus, the smaller-sized indigenous Malin rams which had smaller scrotal circumference and shorter testes, produced significantly lesser ( $p < 0.01$ ) semen volume. This result confirms the findings by Weimer and Ruttle (1987), and Yarney et al. (1990) who reported high positive correlation between semen output and testicular size. Testicular size is a good indicator of spermatogenic function and also sperm producing capacity of a ram (Lino 1972; Knight 1977; Notter et al. 1981). However, it may be a less reliable predictor in younger lambs because at this age testicular tissue occupies only a smaller proportion of the scrotal volume. The

Table 2. Least squares means and standard error of means for testicular size of Malin and wool Malin crossbred rams

Breedtype	Circumference (cm)	Length (cm)
Malin	24.39 ± 0.50a	82.39 ± 2.32a
Border Leicester x Malin	26.88 ± 0.77b	89.13 ± 3.54ab
Corriedale x Malin	24.31 ± 0.77a	82.33 ± 3.54a
Dorset Horn x Malin	27.14 ± 0.54b	90.39 ± 2.51b
Suffolk x Malin	29.14 ± 0.44c	97.38 ± 2.05c

Values with different letters within each column are different at  $p < 0.05$

Table 3. Least squares means and standard error of means for libido of Malin and wool Malin crossbred rams

Breedtype	Ejaculation time(s)	No. of mounts taken to ejaculate
Malin	37.89 ± 34.6ns	2.99 ± 2.09ns
Border Leicester x Malin	23.45 ± 14.5ns	2.52 ± 0.88ns
Corriedale x Malin	31.56 ± 27.0ns	3.11 ± 1.64ns
Dorset Horn x Malin	23.74 ± 11.5ns	2.14 ± 0.70ns
Suffolk x Malin	38.52 ± 7.6ns	3.02 ± 0.46ns

ns = non-significant

seminal volumes of wool Malin crossbred rams in this study are comparable with those of imported Dorset Horn, Suffolk and Siamese Long Tail (Ramakrishnan et al. 1991; Abdul Wahid et al. 1992). However, the semen volumes of wool Malin crossbred rams in this study are much lower than those reported for Bali-Bali, Balin, Badorlin and Bali-Bali x Siamese Long Tail rams (Musaddin et al. 1993).

Sperm concentration was similar amongst BM, CM, DM and SM, and was significantly higher ( $p < 0.01$ ) than that of Malin rams. The sperm concentrations of the wool Malin crossbred rams in this study were comparable with those reported for Dorset Horn and Suffolk (Abdul Wahid et al. 1992) and Siamese Long Tail rams (Ramakrishnan et al. 1991) but lower than those reported for Bali-Bali and its crossbred rams (Musaddin et al. 1993). No significant differences in the sperm mass motility were observed among the wool crossbreds. The lowest ( $p < 0.01$ ) semen mass motility was recorded in the Malin rams. However, the mass motility observed in this study which exceeded the minimum value of 50% for satisfactory fertility (Sorenson 1979),

indicated that all five ram breedtypes are fertile and thus, have the potential to be used as breeders. The Malin and the four crossbred rams had live spermatozoa greater than 95%. These values were higher than those reported for the Dorset Horn, Suffolk (Abdul Wahid et al. 1992) and the Siamese Long Tail (Ramakrishnan et al. 1991) but similar to the hair sheep crossbred rams (Musaddin et al. 1993).

Total sperm abnormalities were lowest ( $p < 0.05$ ) in CM but highest in SM rams. Bali-Bali and its crossbred rams were reported to have a lower percentage of sperm abnormalities (Musaddin et al. 1993). The most common types of sperm abnormalities observed were bent and off-centered mid-pieces. Similar observations were previously reported on mature Suffolk, Lincoln, Columbia and Polyopia rams (Mickelsen et al. 1982). However, the spermatozoan abnormality for all breedtypes in this study was lower than the minimum value of 25% required for satisfactory ram fertility as suggested by Sorenson (1979). From the ANOVA tables, it was observed that, except for the seminal volume, all the other variables showed no week-to-week

variation. The variation in the seminal volume could be due to the degree of stimulation received by the rams on each semen collection day as reported in bulls (Almquist 1973) and boars (Hemsworth and Galloway 1979). These findings suggest that the semen characteristics of the wool Malin crossbred rams evaluated are of good quality and should be able to settle down ewes.

Results of the libido assessment revealed no significant differences in the time taken by the Malin and wool Malin crossbred rams to achieve ejaculation (Table 3). Similar figures were reported for Bali-Bali and its crossbreds (Musaddin et al. 1993). There was a wide individual variation in the ejaculation time of the rams in the present study. Similar observations were previously reported on Targhee (Price et al. 1991), Siamese Long Tail (Ramakrishnan et al. 1991), and Bali-Bali and its crossbred rams (Musaddin et al. 1993). The results also suggest that the five breedtypes required similar number of mounts to achieve a single ejaculation. However, a smaller number of mounts were required by Bali-Bali rams and its crossbreds to achieve ejaculation (Musaddin et al. 1993). It has been suggested that the libido of each ram should be given due consideration because it determines the number of ewes (of reasonable fertility) settled in a specific time frame although it might have good quality semen (Roszczewska 1984).

This study only managed to assess the basic libido status of the rams. It would only identify whether the male is a 'worker' or a 'non-worker', but does not necessarily answer the question of overall or sustained performance. Therefore, in future, pen libido testing using ewes in estrus and field flock mating should be carried out because it provides a better and accurate understanding of a ram's serving capacity (Mattner et al. 1967). Pending further investigations based on field observations, it is concluded that utilization of any of these breedtypes in natural mating programme may yield acceptable success rates.

