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Effect of faba bean intake on growth and carcass characteristics of lambs from three breeds

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Abstract. The lambs fattening regimen in Tunisia is based on barley. The aim of this study was to assess the effect of feeding faba beans on lamb's growth and carcass characteristics. Forty two lambs from Barbarine, Queue Fine de l'Ouest and Noire de Thibar breeds were used. Animals of each breed were divided into two groups receiving oat hay (7 % crude protein, 34 % crude fiber) ad libitum and 1 kg of concentrates. The concentrates were: 100 % barley for Control (CG) and 50 % barley 50 % faba beans for the experimental group (FG). At the end of the experiment, all animals were slaughtered. Oat hay intake was similar for all groups (527g). The diet and breed did not significantly affect slaughter weight and average daily gain, although a trend toward higher values of these parameters was observed for FG than CG (51.8 *vs.* 49.60 kg and 178 *vs* 166 g, respectively). Carcass yield was significantly higher for Barbarine breed (P= 0.01). The gut was significantly more developed for thin tailed breeds than for Barbarine, but was not affected by the concentrate type. Cold carcass and lean weights were higher for FG (25.2 and 11.8 kg) than CG (23.3 and 10.9 kg). Faba bean incorporation tends to improve lamb's growth and carcass composition. Applying this regimen to lighter lambs may lead to more significant results.

Keywords. Faba bean – Lambs – Growth – Carcass composition – Barley.

Effet de l'incorporation de la féverole sur la croissance et les caractéristiques de carcasses des agneaux de trois races

Résumé. *Le but de cette étude était d'étudier l'effet de l'incorporation de la féverole sur la croissance et les caractéristiques de carcasses des agneaux. Quarante-deux agneaux des races Barbarine, Queue fine de l'Ouest et Noire de Thibar ont été utilisés. Les agneaux de chaque race ont été divisés en lot témoin (CG) recevant 1 kg d'orge et lot expérimental (FG) recevant 1 kg de concentré fermier (50 % d'orge 50 % de fèves). Tous les animaux ont reçu du foin d'avoine et de l'eau à volonté. À la fin de l'expérience, tous les animaux ont été abattus. Le régime et la race n'ont pas affecté de manière significative le gain moyen quotidien et le poids à l'abattage, bien que ces paramètres aient été plus élevés pour FG que pour CG (51,8* vs. *49,60 kg et 178* vs *166 g). Le rendement en carcasse était significativement plus élevé pour la race Barbarine (P = 0,01). Le tube digestif était significativement plus développé pour les races à queue fine que pour la Barbarine, mais le type de concentré n'avait pas d'effet significatif sur ce paramètre. Le poids de la carcasse froide et celui de la masse musculaire étaient plus importants pour FG (25,2 et 11,8 kg) que ceux du lot CG (23,3 et 10,9 kg), mais les différences n'étaient pas significatives. En conclusion, l'incorporation de fèverole tend à améliorer la croissance de l'agneau et la composition en carcasse. L'application de ce régime à des agneaux plus légers peut mener à des résultats plus signifiants.*

Mots-clés. *Féverole – Agneaux – Composition de croissance – Orge.*

I – Introduction

Most of concentrate feedstuffs for livestock is based on soya bean cake and corn. The rise in prices of these materials in 2007 leads to search other solutions in order to provide alternative feed resources. In Tunisia, barely is often used as concentrate in ovine fattening diets, but this energetic source is known for its low protein content. Adding a protein source such as locally produced faba bean, with high protein (30% MAT) and starch (42%) contents (Yu *et al.*, 2002)

to the ovine feeds, became essential especially in growing and finishing steps of meat lambs. The objective of this work was to study the effect of using both barely and faba bean in finishing diets on growth and carcass characteristics of Tunisian lambs belonging to three breeds.

