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Production perfpormance and growth monitoring of Rembi sheep breed in Tiaret region-Algeria

DJAOUT Amel[1,2*]. SAMADI Djamila[3]. BELHARFI Fatima Zohra[4,5]. OUENNES Houria[2]. GAOUAR Semir Bechir Suheil[4].

1 Institut National de la Recherche Agronomique d'Algérie (INRAA). Division Agro-système Est. Sétif 19.000, Algérie

2 Laboratoire de production animale, Biotechnologie et santé (PABIOS). Institut des Sciences Agrovétérinaires (ISAV). Université Mohammed Cherif Messaadia. Souk-Ahras 41.000. Algérie.

3 Département de biologie, faculté des sciences de nature et de la vie et des sciences de la terre et de l'univers, Université Abou Bekr Bélkaid. Tlemcen. 13.000. Algérie

4 Laboratory of Applied Genetic in Agronomy. ecology and public health (GenApAgiE). Biology department. University Abou Bekr Belkaid. Tlemcen. 13.000. Algeria

5 Laboratory of Physiopathology and Biochemistry of Nutrition (PpBioNut). Department of Biology. University Abou Bekr Belkaid. Tlemcen. 13.000. Algeria

***Corresponding Author**: Djaout Amal, Institut National de la Recherche Agronomique d'Algérie (INRAA). **Email**: djaout.amel08@gmail.com

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Abstract

The main objective of the present research was to evaluate the productive status of the Rembi breed in order to estimate the relative importance of milk in the growth of lamb during the period of lactation within an optimal system of production and allows as well to reveal the impact and influence of various factors on production and growth parameters. The Rembi breed studied was reared on a farm in the Ksar Chellala region of Tiaret province, 113 ewes aged 4.9 ± 2.10 years and 6 rams aged 3 years were used for breeding. With 93 pregnant ewes 97 lambs are born, among them, 13 are born dead. Reproductive data showed an average rate of 0.74; 2.06% and 13.4% for the respective rates of reproductive efficiency (RE) at 30 days, perinatal mortality (0 to 5d), and mortality rate at 30 days. Growth monitoring was carried out on the 84 lambs that were born alive. The mean of bodyweight at birth was 4.3±0.69 kg; 6.42±1.22 kg at 10 days of age and 8.8±1.73kg at 30 days of age, the average daily gain estimates between birth and 10 days (ADG 0-10) were 211±77.8g/d, between 10 and 30 days (ADG10-30) were 119±52.8 g/d and between 0 and 30 days (ADG 0-30) were 150±46.2g/d. The analysis of variance showed that these parameters were influenced significantly ($p<0.05$) by lambs' sex, birth type, and ewes' lambing rank. The weights taken on the birth day, after 10 and 30 days could be used as selection criteria in the dairy production of ewes.

Keywords: ADG, production, Rembi, reproduction, sheep, weight.

الملخص

هدفت دراستنا إلى تحديد الحالة الإنتاجية لسلالة رمبي من أجل تقدير الأهمية النسبية للحليب في نمو الحمل خلال فترة الرضاعة ضمن نظام الإنتاج الأمثل ويسمح كذلك بالكشف عن قوة وتأثير عوامل مختلفة على معايير الإنتاج والنمو. سلالة الرمبي المدروسة تم تربيتها على مستوى مزرعة قصر الشلالة بولاية تيارت ، 113 نعجة يتراوح عمرها بين 2.10 ± 4.9 سنة و 6 كياش اعمارهم 3 سنوات استخدمت في التكاثر. ولدى 93 نعجة حامل ، وُلد 97 حملًا ، من بينهم 13 حملًا نافقا. أظهرت بيانات التكاثر المسجلة على مستوى المزرعة متوسط معدلات 0.74 و2.06٪ و 13.4٪ علي التوالي لمعدلات الإنتاجية العددية و معدل الوفيات بين الفترة المحيطة بالولادة (0 إلى 5 يوم) ومعدل الوفيات عند 30 يوم. تم إجراء مراقبة النمو على 84 حملًا ولدوا أحياء. كان متوسط وزن الجسم عند الولادة 4.3 ± 0.69 كغ. 6.42 ± 1.22 كغ عند عمر 10 أيام و 8.8 ± 1.73 كغ عند 30 يومًا من العمر ، كان متوسط تقديرات الكسب اليومي للوزن بين الولادة و 10 أيام (ADG 0-10: 77.8 ± 211 غ/يوم ، بين 10 و 30 يومًا (ADG10-30) كانت 119 ± 52.8 غ/يوم وبين 0 و 30 يومًا (ADG 0-30) كانت 150 ± 46.2 غ/يوم. أظهر تحاليل التباين تأثر هذه المعلمات بشكل كبير ($P <0.05$) بجنس الحملان وبنوع الولادة وبرتبة حمل النعاج. فلهذا يمكن استخدام الأوزان المأخوذة في يوم الولادة ، بعد 10 و 30 يومًا كمعايير اختيار في إنتاج الألبان للنعاج.

