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Effects of yeast (*Saccharomyces cerevisiae*) feed supplement on growth performances in "Queue Fine de l'Ouest" lambs

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Abstract - This study aims explore the effects of yeast *Saccharomyces cerevisiae* feed supplement on lambs growth and their feed intake. For this purpose, 14 lambs aged of 148 days were used during 9 weeks and allocated to 2 groups according to body weight and age. Lambs receiving a basal diet of oat hay ad libitum supplemented with whole grain barley (400g) and concentrate (400g). The control group (C) received oat hay ad libitum, whole grain barley (400g) and concentrate (400g). The second group (Y) received the same feeds than (C) group plus a dose of 1,5g/lamb/day of yeast *Actisaf* ® *Sc 47*. The ration was distributed twice a day at fixed times. Animals of two groups had free access to water.
This study showed that the average amount of oat hay voluntarily ingested was 147,1 and 148,7 g DM/lamb/day, for (C) group and (Y) one respectively in the first week of control. Feed intake continues to increase slightly until the 5th week and reached a maximum around the 9th week of trial (374,6 *vs.* 439,9 g DM/lamb/day for (C) group and (Y) respectively). Weight of lambs has evolved during trial period, it increased from 22,5 kg to 30,5 kg for (C) group and 22,3 kg to 34,5 kg for (Y) group with a notable superiority for (Y) group in comparison with (C) one. For the daily gain, the respective averages are 145 g/day and 223 g/day for lambs of (C) group and (Y) one. The statistical analysis shows that there are significant differences for daily gain (g/day) within 5th, 6th, 8th week of growth trial, and a significant difference of daily gain throughout growth trial (1th; 8th week). Feed conversion decreased notably for lambs of (Y) in comparison with group and (C) one.

Keywords: lambs / concentrate / *Saccharomyces cerevisiae* yeast / intake / growth.

1. Introduction

Sheep farming is traditionally the most important by Tunisian farmer's activity with its social and economic role, particularly in the context of food security and incomes of small farmers (Mohamed Brahmi et al. 2010). Indeed, due to population growth, the state is still investing to improve the sheep industry at the end of meet the ongoing needs red meat mainly applied in religious and family celebrations. This increase in the number of sheep was at the expense of food available. In fact, food intake are limited and do not meet the needs of animals. Meanwhile, the settlement of nomadic society and the depletion of natural resources and technology have led to a range of driving mode which vary from extensive to intensive, whose degrees of intensification of conduct depends on natural resources and constraints of each herd (Najari 2005). This intensification of livestock has led to the use of excessive use of concentrate and cereals in animal feed more precisely in lambs.

To promote their products and improve their incomes, farmers' leads to increase the proportion of concentrates and cereals in animal feed without considering the risks of diseases such as metabolic acidosis leading to the decrease performance. To prevent this risk, several studies have shown that the use of food additives also appears to be an effective solution to reduce latent acidosis in ruminants.

Including yeast *Saccharomyces cerevisiae* have been extensively studied (Chaucheyras-Durand et al. 2008; Desnoyers et al. 2009; Chaucheyras-Durand and Durand 2010). They help maintain a healthy digestive comfort and improve their growth performance.

The objective of this study is to explore the effects of yeast (*Saccharomyces cerevisiae*) feed supplement on growth performances in "Queue Fine de l'Ouest" lambs.

