PRODUCTIVITY OF TWO PHAN RANG SHEEP LINES: THE FIRST GENERATION

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ABSTRACT

The aim of this study is to select two sheep lines for braided and fluff wool in the first generation and to continue for selecting in the second and third generation. In experiment 1 (Exp.1), 2500 Phan Rang fluff wool ewes and 260 Phan Rang fluff wool rams were used for selecting 1850 females and 78 males adapting to the study requirements of unified appearance, age, live weight and reproductive organs for good reproduction. Selected above sheep were family-bred to create first generation fluff wool sheep. In Experiment 2 (Exp 2), 1400 Phan Rang braided wool ewes and 130 Phan Rang braided wool rams used to select 920 females and 39 females satisfying the study standards for mating. Selected above sheep were family-bred to create first generation braided wool sheep.

The results in Exp 1 showed that total number of the first generation fluff wool were 2181 heads with the live weigth at birth, 3, 6 and 9 months of age coressponding to 2.60, 14.21, 19.89 and 25.84kg, respectively. The male live weight at all the ages observed were higher than those of the females. The first ages of pregnancy and parturition of the first generation fluffy wool ewes were 293 and 443 days, respectively. Number of kid at birth was 1.32/litter and at 9 months of age their hair was white and fluffy (94.95%). In Exp 2, total number of lambs produced was 1085 heads and the live weight at birth, 3, 6 and 9 months of age was 2.43, 13.83, 20.09 and 25.01 kg, respectively. The male live weight was also higher than that of the females. At 9 months of age the sheep hair was white and fluffy. The first ages for pregnancy and parturition were 290 and 440 day, respectively and average number of kids per litter was 1.27. .

Keywords: *Phan Rang sheep, wool charecteristic, body weight, age at first lambing, liter size.*

INTRODUCTION

In recent years, the total number of sheep in Vietnam has increased rapidly, from 68,579 in 2014 to 102,474 in 2023, an increase of 1.5 times after 10 years. In 2023, the North Central and Central Coast regions always had the highest total number of sheep (101,429 heads), accounting for 98.98% of the total sheep population in the country (Vietnam livestock statistics, 2014; 2023).

In the current structure of Vietnamese sheep breeds, the native Phan Rang sheep breed accounts for the largest proportion, the rest are imported sheep breeds such as Dorper, Suffolk or Arabian (Do Thi Thanh Van, 2022). The Phan Rang sheep breed is characterized by being small, low-yielding but has good meat quality, good disease resistance, can withstand hardship, is gentle, easy to raise and eats many types of food. According to the book "Atlas of Livestock Breeds in Vietnam" by the Institute of Animal Science, the Phan Rang sheep breed originated from the Palm (Indian) people brought to Phan Rang hundreds of years ago; and they began to be included in the conservation list since 1993 and put into exploitation and development since 1998 (Hoang Van Tieu et al., 2013). Phan Rang sheep are currently raised in many provinces and cities across the country (Bui Van Loi, 2014; Dinh Van Binh and Ngo Thanh Vinh, 2015), but sheep farming only contributes a very small part to the structure of the livestock industry.

Although the current Phan Rang sheep herd adapts well to the local conditions, its productivity is modest, the breeding herd is not well managed, the male and female sheep are not monitored following the pedigree. In fact, the Phan Rang sheep herd has the wool

characteristics, which are clearly separated and expressed, and in which the characteristics of fluffy and braided wool are easily recognized in the same breeding herd. However, research on breeding and selection based on wool color type on Phan Rang sheep in recent years has not been much.

The objective of this study was to determine the productivity of two Phan Rang sheep lines (fluff and braided wool sheep) at the first generation.

MATERIALS AND METHOD

Location and time

The trial was conducted from March in 2020 to December in 2021 at Ninh Thuan Goat and Sheep Breeding Station belonging to Sontay Goat and Rabbit Research Centre in Central Region of Viet Nam.

Research content

Experiment 1: Productivity of the first generation fluff wool sheep line

Experiment 2: Productivity of the first generation braided wool sheep line

Experimental design and methods

Select and build the initial generation nucleus flock for breeding:
Select the initial generation nucleus rams (37 fluff wool rams and 19 braided wool rams) to be the breeding males for the first generation by surveying 260 fluff wool rams and 130 braided wool rams from sheep farming in Ninh Thuan province. Rams were selected according to the following criteria: Beautiful appearance, characteristics of the breed, one to three years of age and body weight $\geq$ 35 kg.
Select the initial generation nucleus ewes (373 fluff wool ewes and 185 braided wool ewes) to be the breeding females for the first generation by surveying 2500 fluff wool ewes and 1400 braided wool rams from sheep farming in Ninh Thuan province. Ewes were selected according to the following criteria: Beautiful appearance, characteristics of the breed, one to three years of age and body weight $\geq$ 23 kg.
Mating the selected woolly rams and woolly ewes according to wool line to build the first generation sheep.