II – Materials and methods

The experiment was carried out with a total of 42 lambs from Barbarine, Queue Fine de l'Ouest (QFO) and Noire de Thibar (NT) breeds. Animals were 11 months old and 32.7 kg body weight (BW). Lambs of each breed were divided into two groups. All groups had free access to water and they were offered oat hay ad-libitum and an average amount of 1 kg of concentrate. For each breed, the control group (CG) received barely as a concentrate; the experimental group (FG) received a farmer concentrate composed by 50 % barely and 50 % faba bean (Table 1). Animals were allowed 120 days in this growth trial and then were slaughtered.

Table1. Chemical composition (g/kg DM) of ingredients of concentrate and roughages

	Hay	Barely	Faba bean
Dry matter g/kg	933	965	954
Organic matter	97.31	99.71	98.06
Ash, g/kg DM	5.82	2.65	2.57
Crude protein g/kg	6.2	13.2	27.6

Feed intake was recorded daily and lambs BW weekly. At slaughter, external and internal organs were weighed. All fractions of the digestive tract were weighed full then empty, in order to determine the empty body weight (EBW). Carcasses were weighed cold (CCW) after storage 24 h at 4℃. After removing the tail, each carcass was split longitudinally into two halves; the left sides were dissected into fat, muscles and bones.

The statistical effects of dietary treatment and breed on growth and carcass composition were performed by analysis of variance using the GLM procedure of SAS (1989). Differences between groups were evaluated by t-test; significance was declared at $p<0.05$.

III – Results and discussion

1. Food intake, growth performance and slaughter parameters

During the whole trial period, oat hay intake was similar for both diet treatments and had not exceeded an average daily consumption of 550g/day for all groups (Fig.1). The FG group was in phase lead by one week compared to CG group, which can be explained by the improvement of fermentative facieses ensured by the nitrogen contribution and by the variation of the rumen pH which value decreases by the intake of a large quantity of concentrate. At the end of the trail, both diets reached the same quantity of concentrate 1400g/day (Fig. 1). Lambs of all groups had a similar slaughter BW (50.15 kg). The average total body gain was 17.7 kg, which could be considered as an important result for animal having 11 months old at experiment start. Neither regimen nor breed affected average daily gain (ADG) which was similar for all groups. This ADG (171 g) was lower (Table 2) than gains (214 g) achieved by lighter lambs (15 kg) from Rasa Aragonesa breed receiving diets based on faba bean (Purroy *et al*., 1992). FG group had higher body weight, carcass weights and dressing percentages than CG group with tendency to significant effect (p=0.1). The advantage of faba bean diet was found by other authors (Lanza *et al.*, 1999), who detected significant difference in these parameters when using post weaned

lambs. EBW, carcass weights and consequently the dressing percentage were higher for Barbarine lambs than both other breeds (Table 2) this result is in accordance with other finding concerning the same breeds (Atti and Khaldi, 1989).

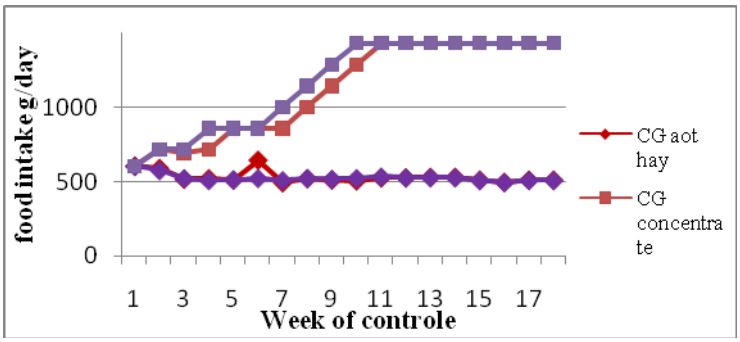

Fig.1. Evolution of food intake.