الكلمات المفتاحية : ADG ، الإنتاج ، الرمبي ، التكاثر ، الأغنام ، الوزن

Introduction

Performance monitoring is the basic means for genetic improvement within each breed, further, it is an important means for the breeder when dealing with his flock's monitoring (Migne, 2004). The dairy production of African ewes is weak. It is set between 30 to 158.70 kg/lactation (Gbangboche et al., 2002).

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Moreover, pressing factors that may have impacts on the viability and growth of lambs allows us to adopt the best breeding conducts able to reduce to the maximum the impact of factors that limit the development and growth of lamb.

Algerian ewes can not be milked ; their milk is merely used for feeding lambs. Its dairy production during the suckling period may be measured by the lamb's growth, which reflects well the available quantity of milk swallowed and transformed by lambs (Ben Salem et al., 2009). Ewe's milking ability is one of the most important factors that may have an impact on the lamb's weight during the pre-weaning period (Ünal et al., 2007).

The study of dairy products of some breeds traditionally considered for meat production (the case of Rembi sheep) is too important for the production of lambs. However, it is too difficult to measure the exact milk yield of the ewe by hand milking especially concerning ewes of local sheep breeds which are not accustomed to milking (Ünal et al., 2007). However, it is very useful to do manual milking after injecting the hormone of oxytocin (Morgan et al., 2000).

Among the very used methods to estimate dairy production of small ruminants that of measuring weigh-suckle-weigh (WSW) (Ünal et al., 2007; Benchohra et al., 2014 ; El Bouyahiaoui et al., 2021). Nevertheless, this method shows some weakness because of its incapacity to measure accurately small quantities of milk swallowed by young lambs, appetite degree when taking measures and neglecting urine, and wastes between weights (Benson et al., 1999).

Another method that has been used by many authors for its high accuracy is the hormonal method (by injecting Oxytocin before manual or mechanical milking), (Ünal et al., 2008).

Indirect estimation of milk yield (ADG) is the very used method by breeders and scientists (Lafri et al., 2014; Benchohra et al., 2014; El Bouyahiaoui et al., 2019; Boubekeur et al., 2019; Belkheir et al., 2021) because it is simple reliable, and doesn't cost a lot.

Our study aims to evaluate the milk production of Rembi breed ewes called « Sagâa » over the region of Tiaret. This breed has practically the same morphological characteristics as the Ouled Djellal breed, except that it has a slightly curved dorsal line and limbs as well as a tawny head or slightly greyish with medium and pendulous ears. The wool is white and covers the whole body up to the knees and hocks. Rams have voluminous and spiral horns, and ewes may have horns inclined backward (Djaout et al., 2017). Its living area become limited in the Center and the West of Algeria over the Wilaya of Tiaret and Ain-Tmouchent. There is only a small number over the region of Djelfa and Nâama with some breeders, generators production centers (Breeding Technical Institute of Tiaret and selection genitors center at Ain-Tmouchent), and some major farms in these two areas working in cooperation (Djaout et al., 2017). In addition to that, the number of these animals, which was estimated at 2.2 million in 2003 (AnGR 2003), is now drastically reduced and has only about a thousand animals (Djaout et al., 2017).

The estimation of milk production of this breed has been studied according to ADG appreciation of its lambs, starting from 3 weights of lambs from birth to 1 month old (D0, D10, and D30), to approach reproductive efficiency (RE) of the flock studied and study the influence of the sex, the birth type and rank of lambing on milk production of ewes.