Data collection

Characteristics of wool, age and weight of surveyed and selected initial generation nucleus flock.

Body weight changes of first generation lambs by month of age: Lambs' weights were taken in the morning before eating at birth, 3, 6 and 9 months of age by Nhon Hoa scale.

Characteristics of wool was observed at 9 months of age.

Reproductivity of first generation ewes: Age at first mating, age at first lambing, gestation time and litter size were colected.

Statistical analysis

The data from the experiments were analyzed by analysis of basic statistic for all parameters and by analysis of variance using the ANOVA of General Linear Model to compare the means of body weight of two genders of Minitab Release 16.2 (Minitab, 2010).

RESULTS AND DISCUSSION

Experiment 1: Productivity of the first generation fluff wool sheep line

Characteristics of wool, age and weight of the initial generation nucleus flock

The survey results of the fluff wool rams show (Table 1) that the main wool characteristics include 3 types: (1) Brownish white, shaggy hair; (2) white, loose hair; and (3) loose white, not sticky; in which the loose white, not sticky hair characteristic accounts for 217 animals, equivalent to 83.47%. The genitals are 100% balanced.

The selected flock of 78 fluff wool rams has the characteristic of loose white hair, not sticky, and has balanced genitals. The age and weight of the surveyed rams were 1.99 years old and 39.33 kg, respectively. The age and weight of the selected rams were 1.91 years old and 41.89 kg, respectively, meeting the requirements of the project.

Table 1. Characteristics of wool, age and body weight of surveyed and selected fluff wool rams

Parameters	Number (head)	Ratio (%)
Hair characteristics		
Surveyed rams	260	
Hair characteristics		
Brown white color, fluffy fur	18	6.92
White spot color, fluffy fur	25	9.61
White color, fluffy, not sticky	217	83.47
Characteristics of age and body weight		
Surveyed rams	260	
Age (year)	1.99	0.01
Body weight (kg)	39.30	0.14
Selected rams	78	
Age (year)	1.91	0.02
Body weight (kg)	41.90	0.16

The main wool characteristics of fluff wool ewes include 4 types: (1) Brownish white, shaggy wool; (2) white-streaked, fluffy wool; (3) white-streaked, fluffy wool; and (4) black-streaked, smooth wool; of which the fluffy white wool characteristic accounts for 1,973 animals, equivalent to 78.92%. The reproductive organs are 100%. The selected flock of 1,850 woolly ewes has the characteristic of fluffy white hair, not sticking together, and has symmetrical reproductive organs. The age and weight of the surveyed ewe flock were 1.90 years old and 30.74 kg/head, respectively. The age and weight of the selected ewe flock were 1.90 years old and 30.21 kg/head, respectively, within the requirements of the project.

Table 2. Characteristics of wool, age and body weight of surveyed
and selected fluff wool ewes

Parameters	Number (head)	Ratio (%)
Characteristics of wool		
Surveyed ewes	2500	
Hair characteristics		
Brown white color, fluffy wool	132	5.28
White spot color, fluffy wool	190	7.60
White color, fluffy, not sticky	1973	78.92
Black-streaked, smooth wool	205	8.20
Characteristics of age and body weight		
Surveyed ewes		
Age (year)	2500	1.90
Body weight (kg)	2500	30.7
Selected ewes		
Age (year)	1850	1.90
Body weight (kg)	1850	30.21

Body weight changes of first generation fluff wool lambs

The results of weight changes of the first generation fluff wool lambs selected over the months of age are presented in Table 3. The body weight of the first generation fluff wool lambs at birth, 3, 6 and 9 months of age is 2.6; 14.21; 19.89; and 25.83 kg/head, respectively. The body weight of the male lambs was higher ($P<0,001$) than that of the female lambs during the monitoring times. The coefficient of variation (CV) of the criteria was low, from 2.62 to 9.79 % (<10.0 %).

Table 3. Body weight changes of first generation fluff wool lambs (kg/head)
by months of age

Parameters	Gender	n (head)	Mean	SE	CV (%)	Min	Max
Birth weight	Female	1130	2.51	0.007	8.89	2.00	3.20
	Male	1051	2.71	0.008	9.17	2.00	3.50
	Average two genders	2181	2.60	0.005	9.79	2.00	3.50
Weaning weight at 3 months of age	Female	1045	13.64	0.015	3.50	12.30	17.50
	Male	976	14.82	0.0157	3.31	13.40	16.00
	Average two genders	2021	14.21	0.017	5.38	12.30	17.500
Weight at 6 months of age	Female	1025	18.38	0.016	2.75	17.00	19.50
	Male	963	21.50	0.018	2.62	20.00	24.60
Birth weight	Average two genders	1988	19.89	0.037	8.29	17.000	24.60
Weaning weight at 9 months of age	Female	1019	24.40	0.025	3.26	22.60	27.50
	Male	962	27.36	0.026	2.92	17.80	29.50
	Average two genders	1981	25.84	0.038	6.50	17.800	29.50