2. Materials and methods

2.1. Experimental design

The experiment was carried out at the Regional Center of Agricultural Research Sidi Bouzid (CRRA), Tunisia. The experiment started in April with a total of 14 "Queue Fine de l'Ouest" male lambs. They were 148 days old and had an average body weight (BW) of 22,5 ± 3,9 kg and 22,3 ± 2,6 kg for (C) group and (Y) one respectively. They were divided into two equal groups according to live weight and age. Animals were subjected to the same conditions of temperature and density (lamb/2 m^2). Lambs receiving a basal diet of oat hay ad libitum supplemented with whole grain barley (400g) and concentrate (400g). The control group (C) received oat hay ad libitum, whole grain barley (400g) and concentrate (400g). The second group (Y) received the same feeds than (C) group plus a dose of 1,5g/lamb/day of yeast *Actisaf* ® *Sc 47*. The ration was distributed twice a day at fixed times. Animals of two groups had free access to water. Concentrate was based on barley (30%), maize (24%), wheat bran (25%), soya bean (17%) and mineral-vitamin supplement (4%). Lambs were weighed weekly just prior to feed distribution. Quantities of feeds offered and refused were recorded daily.

2.2. Laboratory analysis

The chemical composition of oat hay, concentrate and whole grain barley was determined. Samples of these components were dried in a forced-air oven at 105 °C for 24 h to determine DM. Dried samples were then ground through a 1-mm screen. Ground samples were used to determine ash content (450 °C for 8 h), crude fiber by the method of Weende. Crude protein was determined by Kjeldahl method (AOAC, 1984).

2.3. Statistical analysis

Data of feed intake, initial body weight, final body weight, daily gain and feed conversion were analyzed using the General Linear Model of SAS (2000). Means of dietary treatments were compared by a t-test p-diff procedure of SAS.

Equation Model: $Yij = \mu + Ri + ij$

With Yij: parameter measured.

μ: average.

R: Effect of i^{th} diet (1, 2).

Eij: residual error and j^{th} repetition.

3. Results and discussions

3.1. Feed composition

The ration is rich in starch and carbohydrate intake; it has about 40% of concentrate and 40% whole grain barley. According to table 1, the proportions of CP were respectively 19,7% for concentrated, 9,2% for barley grain and 4,2% for oat hay. This ration can probably induce a ruminal acidosis. According Sauvant and Peyraud (2010), a ration which it has a concentrate more than 40% induce acidogenic potential risk. Desnoyers (2008) indicated that the main causes of acidosis appear to be a bad adaptation of rumen diet intake too fast or too much and rapidly fermentable carbohydrates. Many parameters, including the composition of the diet, the individual behavior of the animal, might influence the susceptibility of animals to acidosis.

Table 1. Chemical composition of concentrate, barley grain and oat hay

	Concentrate	Barley grain	Oat hay
Dry matter (DM) (%)	95.6	92.08	89.68
Crude protein (% DM)	19.7	9.2	4.2
Crude fiber (% DM)	2.4	4.0	34.5
Ash (% DM)	6.0	2.4	8.9
Organic matter (% DM)	94.0	97.6	91.1
Fat matter (%DM)	3.0	2.6	2.4
dDM (%)	90.2	77.5	50.3
UF / Kg DM	1.12	1.09	0.59

DM : dry matter ; OM : organic matter ; CP : crude protein ; FM : fat matter ; CF : crude fiber ; dMD : dry matter digestibility ; UF: fodder unit.

3.2. Feed Intake

Oat hay intake was 147,1 and 148,7 g DM/lamb/day, for (C) group and (Y) one respectively, in the first week of trial. Feed intake continues to increase slightly until the 5th week and reached a maximum around the 9th week of trial (374,6 *vs.* 439,9 g DM/lamb/day for (C) group and (Y) one respectively). The respective intake values remain within the standards of the intake capacity which closely depends on the weight of the animal (2 to 2,5 kg DM/100kg BW) (Jarrige et al. 1995). Statistical analysis reveals that there is no significant difference between groups. Indeed, total dry matter intake in whole period was 56,1 against 58,9 kg DM/lamb for (C) group and (Y) one respectively (Table 2). The amount of total dry matter intake per day was 1,02 against 1,07 kg DM/lamb/day for (C) group and (Y) one respectively as shown in table 2. Our results are consistent with those of Desnoyers et al. (2006), who found that feed intake didn't differ with yeast supply. Further work on beef cattle, led by Moncoulon and Auclair (2001) even claimed a significant decrease in the amount of 2,6% of dry matter intake. By cons, Mutsvangwa et al. (1992) reported that the addition of yeast to a diet acidogenic nature contributes to increasing amounts of dry matter intake in beef cattle. This trend can be explained by the fact that the yeast on intake effect is negligible with a diet rich in concentrate (high energy intake) due to metabolic satiety already established following the major VFA production from carbohydrates quickly fermentable. Thus, feed intake may likely to increase in the case of a diet rich in fiber due to the direct action of yeast on communities that degrade fiber in the rumen through its action at the level of oxygen consumption (Marden et al., 2008) and promote the fibrolytic activity accelerated intestinal transit and subsequently increasing the amount of dry matter intake (Chaucheyras-Durand and Durand, 2010).