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## References

- Abdul Wahid, S., Yunus, J. M. and Ariffin, M. (1992). Libido and semen quality of imported temperate rams. *Proc. Natl. IRPA (Intensification of Research in Priority Areas) Seminar (Agriculture Sector)* 6–11 Jan. 1992 (Ho, Y. W., Vidyadaran, M. K., Noraini, A., Jainudeen, M. R. and Abdul Rani, B., ed.) Vol. 2, p. 171–2. Kuala Lumpur: Ministry of Science, Technology and Environment
- Almquist, J. O. (1973). Effects of sexual preparation on sperm output, semen characteristics and sexual activity of beef bulls with a comparison to dairy bulls. *J. Anim. Sci.* **36**: 331–6
- Elliott, F. I. (1978). Semen evaluation. In *Physiology of reproduction and artificial insemination of cattle* (Salisbury, G. W., Van Demark, N. L. and Lodge, J. R., ed.) Chap. 14, p. 400–27. San Francisco: W. H. Freeman & Co.
- Hahn, J., Foote, R. H. and Seidel, G. E. (1969). Testicular growth and relative sperm output in dairy bulls. *J. Anim. Sci.* **29**: 41–7
- Hemsworth, P. H. and Galloway, D. B. (1979). The effect of sexual stimulation on the sperm output of the domestic boar. *Anim. Reprod. Sci.* **2**: 387–94
- Knight, T. W. (1977). Methods of indirect estimation of testes weight and sperm numbers in Merino and Romney. *New Zealand J. Agr. Res.* **20**: 291–5
- Land, R. B. and Sales, D. T. (1977). Mating behavior and testes growth of Finnish Landrace, Tasmanian Merino and crossbred rams. *Anim. Prod.* **24**: 83–90
- Lino, B. J. (1972). The output of spermatozoa in rams. II. Relationship to scrotal circumference, testis weight, and the number of spermatozoa in different parts of the urogenital tract. *Aust. J. Biol. Sci.* **25**: 359–66
- Mattner, P. E., Braden, A. W. H. and Turnbull, K. E. (1967). Studies in flock mating in sheep. I. Mating behavior. *Aust. J. Exp. Agric. Anim. Husb.* **7**: 103–9
- Mickelsen, W. D., Paisley, L. G. and Dahmen, J. J. (1982). Seasonal variation in the scrotal circumference, semen, semen quality, and sexual activity in rams. *J. Am. Vet. Med. Assoc.* **181**: 376–80
- Musaddin, K., Mohd Khusahry, M. Y. and Jasni, I. (1993). Semen characteristics and libido of

- Bali-Bali rams and its crossbred. *Proc. 16th Ann. Conf. MSAP* (Theme: Animal production strategies in the challenging environment) 7–8 May 1993, Langkawi (Dollah, M. A., Wan Zahari, M., Ramlah, A. H., Hilmi, I., Dahlan, I. and Engku Azahan, E. A., ed.) p. 188–90. Serdang: Malaysian Society of Animal Production
- Notter, D. R., Lucas, J. R. and McClaugherty, F. S. (1981). Accuracy of estimation of testis weight from in situ testis measures in ram lambs. *Theriogenology* **15**: 227–34
- Price, E. O., Estep, D. Q., Wallach, S. R. J. and Dally, M. R. (1991). Sexual performance of rams as determined by maturation and sexual experience. *J. Anim. Sci.* **69**: 1047–52
- Ramakrishnan, P., Hassan, A. W. and Abdullah Sani, R. (1991). The semen production and quality of imported Siamese Long Tail sheep in Malaysia. *Proc. 14th Ann. Conf. MSAP* (Theme: Recent innovations in the animal and animal by-products industry) 8–9 May 1991, Genting Highlands (Ishak, Y., Kassim, H., Engku Azahan, E. A. and Abas, M. O., ed.) p. 118–20. Serdang: Malaysian Society of Animal Production
- Rosciszewska, Z. E. (1984). Evaluation of sexual behavior in rams in relation to their reproductive capacity. *Anim. Reprod. Sci.* **7**: 517–20
- Simplicio, A. A., Riera, G. S., Nelson, E. A and Pant, K. P. (1982). Seasonal variation in seminal and testicular characteristics of Brazilian Somali rams in the hot semi-arid climate of tropical northeast Brazil. *J. Reprod. Fert.* **66**: 735–8
- Smith, M. F., Morris, D. L., Amoss, M. S., Parish, N. R., Williams, J. D. and Wiltbank, J. N. (1981). Relationships among fertility, scrotal circumference, seminal quality and libido in Santa Gertrudis bulls. *Theriogenology* **16**: 379–97
- Sorenson, A. M. (1979). Breeding soundness evaluation. In *Animal reproduction, principles and practices* Chp. 5, p. 110–43. New York: McGraw-Hill
- Weimer, K. E. and Ruttle, J. L. (1987). Semen characteristics, scrotal circumference and bacterial isolates of fine wool range rams. *Theriogenology* **28**: 625–37
- Woods, P. D. P., Foulkes, J. A., Shaw, R. C. and Melrose, D. R. (1986). Semen assessment, fertility and the selection of Hereford bulls for use in AI. *J. Reprod. Fert.* **76**: 783–8
- Yarney, T. A., Sanford, L. M. and Palmer, W. M. (1990). Pubertal development of ram lambs: body weight and testicular size measurements as indices of postpubertal reproductive function. *Can. J. Anim. Sci.* **70**: 139–47