The weight results of first generation wool sheep at all monitoring times were relatively high compared to the survey reported by Do Chien Thang et al. (2020) at the time points of newborn (2.1kg compared to 2.6kg), 3 months (11.3kg compared to 14.21kg), 6 months (16.1kg compared to 19.89kg) and 9 months of age (20.5kg compared to 25.84kg). This result is also significantly higher than the survey results of Nguyen Huu Van at al. (2023) on the mass flock of Phan Rang sheep of males at the time of birth (2.44kg vs. 2.6kg), 3 months (13.88kg vs. 14.21kg) and 9 months of age (27.3kg vs. 27.4kg) and of females at the time of birth (2.25kg vs. 2.51kg), 3 months (13.64kg vs. 14.1kg), and 9 months of age (22.81kg vs. 24.40kg) in Ninh Thuan province. The higher results in this study may be due to the fact that the sheep were selected and raised according to better technical processes than in the surveyed households.

The first generation Phan Rang fluffy wool sheep in this study had a higher birth weight than the Menz and Horro sheep (Ethiopia) male and female at 2.38 and 2.22 kg (Awgichew, 2000); the West African dwarf sheep (Djallonke sheep) at 1.67-2.70 kg (Adjibode et al., 2017); and equivalent to the Abou-Delik sheep (Egypt) at 2.29-2.81 kg (Farrag, 2022). This result is also higher than the publication of Ngo Thanh Vinh (2014) when studying Phan Rang sheep raised in Ninh Thuan and Ba Vi, ranging from 2.3 kg (female) to 2.4 (male). However, this result is lower than the Karayaka sheep breed (Uluta et al., 2010); Balouchi-New Zealand (Norouzian, 2015); Awassi in Jordan (Al-Momani et al., 2020) were all >3kg.

At 3 and 6 months of age, the weight of sheep in this study was also within the range of data published by Ngo Thanh Vinh (2014) and Bui Van Loi (2014) when raised in Ninh Thuan, Ba Vi and Thua Thien Hue (10.9-14.6 kg at 3 months of age and 15.3-20.8 kg at 6 months of age). Also according to Ngo Thanh Vinh (2014), Phan Rang sheep raised in Ninh Thuan and Ba Vi at 9 and 12 months of age had a weight of 21.02-23.34 kg and 24.74-29.53 kg, respectively.

Reproductive performance of the first generation fluff wool ewes

The mating and reproductive results of first generation fluff ewes are presented in Table 3. The results show that the age ats first mating and age of first lambing of first generation fluff wool ewes are 293 and 443 days, respectively. The average gestation period is 149.87; lambs give birth to 1.30 lambs/litter.

Table 4. Reproductivity of first generation fluff wool ewes (n=749)

Parameters	Mean	SE	CV (%)	Min	Max
Age at first mating (day)	292.72	0.165	1.55	285	298
Age at first lambing (day)	442.59	0.169	1.05	433	449
Gestation time (day)	149.87	0.037	0.69	148	152
Litter size at birth (head/litter)	1.31	0.016	35.31	1	2

The age at first mating of first generation fluffy wool ewe are lower than that of studies in India on Pattanam adu sheep (Sundaramoorthy et al., 2021) at 12-13 months; of Harini et al. (2019) on Nellore Palla sheep at 361.5±1.09 days. Dinh Van Binh and Ngo Thanh Vinh (2010) reported that Phan Rang sheep raised in Son Tay had the first gestation age of 299 days.

In this study, the gestation time of TH1 fluffy wool sheep was 149.87 days, similar to the published results of Nguyen Huu Van et al. (2023) of 150 days, but higher than the published results of Dinh Van Binh and Ngo Thanh Vinh (2010) of 148.9 days. According to Rusyad (1977), the gestation period was 148-150 days in Priangan sheep, 150 days in fat-tail sheep and 149 days in their crossbreds.

In this study, the age at first lambing of second generation fluffy wool sheep was 442.59 days and the sheep gave birth to 1.31 lambs/litter, higher than the published 1.25 lambs/litter by Dinh Van Binh and Ngo Thanh Vinh (2010).

Experiment 2: Productivity of the first generation braided wool sheep line

Characteristics of wool, age and weight of the initial generation nucleus flock

Selecting wool rams to be the breeding males for the starting generation: The survey results of the wool rams show (Table 5) that the main wool characteristics include 3 types: (1) white curly color, braided; (2) White with black stripes, braided; and (3) White with brown stripes, braided; in which the loose white, not sticky hair characteristic accounts for 56 animals, equivalent to 43.08%. The genitals are 100% balanced.