Table 2. Effect of yeast supply on total and daily dry matter intake (DMI)

Group	Control (C)	Yeast (Y)	m.s.e	Pr < F
Total DMI (kg)	56.1 ± 8.4	58.9 ± 5.1	4.8	0.4
DMI/day (kg)	1.02 ± 0.15	1.07 ± 0.09	0.16	0.4

[a, b] Mean values with different letters in the same row are significantly different.
m.s.e: mean standard error. (±): standard error.

3.3. Lamb Growth

Body weight of lambs has increased from 22,5 to 30,5 kg for the (C) group and from 22,3 kg to 34,5 kg for (Y) group with notable superiority for the lambs received yeast supply as shown in Figure 1. From table 3, it appears that lambs received *Saccharomyces cerevisiae* yeast feed supplement had a more cumulate body weight gain than those of (C) group (12,3 ± 2,6 kg *vs.* 8 ± 2,4 kg for (Y) group and (C)

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one respectively). Statistical analysis revealed that cumulative weight gain was significantly higher (P<0,01) between the two groups with 34,9% for the (Y) group.

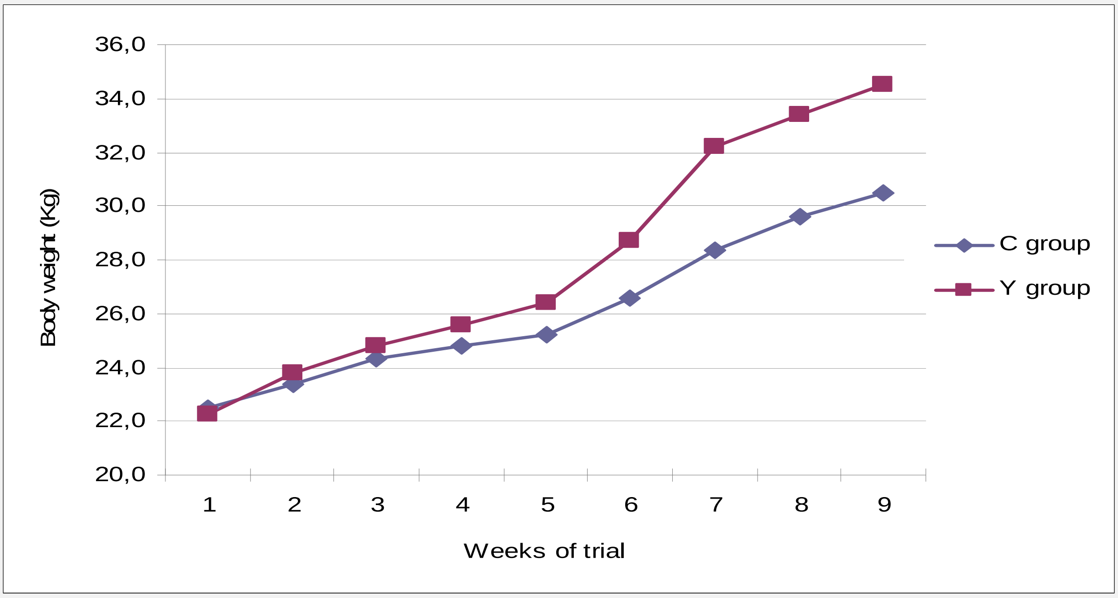

Figure 1. Lambs body weight evolution according groups during whole trial

For the daily weight gain (g/day), the respective averages are 145 ± 44,5 g/day and 223 ± 47,1 g/day for lambs of (C) group and (Y) one (Table 3). The statistical analysis shows that there are significant differences for daily gain (g/day) within 5^{th}, 6^{th}, 8^{th} week of growth trial (P<0,05) (Figure 2), and a significant difference (P<0,01) of daily gain throughout growth trial (1^{th}; 8^{th} week) as shown in table 3. Feed conversion decreased notably (P<0,05) for lambs of (Y) in comparison with group and (C) one. Results are entirely consistent with those of El Hassan et al. (1993) and Hancock et al. (1994) who mentioned a significant increase in body daily gain when animals are fed a diet acidogenic character and received yeast supply. This could be the cause of yeast effect that probably limits the disruption fermentation in the rumen generally caused by diets high in concentrate (Desnoyers, 2008). Indeed, Beauchemin et al. (2003) denoted that the addition of the yeast *Saccharomyces cerevisiae* allows the user flora lactate to be effective and thus prevent the accumulation of lactic acid in nutritional situations leading to the onset of acidosis. Fermentation of starch (carbohydrate of concentrate and barley grain) is much faster and gives rise to a greater amount of VFA and the intermediate production of lactic acid is less rapidly metabolized. Therefore, supplementation with yeast can stimulate lactic acid bacteria in rumen digestion and improving the flow of microbial protein in the rumen, resulting in increased weight gain.

Table 3. Effect of yeast supply on cumulative (kg) and daily weight gain (g/day)

Group	Control (C)	Yeast (Y)	m.s.e	Pr < F
Weight gain (kg)	8^{b} ± 2.4	12.3^{a} ± 2.6	6.35	0.007
Daily weight gain $_{(1w\text{-}8w)}$	145^{b} ± 44.5	223^{a} ± 47.1	21	0.008

$^{a,\,b}$ Mean values with different letters in the same row are significantly different.
m.s.e: mean standard error. (±): standard error.

