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Sheep–Oil Palm Integration: Growth Performance of Dorset x Malin and Dorset x Siamese Long Tail Sheep

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ABSTRAK

*Kajian ini melibatkan integrasi bebiri dengan peladangan kelapa sawit. Penilaian kadar pertumbuhan bebiri jenis 25% Dorset x 75% Malin (DMalin) dan 25% Dorset x 75% Siamese Long Tail (DSLT) dipelihara di dalam ladang kelapa sawit berumur 9, 13, 16 dan 21 tahun telah dijalankan. Ukuran-ukuran telah diambil secara rawak dari kumpulan bebiri pada umur lahir 2, 4, 6, 8 dan 10 bulan. Pertalian antara berat badan dan umur ditentukan oleh model Brody. Model pertumbuhan bebiri adalah 1) BW = 17.9715 (1-0.9113 exp (0.0049*AGE)) untuk DMalin jantan, 2) BW = 17.7792 (1-0.9230 exp(-0.005*AGE)) untuk DMalin betina, 3) BW = 21 (1-0.8778 exp(-0.0049*AGE)) untuk DSLT jantan dan 4) BW = 18.7301 (1-0.8613 exp(-0.0059*AGE)) untuk DSLT betina. Kenaikan berat harian bebiri DMalin dan DSLT dari umur lahir ke 10 bulan ialah 41.0 dan 54.1 gram/ekor/hari, berturutan. Bebiri jantan adalah lebih berat sedikit daripada bebiri betina. Kenaikan berat harian bebiri adalah berhubungkait dengan masa ragutan yang kurang dan kualiti rumpai yang rendah didalam ladang kelapa sawit tua.*

ABSTRACT

*This study involved the integration of sheep into oil palm plantations. The growth rates of 25% Dorset x 75% Malin (DMalin) and 25% Dorset x 75% Siamese Long Tail (DSLT) sheep raised in 9, 13, 16 and 21 year-old oil palm plantations were evaluated. The measurements were taken by randomly sampling from the flock at birth, 2, 4, 6, 8 and 10 months of age. The relationship between body weight and age was determined by Brody's model. Consequently, the growth models of sheep were 1) BW = 17.9715 (1-0.9113 exp(-0.0049*AGE)) for DMalin male, 2) BW = 17.7792 (1-0.9230 exp(-0.005*AGE)) for DMalin female, 3) BW = 21 (1-0.8778 exp(-0.0049*AGE)) for DSLT male and 4) BW = 18.7301 (1-0.8613 exp(-0.0059*AGE)) for DSLT female. The average daily gain of DMalin and DSLT sheep from birth to 10 months of age was 41.0 and 54.1 gm/head/day, respectively. The males were slightly heavier than the females. Daily weight gains of sheep were related to the limited grazing period and low quantity of herbage available in old oil palm plantations.*

INTRODUCTION

Sheep production under oil palm is a viable venture in Malaysia (Chen *et al.* 1996). This production system is popular because of its symbiotic nature. The integrated system has two main objectives, namely, to convert the unwanted herbage under the oil palm canopy into a useful feed resource (Pillai *et al.* 1985), and to utilize free space for animal production (Chen and Dahlan 1996). The breeds of sheep such as Malin (Malaysia indigenous breed), Siamese Long Tail and its crosses with the Dorset used for this integrated system have performed well in the Malaysian environment and management systems (Tajuddin and Chong 1988; Rajion *et al.* 1993). However, information on the productivity of an integrated sheep-oil palm production system is very limited and is mostly related to fertility, mortality and management problems. Recently, the interest of plantation owners towards sheep-oil palm integration is declining because of the poor performance of the animals in the plantation and inadequate information on the relevant technology in livestock production (Chen *et al.* 1996). More information on this system is needed through proper data collection and field experiments.

This study was conducted to evaluate the growth performance of 25% Dorset x 75% Malin (DMalin) and 25% Dorset x 75% Siamese Long Tail (DSLT) sheep integrated with oil palm.

MATERIALS AND METHODS

Animals and Management

The research was conducted at Sungai Seraya Plantation belonging to Far East Holdings Bhd at Keratong, Pahang. The size of the plantation was 376 ha and the ages of oil palms were 9, 13, 16 and 21 years. The plantation raised 1,460 head of sheep. Lambs were kept in the sheds and fed with natural herbage *ad libitum* through a cut and carry system supplemented with commercial pellets containing 16.7% crude protein, 7.5% ash, 6.9% crude fibre, and 6.5% ether extract at 80 gm/head/day from 3 weeks of age until weaning at four months of age. After weaning, the lambs were divided into two groups according to sex. They were kept in the sheds in groups of 35-45 until six months of age when they were allowed to graze under oil palms from 0900 to 1400 hours without supplementation. The grazing area was rotated every day.

Data Collection

Measurements of body weight related to age were randomly sampled from 220 DMalin and 275 DSLT sheep. The relationship between weight and age was determined using the model of Brody (Brown *et al.* 1976). The following model was used; body weight $(BW) = AWT * (1 - CON * \exp(-MR * AGE))$; where AWT = the asymptotic weight, CON = constant, MR = rate of maturity, and AGE = age of sheep (days).