Materials and methods

Study area

Our study has been carried out in 2019 at the technical institute of farming (Breeding Technical Institute : ITELV) located in Ksar Chellala an Algerian district at Tiaret. It is situated 116 km to the West of Tiaret and 260 km to the South of Algers and 170 km to the eastern South of Djelfa. Breeding Technical Institute farm is the principal Rembi experimental sheep location and a database was available within this farm thanks to the regular technical monitoring by breeding technical institute technicians.

Figure 1 : Study area (Tiaret)

Animal studied

The experiment has been applied on 113 ewes of 4.9±2.1 years old, with an average weight of 52.81±10.87kg during the mating period; and 06 rams of 3 years old with a variation of body weight from 80 to 96 kg. These animals do not suffer from any general or specific disease in their genitals organs. Among 113 ewes under mating ; 94 ewes were pregnant, 19 were empty, one ewe had an abortion, and 93 ewes gave birth. The flock of 97 lambs gave birth to (47 females and 50 males). Concerning birth type; the single lambing rate was 91.7% prevailed on double lambing (8.2 %). Next to that, primiparous gave birth to 15 lambs, while multiparous gave birth to 82 lambs.

Table 1. Number of lambs according to sex, birth type and lambing rank.

Number of lambs and %	**Sex**		**Birth type**		**Lambing rank**	
	♂	♀	Singles	Doubles	Primiparous	Multiparous
97	50	47	89	08	15	82
100%	51.5 %	48.4 %	91.7%	8.2 %	15.5 %	84.5%

Mating method

Mating has been carried out after the ram effect in spring (from march to June 2019) to obtain births in autumn. Mating season was for about 45 days (in order to give the female a chance to show signs of heat three times).

Information to be gathered

Permanent supervision has been ensured during and after lambing. The information recorded after every gestation were : Date of birth, age and physical conditions of the ewe, sex of the lamb, birth type, date of mortality, lambing rank of the ewe, and lamb identification by two earrings.

Studied production parameters

Mortality rate and reproductive efficiency (RE) have been calculated according to formulae stated by Craplet and Thibier (1980).

Mortality rate = Number of dead lambs/ Number of lambs born dead and alive.

Perinatal mortality rate = Number of lambs died between 0 and 5 d/ Number of lambs born dead and alive.

RE30 = Number of lambs alive within 30 d/ Number of bred ewes.

Growth monitoring by Average Daily Gain *(ADG):* every lamb has been weighed using an electronic balance on birth time (d0), on the 10th, and the 30th day after birth in order to measure the average daily gain (ADG 0-10, ADG 10-30 et ADG 0-30) of the lambs.

Statistical analysis

All data of studying parameters such as BW0, BW10, BW30, ADG0-10, ADG10-30 and ADG0-30 have been used just in order to get descriptive statistics and variations using SPSS 20 software (Statistical Program for Social Science). Descriptive analysis shows averages, minimums, maximums, standard errors, standard deviations, and variations of the studied parameters. The following parameters BW0, BW10, BW30, ADG0-10, ADG10-30, and ADG0-30 have allowed us to make variation analyses with several factors (birth type, sex of the lamb and row lambing). The results are stated using average values (± standard deviation) and Spearmen's rank correlation with a signification threshold of ($p < 0.05$).

Results and discussion

Lambs mortality

Among 97 lambs born, we have obtained 84 lambs born alive and 13 lambs born dead. The rate of mortality on the birth day was 13.4%.

Table 2. Lambs mortality according to sex and birth type.

Mortality rate	**Total**	**Sex**		**Birth type**	
		♂	♀	Singles	Doubles
in 30d	**13.4%**	8.24%	5.15%	11.3%	2.06%
Perinatal (0-5d)	**2.06%**	00%	2,06%	2.06%	00%

A lot of studies have shown the impact of several factors on lambs' mortality, which are the same in all countries including various factors infectious and not infectious (Khan et al., 2006). In order to push forward local sheep production, improving breeding conditions (cleanliness, shelter, and food) is also an important factor. Disrespecting these rules can actually be the cause of lambs' death, to the extent of 50% as far as lacteal feeding breeding is concerned (Fragkou et al., 2010).

We have recorded an average mortality rate of 0-30d of 13.4 %. This rate is very weak regarding that of the breed of Ouled Djellal (Djaout et al., 2019).

