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GENETIC AND PHENOTYPIC ESTIMATES OF GROWTH AND REPRODUCTIVE TRAITS OF THAI LONG TAIL AND ITS CROSSES WITH CAMEROON HAIR SHEEP

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ABSTRACT

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Studies on the growth, body conformation and reproductive traits of purebreds Cameroon hair sheep that was imported from Germany and the local Thai Long Tail wool sheep and their crossbreds were conducted at the University of Malaya's experimental farm. Crossbreeding between the hair sheep sires with the local wool sheep females was done with the aim of producing hair sheep crossbreds that are heat tolerant and have no wool or with very little wool cover, and with the assumption that at least some of the feed intake by the crossbred animals will be converted to meat instead of the very low quality wool. Various crossbreds including the F_1 (Cameroon x Thai Long Tail), F_2 (F_1 x F_1), F_3 (F_2 x F_2), BC_1 (F_1 male x Thai Long Tail female), BC_2 (Thai Long Tail male x F_1 female) have been produced in the farm and managed under an intensive management system. Data obtained in the farm from the year 1990 to 1997 was analysed and presented.

Comparative performances were made on their birth weights, weaning weights (90-days weight) and post-weaning weights (180, 270 and 360-days weights) with the effects of the year of birth, genotypes, sex, the type of birth, the parity of birth and the interactions between genotypes and sex, genotypes and type of birth. Other than the above traits, studies on the estimates of genetic and phenotypic parameters on the body weight traits were also presented.

The effect of genotype was significant for birth weight ($P \leq 0.05$), the interaction between genotypes and sex at 180 ($P \leq 0.001$), 270 ($P \leq 0.01$) and 360 ($P \leq 0.001$) days' weight. The interaction effect between genotypes and the type of birth was significant at 90 ($P \leq 0.01$), 180 ($P \leq 0.001$), 270 ($P \leq 0.01$) and 360 ($P \leq 0.05$) days, the interaction effect of genotype and year of birth on ADG at 90 – 180 days ($P \leq 0.01$) and 180 – 270 days ($P \leq 0.05$), interaction effect between genotype and sex on ADG at the

age of 90 – 180 days (P≤0.01) and the interaction effect between genotype and type of birth on ADG from birth – 90 days (P≤0.01), height at wither (P≤0.01), body length (P≤ 0.01), heart girth (P≤0.01) and back girth (P≤0.01) in all the age groups, the age at first oestrus (P≤0.001), age at first successful mating (P≤0.001) and the age at first parturition (P≤0.001) were also significant.

Sex had significant effects for birth weight (P≤0.05), 90 (P≤0.01), 180 (P≤0.05), 270 (P≤0.01) and 360-days (P≤0.01) body weight, on ADG from birth – 90 days (P≤0.01). The interaction effect between genotype and sex on ADG at the age of 90 – 180 days (P≤0.01), and for the height at wither at 90 (P≤ 0.01), 180 (P≤0.01) and 270 (P≤0.05) days of age was also significant. The effect of the type of birth was very highly significant at birth (P≤0.001), 90 (P≤0.001) and 180-day weight (P≤0.001) but became less significant for 270-day weight (P≤0.05), on ADG from birth – 90 days (P≤0.001) and for 90 – 180 days (P≤0.05). The interaction effect on ADG between genotype and type of birth from birth – 90 days (P≤0.01) was significant. Significant effect of parity was found for the birth weight (P≤0.05) and on ADG at the age of 90 – 180 days (P≤0.001).

On body conformation traits, genotype had very significant effects on the height at wither (P≤0.01), body length (P≤0.01), heart girth (P≤0.01) and back girth (P≤0.01) in all the age groups. The effect of sex was significant for height at wither at 90 (P≤0.01), 180 (P≤0.01) and 270 (P≤0.05) days of age only. The other main effects and the interaction effects were not significant.

Studies on reproductive traits showed that the effect of genotype was very significant for the age at first oestrus (P≤0.001), age at first successful mating (P≤0.001) and the age at first parturition (P≤0.001). The effects of genotypes, type of birth, parity

of birth and their interaction effects were all not significant for the other reproductive traits.

The heritability of body weight traits, and genetic and phenotypic correlations between these body weight traits were estimated. The heritability estimates for birth weight, 90-day, 180-day and 270-day body weights ranged from 0.26 ± 0.82 to 0.90 ± 0.82. The genetic correlations ranged from –0.07 to 0.25 for the F_1 offspring on Thai Long Tail ewes and from 0.06 to 0.38 for the F_2 offsprings on F_1 ewes. The phenotypic correlations ranged from 0.23 to 0.92 in the F_1 and between 0.51 to 0.96 in the F_2. The genetic correlations between body weight traits were in general much lower than the phenotypic correlations.