Herbage was sampled from experimental plots measuring 3.5 x 3.5 m under 9-year-old oil palm canopy and from experimental plots measuring 4 x 4 m under 16-21 year-old oil palm canopy. Herbage was cut about 1.5 inches above the ground at monthly intervals. The samples were separated into 2 groups to analyse for dry matter yield and chemical composition (AOAC 1984).

Statistical Analysis

The relationship between body weight and age was determined by a non-linear procedure. Statistical analysis was performed according to SAS (1988).

RESULTS AND DISCUSSION

Nutritive Value of Herbage Yield under Oil Palm

The herbage in the oil palms plantation was a mixture of mainly grasses, broad leaves, legumes and ferns (Dahlan *et al.* 1993; Chen *et al.* 1996). Table 1 shows the chemical composition of the herbage. The crude protein content of herbage under oil palm of 7.6-12.7%, and gross energy of 16.0-16.3 MJ/kg dry matter were similar to the report of Dahlan *et al.* (1993). The average dry matter (DM) yield of herbage under oil palm from 9-21 years was 74.8 kg/ha/month. This DM yield was higher than that of Dahlan *et al.* (1993) (76.1 vs. 66.7 kg/ha/month). Nevertheless, the herbage DM yield (DMHYA) decreased as the age of the oil palms increased. This corresponded with lower light penetration under the oil palm canopy (Dahlan *et al.* 1993; Chen *et al.* 1996). The average DM yield of herbage was 1.7-3.7 kg/ha/day (0.17–0.37g/m^2/day). The DM intake requirement for maintenance and growth by sheep in the tropics is about 74.9 g/head/day/kg W$^{0.75}$ (Kearl 1982). Thus, the estimated DM intake per W kg$^{0.75}$ of sheep aged 2-10 months in this present study was 256.3-545.0 g/head/day for DMalin and 359.6-662.7 g/head/day for DSLT, respectively. However, the available herbage in the old oil palm plantation cannot supply sufficient daily DM intake for the sheep.

Growth Performance

Table 2 shows the growth performance of DMalin and DSLT sheep from birth to 10 months of age. The DMalin grew significantly slower than

TABLE 1
Chemical composition of herbage under oil palm

Palm age (years)	% DM	% of DM[1/] CP[2/]	ADF[3/]	CF[4/]	Ash	GE[5/] (MJ/kg)	ME[6/] (MJ/kg)	DMYHA[7/] (kg/ha/mo)
9	18.9	12.7	44.3	24.9	12.7	16.0	8.9	110.9
13	19.8	10.7	45.7	26.9	12.5	16.2	8.0	75.4
16	22.8	9.2	48.4	23.2	10.7	16.1	6.4	62.2
21	25.0	7.6	46.5	28.4	11.7	16.3	6.0	50.8
Mean	21.6	10.1	46.2	25.9	11.9	16.2	7.3	74.8

1/ DM = dry matter; 2/ CP = crude protein; 3/ ADF = acid detergent fibre; 4/ CF = crude fibre; 5/ GE = gross energy; 6/ ME = metabolisable energy; DMYHA = DM yield per ha per month

TABLE 2
Growth performance of DMalin and DSLT sheep under oil palm

Items	Sex	DSLT (MeanSD)	n	DMalin (MeanSD)	n	Level of Significance
Birth wt. (kg)	M	2.1 ± 0.2^a	45	1.7 ± 0.2^b	30	0.01
	F	2.0 ± 0.3^a	45	1.6 ± 0.3^b	20	0.01
	MeanSE	2.1 ± 0.1		1.7 ± 0.1		
Wt. at 60 days (kg)	M	8.1 ± 0.5^a	20	5.4 ± 0.6^b	20	0.01
	F	8.0 ± 0.4^a	20	4.9 ± 0.5^b	20	0.01
	MeanSE	8.1 ± 0.1		5.1 ± 0.3		
Weaning wt (120 days) (kg)	M	10.8 ± 1.1^a	20	8.9 ± 1.9^b	20	0.05
	F	9.0 ± 0.5	20	8.6 ± 1.1	20	NS
	MeanSE	10.3 ± 0.7		8.8 ± 0.2		
Wt. at 180 days (kg)	M	13.1 ± 0.3^a	20	11.9 ± 0.4^b	20	0.05
	F	12.7 ± 0.5^a	20	11.3 ± 0.4^b	20	0.05
	MeanSE	13.1 ± 0.7		11.6 ± 0.4		
Wt. at 240 days (kg)	M	15.4 ± 0.4^a	20	13.0 ± 0.6^b	15	0.01
	F	14.7 ± 0.6^a	20	13.0 ± 0.9^b	15	0.05
	MeanSE	15.0 ± 0.6		13.0 ± 0.0		
Wt. at 300 days (kg)	M	18.9 ± 0.4^a	10	14.7 ± 0.4^b	10	0.01
	F	17.6 ± 0.5^a	15	13.5 ± 1.0^b	10	0.01
	MeanSE	18.3 ± 0.9		14.1 ± 0.8		
ADG, gm/day						
– At weaning (birth-4M)	M	72.5^a		57.1^b		0.01
	F	58.3		60.5		NS
	MeanSD	65.4 ±10.0		58.8 ± 2.4		
– After birth to 10 M.	M	56.2^a		43.3^b		0.05
	F	51.9^a		39.5^b		0.01
	MeanSD	54.1 ± 3.0		41.4 ± 2.7		