- *The effect of the sex on lambs mortality*

Perinatal mortality is more frequent in female lambs (2.1% vs 00%), while the rate of mortality of males is higher than that of females (8.24% vs 4.15%). This benefit is confirmed by many authors (Corbiere et al., 2012) whatever it is the period of age taken into consideration. Those main explanations are that male lambs are less vigorous at birth time and that intensive feeding behavior after weaning is riskier. On the other hand, this risk is encountered within many other species (Gautier and Corbières 2011).

- *The effect of birth type on lambs mortality*

The mortality rate of single lambs is too high for lambs born in double (11.3% vs 2.1%) (Table 2). This can be explained by a bad colostral intake; Colostrum, therefore, ensures life for the lamb, and also better growth. It is an excellent primary food with nutritional value that leads to a sufficient amount of energy (Allemand 2008). This letter provides nutrients and antibodies needed for transitional protection against physical and biological external attacks, besides physiological effectors such as growth factors and hormones (Boudry et al., 2008).

Productivity of the flock

Reproductive efficiency (RE) may be used to explain the reproductive performance of ewes and represent the product of several other factors which are fertility, fecundity, lambs mortality, and the weaning rate (Dekhili., 2014). It is 0.74 on the 30th day after birth : RE30 = 0.74. This rate is considered weak because it has to be near the number 2 (Craplet and Thibier 1980). It is less than those reported by Dekhili and Benkhlif (2005) and Dekhili (2014) in Ouled Djellal breed.

Dekhili and Benkhlif (2005) show that the mating season in Ouled Djellal breed has a considerable impact ($p<0.001$) on the rate of reproductive efficiency (RE), which has been 0.83 in summer; 0.93 in autumn; 0.60 in winter and 1.4 in spring. They point out a significant superiority of spring and autumn mating compared with other seasons. Despite this, our RE30 is very weak even though mating has been in spring.

Lambs growth monitoring

84 lambs have been studied in order to get an estimation for the performance of milk yield of ewes by monitoring the growth of these matters during the first month after birth. These lambs were weighed 3 times on D0, D10, and D30, to observe their growth ADG0-10, ADG10-30, and ADG0-30

Table 3. Body weight and growth rate in Rembi lambs.

Variables	N	Mean	Min.	Max.	Std-Err.	Std-Dev.	Var.
BW0	84	4.3	2.4	6	0.07	0.69	0.47
BW10	84	6.42	3.5	9.5	0.13	1.22	1.49
BW30	84	8.8	4.5	15	0.19	1.73	2.99
ADG 0-10	84	211	10	350	8.49	77.8	6048
ADG 10-30	84	119	5	275	5.76	52.8	2790
ADG 0-30	84	150	60	300	5.04	46.2	2130

Legende *BW0: bodyweight at birth, BW10: bodyweight at 10 days, BW30: bodyweight at 10 days; ADG 0-10: average daily gain between 0 – 10 days, ADG 10-30: average daily gain between 10 – 30 days, ADG 0-30: average daily gain between 0 – 30 days.*Obtained results in this study (Table 3) show that the weight on a birth day varies between 2.4 and 6.0 kg with an average BW0 of 4.3±0.69 kg, BW10 is 6.42±1.22kg average, BW30 is of 8.8±1.73kg average.

Growth rate varies between 10 and 350g/d from birth to 10 days, it is 211±77.8g/d average; it is 119±52.8 g/d between 10 and 30 days, and 150±46.2g/d from birth to 30 days.

Compared different variables of the studied lambs' growth with the results obtained from studying other breeds of Maghreb (Kerfal et al., 2005, Rekik et al., 2008, Brahmi et al., 2011, Lafri et al., 2014, Djellal et al., 2016, Boubekeur et al., 2019, El Bouyahiaoui et al., 2019, Belkheir et al., 2021):

Weight on the birth day: we've observed that these lambs have a BW0 higher than that of Barbarine (3.4kg), D'man (1.7 à 2.9kg), and Hamra (3.3kg) breeds. But it is less than that of Ouled Djellal (5.3kg), Tazegzawt (4.38kg à 4.72), and Rembi (4.98kg).

Weight on the 10th day: The BW10 of the lambs is almost similar to that of the Hamra breed (6.10kg), higher than that of D'man (3.4kg), but less than that of Ouled Djellal (7.87kg) and Rembi in 2014 (7.05 kg) breeds.