The studies also reflected the advantage of removing or reducing the wool for more meat production. With less wool, the weights of the crossbred animals were higher than the Thai Long Tail wool sheep especially after the age of 270 days. This is in agreement with the assumption that the feed consumed have been converted more to the production of meat instead of wool. Body conformation traits of the crossbred animals have shown how the reduction of wool has led to more body compactness by comparing the body conformation of the crossbreds to the Thai Long Tail. The crossbreds were also found to mature earlier than the Thai Long Tail and in most cases have better reproductive performance than either the Cameroon or the Thai Long Tail or both the parental genotypes.

Generally, the results have shown that the crossbreds are better than their parental genotypes in growth, body conformation and reproductive traits.

ABSTRAK

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Kajian mengenai trait tumbesaran, konformasi badan dan pembiakan baka tulin bebiri rerambut Cameroon yang asalnya diimport dari German dan baka tulin bebiri berbulu Thai Long Tail beserta anak kacukan di antara keduanya telah dijalankan di Ladang Penyelidikan Universiti Malaya. Kacukan di antara pejantan bebiri rerambut dengan betina bebiri berbulu tempatan telah dilakukan, bertujuan untuk menghasilkan anak-anak kacukan bebiri rerambut yang tahan haba, tidak mempunyai bulu atau hanya mempunyai sedikit bulu sahaja dibadannya, dengan andaian bahawa makanan yang dimakan itu akan ditukarkan lebih kepada pembentukan daging berbanding kepada pembentukan bulu yang berkualiti rendah dan tidak diperlukan. Pelbagai baka anak kacukan telah dihasilkan, ini termasuklah F_1 (Cameroon x Thai Long Tail), F_2 (F_1 x F_1), F_3 (F_2 x F_2), BC_1 (F_1 jantan x Thai Long Tail betina) dan BC_2 (Thai Long Tail jantan x F_1 betina), dan diselenggara mengikut cara sistem pengurusan intensif. Data yang dikumpul dari tahun 1990 sehingga 1997 telah dianalisa dan dibentangkan dalam tesis ini.

Perbandingan tumbesaran antara genotip telah dibuat untuk berat lahir, berat semasa penyapihan (berat pada umur 90-hari) dan berat selepas penyapihan (pada umur 180, 270 dan 360 hari) berdasarkan kepada kesan tahun kelahiran, genotip, jantina, jenis kelahiran, pariti kelahiran, kesan interaksi antara genotip dan jantina, dan kesan interaksi antara genotip dan jenis kelahiran. Selain daripada itu, hasil kajian tentang korelasi genetik dan finotipik dengan berat badan juga dibentangkan.

Kesan genotip didapati signifikan pada berat lahir ($P \leq 0.05$) manakala kesan interaksi antara genotip dan jantina ke atas berat badan adalah signifikan pada umur 180 ($P \leq 0.001$), 270 ($P \leq 0.01$) dan 360 ($P \leq 0.001$) hari. Kesan interaksi antara genotip dan jenis kelahiran terhadap berat badan adalah signifikan pada umur 90 ($P \leq 0.01$), 180

(P≤0.001), 270 (P≤0.01) dan 360 (P≤0.05) hari. Kesan interaksi antara genotip dan tahun kelahiran didapati signifikan pada purata berat badan harian (ADG) di antara umur 90 – 180 hari (P≤0.01) dan 180 – 270 (P≤0.05) hari. Kesan interaksi antara genotip dan jantina pula didapati signifikan pada purata berat badan harian (ADG) di antara umur 90 – 180 (P≤0.01) hari dan kesan interaksi antara genotip dan jenis kelahiran didapati signifikan pada purata berat badan harian (ADG) diantara berat lahir – 90 (P≤0.01) hari. Kesan genotip juga didapati signifikan pada ukuran badan haiwan iaitu untuk tinggi haiwan (P≤0.01), panjang badan (P≤0.01), ukurlilit depan (P≤0.01) dan ukurlilit belakang (P≤0.01) pada umur 90, 180, 270 dan 360 hari. Dalam kajian pembiakan, didapati kesan genotip adalah signifikan untuk umur semasa estrus yang pertama (P≤0.001), umur semasa pengawanan yang berhasil (P≤0.001) dan umur semasa kelahiran pertama (P≤0.001).