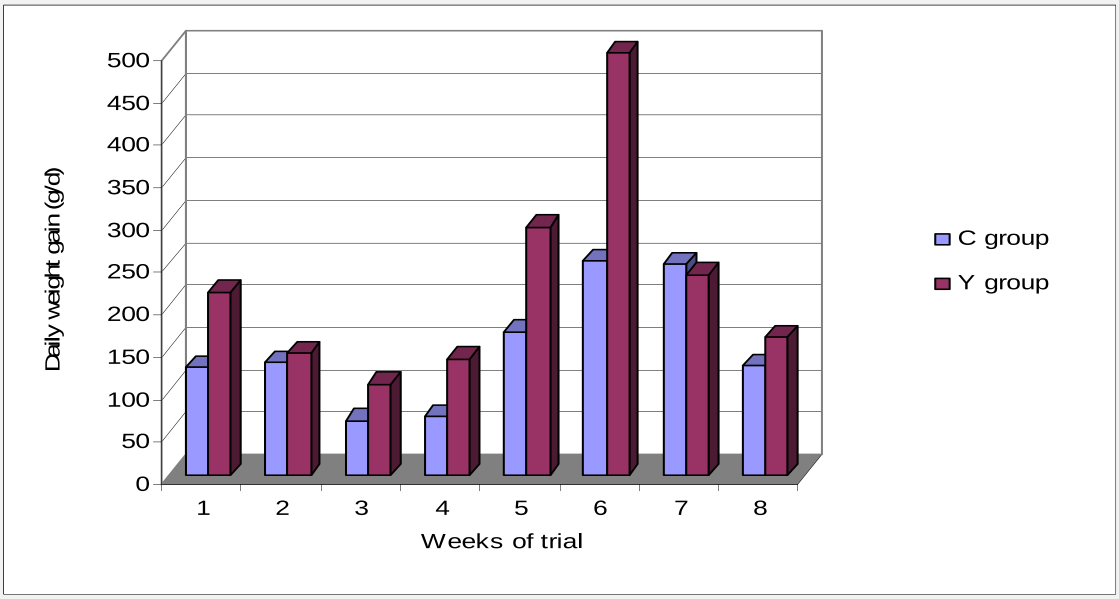

Figure 2. Lambs' daily weight gain (g/d) according groups during whole trial

3.4. Food conversion factor (Ratio of feed to live weight gain)

Food conversion factor is measured to determine the efficiency of feed in a production by weight (Jarrige et al., 1995). It is of the order of 7,6 ± 2,5 and 4,9 ± 0,9 kg DMI/kg weight gain, respectively, for (C) group and (Y) one respectively as shown in table 4.

Although feed intake did not significantly differ between the two groups of lambs throughout the trial, statistical analysis showed a significant difference (P<0,05) of food conversion factor between the two groups. Indeed, the food conversion factor for (Y) group was significantly lower than 35,5% compared to the control group (Table 4). This result confirms that of Boccard (1963) who showed that a low growth rates lead to a high ratio of feed to live weight gain. Similarly, for cattle, these results are entirely consistent with those of Moncoulon and Auclair (2001) who suggested a significant decrease in food conversion factor of veal calf received yeast and fed with rations rich in rapidly fermentable carbohydrates.

Table 4. Effect of yeast supply on food conversion factor (FCF)

Group	Control (C)	Yeast (Y)	m.s.e	Pr < F
FCF	$7.6^{a} \pm 2.5$	$4.9^{b} \pm 0.9$	3.3	0.02

[a, b] Mean values with different letters in the same row are significantly different.
m.s.e: mean standard error. (±): standard error.

4. Conclusion