Table 2. Growth performances parameters, carcass weight (CCW) and dressing percentage (DP, %)

	Barbarine	QFO	NT	CG†	FG†	Bd†	Rg†	MES
Initial BW	32.14	33.24	32.19	32.27	32.70	0.83	0.79	4.97
SBW	50.05	51.72	49.28	48.75	51.56	0.56	0.15	6.45
ADG (g)	163	190	163	165	178	0.18	0.33	42.26
EBW (kg)	43.30	44.72	40.54	41.32	44.20	0.17	0.11	5.69
CCW (kg)	24.89	24.49	23.36	23.30	25.17	0.52	0.11	3.63
DP	49.87	48.05	47.95	48.38	48.93	0.01	0.16	1.58

†CG: Group receiving barely; FG : group receiving barely and faba bean; Bd: breed effect ; Rg: regimen effect

2. Non carcass components

For all non carcass components lambs from FG groups had slightly better development than CG groups, but only the head weight was significantly affected by faba bean incorporation (Table 3). According to Morbidini *et al.*, (2005), using light lambs, faba bean increase significantly the development of both pelt and head. The weight of most offal components was not different between groups slaughtered at a similar BW, despite the difference in feed level and quality (Atti *et al.*, 2003). This suggests that the weight of most offal components depends more on weight at slaughter rather than on the intake level or diet composition as mentioned by several authors (Kamalzadeh et al 1998). Breed had significant effect on head and skin weights. Head was heavier in QFO breed (2.88 *vs* 2.65 kg); this is in relation with its developed skeleton (Table 3). Red cut downs (heart and lungs) and rumen were significantly more important in thin tailed breeds than in fat tailed one ($P< 0.05$).

3. Carcass composition

Faba bean incorporation tended to have a positive effect on tissues' weight and proportion (Table 4). This trend may be due to the heavy initial weight of lambs (32.7 kg) whilst, with light lambs, there was no significant effect of faba bean on carcass composition (Morbidini *et al.*,

2005). Although faba bean incorporation as protein source has a positive effect on nitrogen intake there was no increase on muscle amount. The barely protein content seems to be sufficient to produce the same amount of muscle as barley plus faba bean. For heavy and old (11 months) lambs, the use of barely alone or its mixture with faba bean resulted in the same carcass composition. Muscle weight was similar for all breeds (11.33 kg) but its percentage was higher for NT lambs (Table 4). Fat was significantly more important for Barbarine than both other breeds (36 *vs* 29 %).

Table 3. Non carcass components (kg)

	Barbarine	QFO	NT	CG†	FG†	Bd†	Rg†	mse
Head	2.46	2.88	2.84	2.60	2.84	0.001	0.01	0.281
Skin	7.09	6.98	5.73	6.30	6.86	0.01	0.18	1.267
Liver	0.753	0.872	0.835	0.81	0.82	0.13	0.91	0.154
Heart	0.190	0.208	0.227	0.199	0.217	0.02	0.11	0.034
Rumen	1.03	1.17	1.19	1.114	1.147	0.01	0.45	0.138

†CG: group receiving barely; FG: group receiving barely and faba bean; Bd: breed effect; Rg: regimen effect.

Table 4. Weight of different carcass tissues

	Barbarine	QFO	NT	CG†	FG†	Bd†	Rg†	mse
Muscle, kg	11.1	11.6	11.3	11.0	11.7	0.76	0.18	1.67
Muscle %	48.3	49.1	51.8	49.1	50.4	0.01	0.23	3.22
Fat, kg	8.5	7.6	5.9	6.9	7.7	0.001	0.18	1.79
Fat %	36.3	30.9	26.8	30.7	32.0	0.0001	0.30	4.15

†CG: group receiving barely; FG: group receiving barely and faba bean; Bd: breed effect; Rg: regimen effect.

IV – Conclusions

Faba bean incorporation in finishing diet for heavy lambs had a minor positive effect on growth and carcass components allowed to achieve an important weight in spite of their advanced age. However, this effect of faba bean intake was not significant with regards to carcass composition traits because of the high initial weight of lambs. Studying the effect of this protein source on meat quality and testing its effect using lighter lambs may have an important interest.

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