Weight after one-month-old: The BW30 recorded is higher than that of the D'man breed (5.9 à 7.69 kg), but less than that of Hamra (9.2kg), Tazegzawt (10.5 à 12.2 kg) Barbarine (9.78kg) Rembi in 2014 (10.45kg), and Ouled Djellal (11.62 kg).

Growth rate: The ADG during the first month after the lamb's birth is linked to milky food and the best nourishment of ewes (Ben Salem et al., 2009, Yahiaoui et al., 2010).

ADG0-10 : The growth rate during the first ten postnatal days is lower than that of Ouled Djellal (233g/j) and Tazegzawt between 0 et 7 days (289g/j).

ADG10-30 : The growth rate between 10 and 30 days after birth is less than that of the following breeds: Barbarine (187g/j), Hamra (180g/j) and Rembi in 2014 (250g/j), but it is higher than that of D'man breed (100g/j).

ADG0-30: It is very low compared with the breeds : Hamra (190g/j), Tazegzawt (252 g/j) and Rembi in 014 (270g/j).

Factor having impact on lambs growth

- *According to lambs sex*

Results have conveyed a very significant weight difference ($P<0.01$) from birth to 30 days old in favor of heavy lambs compared with females. Hence, male growth is significantly higher than that of females during the 10 first days after birth (228±82.3g/d vs 195±77.8g/d) and the first month after birth (160±39.8g/d vs 139±39.8g/d). While no significant difference ($p>0.05$) of growth speed according to sex between D10 and D30 (ADG10-30) has been observed.

Table 4. Body weight and ADG in Rembi lambs according to the sex.

Variables	N	Male	Female	P
		42	42	
BW0	84	4.51±0.72	4.1±0.6	**
BW10	84	6.79±0.69	6.04±1.07	**
BW30	84	9.32±1.88	8.27±1.4	**
ADG 0-10	84	228±82.3	195±77.8	*
ADG 10-30	84	126±54.4	112±50.7	ns
ADG 0-30	84	160±39.8	139±39.8	*

Lafri et al., (2014) observe a higher result compared with our study applied on males with a weight of 5.5 kg at birth, 7.55 kg at 10 days, and 10.8 kg at 30 days, while females have quite the same weight, they have weighed respectively 4.75kg, 6.95kg and 8.65 kg at birth, at 10 days and 30 days.

The influence of sex on the weight on the birth day is confirmed by many authors, in the same breeding conditions males are born heavier than females (Traoré et al., 2006 , Ben Salem et al., 2009). Merghem (2009) observed that sex has a significant impact on weight on the birth day and 30 days after birth while it is not significant (P>0.05) on the weight after weaning.

Gbangboche et al., (2005) indicate that there is always a difference of 1 to 2.5 kg of weight on the birth day. This superiority of males over females is attributed to hormones that enhance the strength of the body and growth potentials according to the sex of the individual (Merghem, 2009).

Male superiority compared with females increases with lambs' age evolution (Kerfal et al., 2005 , Rekik et al., 2008). This superiority is explained by genes linked to sex, strength difference (muscles of the neck, bones of the head, the whole skeleton), and especially progressive evolution of digestive organs of males (Bendiab and Dekhili 2012) while females use some of the digested milk to form its fatty tissues which need more energy.

- *According to the birth type*

The results show that single lambs are significantly heavier than double lambs (at 10d and 30d) with higher growth rates (p<0.05). Lafri et al., (2014) have recorded a result similar to that of our study.

Table 5. Body weight and ADG in Rembi lambs according to the birth type.

Variables	**N**	**Singles**	**Doubles**	**P**
		78	06	
BW0	84	4.33±0.66	3.95±1	Ns
BW10	84	6.51±1.16	5.18±1.42	**
BW30	84	8.91±1.64	7.32±2.29	*
ADG 0-10	84	218±75.2	107±57.1	**
ADG 10-30	84	120±45.2	112±55.8	Ns
ADG 0-30	84	153±39.8	112±45.5	*

*BW0: bodyweight at birth, BW10: bodyweight at 10 days, BW30: bodyweight at 10 days; ADG 0-10: average daily gain between 0 – 10 days, ADG 10-30: average daily gain between 10 – 30 days, ADG 0-30: average daily gain between 0 – 30 days. Ns : no significant , * : Significant at 0.05, ** : Significant at 0.01*

But on the birth day, our results do not show any significant difference (p>0.05) between single born lambs and double born lambs while many authors notice that double born lambs are lighter than single ones (Yapi-Gnaoré et al., 1997b). It may be due to the low number of double lambing cases. This low number of double lambing cases is actually linked to the weak prolificacy of the ewes.