Jantina haiwan mempunyai kesan yang signifikan terhadap berat lahir (P≤0.05) dan berat badan pada umur 90 (P≤0.01), 180 (P≤0.05), 270 (P≤0.01) dan 360 hari (P≤0.01), purata berat badan harian pada berat lahir – 90 hari (P≤0.01), kesan interaksi antara genotip dan jantina terhadap purata berat badan harian pada umur 90 –180 hari (P≤0.01), tinggi haiwan pada umur 90 (P≤ 0.01), 180 (P≤0.01) dan 270 (P≤0.05) hari. Kesan kelahiran didapati sangat signifikan pada berat lahir (P≤0.001) dan berat pada umur 90 (P≤0.001) dan 180 hari (P≤0.001) tetapi kurang signifikan pada berat badan semasa umur 270 hari (P≤0.05), purata berat badan harian dari berat lahir – 90 hari (P≤0.001) dan antara 90 – 180 hari (P≤0.05). Kesan interaksi antara genotip dan jenis kelahiran antara lahir – 90 hari (P≤0.01) juga adalah signifikan. Sementara itu kesan pariti kelahiran didapati signifikan terhadap berat lahir (P≤0.05) dan purata berat harian antara umur 90 – 180 hari (P≤0.001).

Dalam trait konformasi badan, kesan genotip adalah sangat signifikan terhadap tinggi haiwan ($P \leq 0.01$), panjang badan ($P \leq 0.01$), ukurlilit depan ($P \leq 0.01$) dan ukurlilit belakang ($P \leq 0.01$) dalam kesemua kumpulan berat badan yang dikaji. Kesan jantina didapati signifikan ke atas tinggi haiwan pada umur 90 ($P \leq 0.01$), 180 ($P \leq 0.01$) dan 270 ($P \leq 0.05$) hari sahaja. Kesan-kesan utama dan kesan interaksi yang lain didapati tidak mempunyai perbezaan yang signifikan terhadap konformasi badan.

Kajian trait pembiakan pula menunjukkan bahawa kesan genotip sangat signifikan terhadap umur pada estrus yang pertama ($P \leq 0.001$), umur pada pengawanan yang berhasil ($P \leq 0.001$) dan umur pada kelahiran yang pertama ($P \leq 0.001$). Kesan genotip, jenis kelahiran, pariti kelahiran dan kesan interaksi adalah tidak signifikan bagi trait-trait pembiakan yang lain.

Heritabiliti untuk trait berat badan, korelasi genetik dan korelasi finotipik antara trait berat badan telah dianggarkan. Anggaran heritabiliti untuk berat lahir dan berat badan pada umur 90-hari, 180-hari dan 270-hari adalah dalam julat $0.26 \pm 0.82 - 0.90 \pm 0.82$. Korelasi genetik untuk anak kacukan F_1 dan induk Thai Long Tail adalah dalam julat $-0.07 - 0.25$ dan dalam julat $0.06 - 0.38$ untuk anak kacukan F_2 ke atas induk F_1. Korelasi finotipik bagi F_1 adalah dalam julat $0.23 - 0.92$ manakala bagi F_2 adalah $0.51 - 0.96$. Secara amnya didapati anggaran korelasi genetik antara trait berat badan adalah sangat rendah berbanding dengan korelasi finotipik.

Kajian ini menunjukkan kelebihan menyahkan atau mengurangkan kehadiran bulu untuk menambah penghasilan daging. Dengan bulu yang berkurangan, berat badan haiwan kacukan didapati lebih tinggi daripada berat badan bebiri berbulu Thai Long Tail terutamanya pada umur lebih dari 270 hari. Oleh itu ia adalah sehaluan dengan andaian bahawa makanan yang dimakan telah digunakan untuk menghasilkan lebih daging berbanding bulu. Konformasi badan haiwan kacukan juga menunjukkan bahawa

kurangnya kehadiran bulu telah menghasilkan konformasi badan yang lebih padat apabila dibandingkan dengan berat badan Thai Long Tail.

Selain daripada itu, anak-anak kacukan ini juga didapati cepat matang dibandingkan dengan Thai Long Tail dan mempunyai trait pembiakan yang lebih baik daripada samaada Cameroon atau Thai Long Tail atau dengan kedua-dua induk baka tulin ini.

Pada amnya, keputusan dari kajian ini menunjukkan bahawa pencapaian dari segi trait tumbesaran, konformasi badan dan pembiakan anak kacukan adalah lebih baik berbanding dengan kedua-dua induk baka tulin.