Means within column with different superscripts differ significantly

DSLT in both sexes (P<0.01). The birth weight of the DMalin lamb was lighter than the weight of DSLT (1.7 vs. 2.1 kg, respectively). The weaning weight of DMalin was lower than DSLT lambs (8.8 vs. 10.3 kg, respectively). The ADG from birth until 10 months of age of the DMalin and the DSLT male was 42.4 and 56.2 gm/day, respectively, while the female was 39.5 and 52.0 gm/head/day, respectively. In both breeds, the males tended to grow faster than the females.

The performance data of DMalin from this study were similar to those of Devendra (1975), Tajuddin and Chong (1988) and Khusahry and Gayah (1991) although the management practices were different. The growth pattern of the DSLT was similar to the report of Schrader

TABLE 3
Comparison of actual weight and estimated weight (kg) of sheep under oil palm

Age	DSLT, male		DSLT, female		DMalin, male		DMalin, female	
(days)	Actual	Estimate	Actual	Estimate	Actual	Estimate	Actual	Estimate
Birth	2.1	2.7	2.0	2.7	1.8	1.7	1.6	1.5
60	8.1	7.5	8.0	7.4	5.4	5.8	4.9	5.6
120	10.8	11.1	9.0	10.8	8.9	8.9	8.6	8.8
180	13.1	13.8	12.7	13.2	11.9	11.2	11.3	11.1
240	15.4	15.8	14.7	14.8	12.9	12.9	13.0	12.8
300	18.9	17.3	17.6	16.0	14.5	14.2	13.5	14.1

(1994) who observed that the SLT sheep grazing under oil palm with no supplements grew about 52.9 gm/day. However, Ramakrishnam *et al.* (1992) reported that the growth rate from birth until 12 months of male SLT sheep months grazing on native grasses and weeds under fruit trees from 0900 to 1700 hours each day was 82.2 gm/head/day.

Genetically, the Siamese Long Tail sheep is bigger than the Malin. When crossed with the Dorset, the DSLT grew faster than the DMalin sheep. The inferior growth performance of the DMalin in this study was similar to that in studies of Wan Mohamad (1977) and Davis *et al.* (1993). Thus, under the integrated system, the DSLT sheep were 29.8% heavier than the DMalin at 10 months of age.

The poor growth performance of both crossbreeds was probably due to insufficient feed from the plantation. During the pre-weaning stage (3-16 weeks of age) when supplementation was given, the animals showed faster growth rates (58.8 and 65.4 gm/head/day for DMalin and DSLT, respectively). These results were similar to those of Batubara *et al.* (1996) who reported that the ADG of North Sumatra sheep under oil palm was 45.3 gm/head/day. However, the results of the present study contrasted with the report of Rajion *et al.* (1994) who showed that Wiltshire x Malin sheep showed good performance when grazing for 7 hours under oil palm due to the availability of preferred digestible forage of high nutritive value.

Table 3 shows the actual weight per age of sheep compared with the estimated weight from Brody's model. The relationship between body weight and age of sheep in this study determined by the model of Brody were 1) DMalin male, $BW = 17.9715\ (1\text{-}0.9113\ exp(\text{-}0.0049{*}AGE))$, 2) DMalin female, $BW = 17.7792\ (1\text{-}0.9230\ exp(\text{-}0.005{*}AGE))$, 3) DSLT male, $BW = 21.6869\ (1\text{-}0.8778\ exp\ (\text{-}0.0049{*}AGE))$, and 4) DSLT female, $BW = 18.7301\ (1\text{-}0.8613\ exp\ (\text{-}0.0059{*}AGE))$. The asymptotic weight (*AWT*) of all breeds was higher than the actual weight at 10 months of age. The *AWT* of males was higher than that of females while DMalin was lower than the DSLT sheep. The study indicated that the maturity rates (*MR*) of both crossbreeds were low, showing the late maturing of the sheep. *MR* was 0.0049-0.005 for DMalin and 0.0049-0.0059 for DSLT. The females showed slightly higher *MR* than the males but not significantly different (P>0.05). However, the models derived from this study are applicable to sheep from birth until 300 days of age.

CONCLUSION

The growth rates of DMalin and DSLT sheep at Sungai Seraya plantation were low due to the lack of quality feed and a limited grazing period. The inferiority of genes was also a factor to consider. In order to improve the growth performance, supplementation is needed to provide sufficient nutrients for maintenance and production. The results of this study indicated that the grazing period should be increased. The model of Brody can be used to estimate the growth of sheep. However, the constant values in Brody's equations will change according to the breed type and feed supply.

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