The selected flock of 39 wool rams has the characteristic of white curly color, braided, and has balanced genitals.

Table 5. Characteristics of wool, age and body weight of surveyed and selected braided wool rams

Parameters	Number (head)	Ratio (%)
Hair characteristics		
Surveyed rams	130	
white curly color, braided	56	43.08
White with black stripes, braided	49	37.69
White with brown stripes, braided	25	19.23
Characteristics of age and body weight		
Surveyed rams	130	
Age (year)	130	2.06
Body weight (kg)	130	38.34
Selected rams	39	
Age year)	39	2.09
Body weight (kg)	39	40.09

The age and weight of the surveyed wool rams were 2.06 years old and 38.34 kg, respectively. The age and weight of the selected wool rams were 2.09 years old and 40.09 kg, respectively, meeting the requirements of the project.

The survey results of the woolly ewes show (Table 6) that the main wool characteristics include 3 types: (1) White curly color, braided wool; (2) White with black stripes, braided wool; and (3) White with brown stripes, braided wool; of which the fluffy white hair

characteristic accounts for 1,234 animals, equivalent to 88.14%. The reproductive organs are 100% balance. The selected flock of 920 woolly ewes has white curly color, braided wool.

Table 6. Characteristics of wool, age and body weight of surveyed and selected braided wool ewes surveyed and selected

Parameters	Number (n)	Ratio (%)
Hair characteristics		
Surveyed ewes	1400	
White curly color, braided wool	1234	88.14
White with black stripes, braided wool	40	2.86
White with brown stripes, braided wool	126	9.00
Characteristics of age and body weight		
Surveyed ewes		
Age (year)	1400	1.65
Body weight (kg)	1400	29.23
Selected ewes		
Age (year)	920	1.67
Body weight (kg)	920	29.64

The age and weight of the surveyed ewe flock were 1.65 years old and 29.23 kg/head, respectively. The age and weight of the selected ewe flock were 1.67 years old and 29.64 kg/head, respectively, within the requirements of the project.

Body weight changes of first generation braided wool lambs

The results of body weight changes of first generation braided wool sheep born at different ages are presented in Table 7.

Table 7. Body weight changes of first generation braided wool lambs (kg/head) by months of age

Parameters	Gender	n (head)	Mean	SE	CV (%)	Min	Max
Birth weight	Female	563	2.35	0.012	11.91	1.70	3.10
	Male	522	2.52	0.010	9.00	2.00	3.40
	Average two genders	1850	2.43	0.01	11.05	1.70	3.40
Weaning weight at 3 months of age	Female	523	13.41	0.030	5.18	11.20	15.70
	Male	481	14.29	0.034	5.16	13.00	25.40
	Average two genders	1004	13.83	0.03	6.07	11.20	25.40
Weight at 6 months of age	Female	517	18.95	0.083	9.91	14.30	22.60
	Male	475	21.34	0.027	2.76	20.10	24.00
Birth weight	Average two genders	992	20.09	0.06	9.21	14.30	24.00
Weaning weight at 9 months of age	Female	516	23.70	0.027	2.62	21.20	25.20
	Male	474	26.44	0.037	3.03	24.50	28.90
	Average two genders	990	25.01	0.05	6.19	21.20	28.90

The results of Table 7 show that first generation braided wool lambs have weights at birth, 3, 6 and 9 months of age of 2.43; 13.83; 20.09; and 25.01 kg/head, respectively. The body weight of male lamb is always higher than that of female lamb at all collected times.

Reproductive performance of the first generation fluff wool ewes

The age at first mating and age at first lambing of first generation braised wool ewes are 290 and 440 days, respectively (Table 8). The average gestation period is 149.88 days; litter size is 1.27 lambs/litter.

Table 8. Reproductivity of first generation braided wool ewes (n=385)

Parameters	Mean	SE	CV (%)	Min	Max
Age at first mating (day)	290.07	0.17	1.16	278	300
Age at first lambing (day)	439.95	0.17	0.78	426	449
Gestation time (day)	149.88	0.03	0.46	148	151
Litter size at birth (head/litter)	1.27	0.02	35.10	1	2

CONCLUSION

The average body weight of first generation fluff wool sheep line at birth, 3, 6 and 9 months of age were 2.60; 14.21; 19.89; and 25.84 kg, respectively. The body weight of males at every months of age were higher than that of females. The age at first lambing was 443 days and litter size at birth was 1.31 heads.

The average body weight of first generation braided hair sheep at birth, 3, 6 and 9 months of age were 2.43; 13.83; 20.09; and 25.01 kg respectly. The body weight of males at every months of age were significantly higher than that of females. The age at first lambing was 440 days and the litter size at birth was 1.27 heads.

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