Single lambs are heavier than double lambs at different ages. These results are similar to that of Merghem (2009) over the region of Setif, and that of Boussena et al.,(2013) over the region of Constantine regarding the breed of Ouled Djellal who had shown that the size of the ewe has an influence on lambs weight and had discovered that single lambs are heavier at various ages and their growth is faster than that of double lambs.

The diminishing growth speed of lambs born double comes from the milk production ability of the mother felt on the first month, and continues diminishing with age till a compensatory growth of lambs born double occurs after weaning (Rekik et al., 2008). That may be explained for birth weight by the physiological ability of the mother to provide a sufficient amount of conception products with a metabolic substrate and; the physical ability of the mother to carry many litters because the womb's space has a finite capacity of gestation besides fetal genotypic effects (Akhtar et al., 2012).

- *According to the mothers age and lambing rank*

In addition to the size of the litter, the age, the mating period, and genetic factors, the milk production level would be also influenced by the weight and body condition of the ewe (Gonzalo et al., 2002).

Table 6. Body weight and ADG in Rembi lambs according to the lambing rank.

Variable	N	Primiparous	Multiparous	P
		11	73	
BW0	84	3.65±0.66	4.40±0.64	**
BW10	84	5.43±1.47	6.57±1.12	**
BW30	84	7.52±1.81	8.99±1.64	**
ADG 0-10	84	177±103	216±72.8	ns
ADG 10-30	84	105±41.8	121±54.2	ns
ADG 0-30	84	129±46	153±45.7	ns

*BW0: bodyweight at birth, BW10: bodyweight at 10 days, BW30: bodyweight at 10 days; ADG 0-10: average daily gain between 0 – 10 days, ADG 10-30: average daily gain between 10 – 30 days, ADG 0-30: average daily gain between 0 – 30 days. Ns : no significant, ** : Significant at 0.01.*

Age and lambing row of ewes have no significant influence ($p>0.05$) on the lambs' growth rate. Nevertheless, multiparous ewes give birth to lambs heavier than those of primiparous ewes ($p<0.01$). This result is confirmed by Dekhili and Mahnane (2004) who found a significant influence of the mother's age on lambs' weight from birth to 30 days after ; lambs come from multiparous ewes are heavier on the birth day than those of primiparous ewes.

Yapi Gnaoré et al., (1997a) have proved that lambs of the first or to some extent of the second lambing are generally lighter on the birth day than those of the following lambing, which makes the mother's age at the first lambing for the growth of the progeny important.

Allemand (2008) found that the ewe-lamb does not have weak milk production but a lack of immunoglobulins in the colostrum. Being badly fed with milk and especially with colostrum could affect the lambs' growth. In addition to that, old pregnant ewes after having reached their ultimate development could allocate more nutrients for feeding lambs inside their uterus while young ewes and those younger may use a big part of digested nutrients for their growth and development and thus, produce lambs' weight is inferior than that of older ewes (Akhtar et al., 2012).

Conclusion

The results of our study have practical implications for sheep farming and the best understanding of factors affecting, with great significance, Rembi breed lambs' growth abilities variation. ADG monitoring allows the selection of mothers bearing rams and those bearing ewe-lambs thanks to their milk yield, in order to manage the group according to lambs' growth rate. The productivity of the flock is weak, it is related to the mortality rate and breeding behavior. It seems that weight on the birth day (BW0), BW10, BW30 ADG0-10, ADG10-30, and ADG0-30 could be used as selection criteria to evaluate the genetic potentials of this breed in the best way. Moreover, pressing factors having an impact on the viability and the growth of the lambs allow for adopting the best breeding conduct, which could be able to reduce the bad effects of these latters.Variation analysis in our study shows that lambs' growth and weight are significantly influenced by sex, birth type, and row lambing. The zootechnical parameters studied in this work could be taken as selection criteria and generalized to other sheep breeds. The methodology and the scientific approach implemented in this work can very well be the starting point of a genetic improvement program via the creation of a national network

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