Our results confirm the importance of incorporating the probiotic yeast *Saccharomyces cerevisiae* in the diet of lambs which may stimulates rumen microorganisms and leads to a better feed efficiency and to improve growth performances and it seems necessary to explore the mechanisms of action of the *Saccharomyces cerevisiae* metabolic activities and intra-ruminal metabolism of lambs on different feeding systems.

5. References

AOAC, Association of Official Analytical Chemists (1984) Official Methods of Analysis. 14th Ed. AOAC, Washington, DC.

Beauchemin KA, Yang WZ, Morgavi DP, Ghorbani GR, Kautz W, Leedle WAZ (2003) Effects of bacterial direct-fed microbials and yeast on site and extent of digestion, blood chemistry and subclinical ruminal acidosis in feedlot cattle. Journal of Animal Science, 81, 1628-1640.

Boccard R (1963) Etude de la production de la viande chez les ovins. VIII. Note sur la relation entre l'indice de consommation et la croissance des agneaux. Annales de Zootechnie, 12, 3, 227-230.

Chaucheyras-Durand F, Durand H (2010) Probiotics in animal nutrition and health. Lallemand Animal

Nutrition, Blagnac, France. Beneficial Microbes. 1, 1, 3-9.

Chaucheyras-Durand F, Walker ND, Bach A (2008) Effects of active dry yeasts on the rumen microbial ecosystem. Past, present and future. Animal feed Science and Technology, 145, 5- 26.

Desnoyers M (2008) Intérêt de l'apport de levures sur la susceptibilité à l'acidose et le comportement alimentaire du ruminant, Institut des sciences et Industries du vivant et de l'environnement (AgroParisTech).

Desnoyers M, Duvaux-ponter C, Bertin G, Roussel S, Tessier J, Piquerel P, Giger-Reverdin S (2006) Effets de l'apport de levures (*Saccharomyces cerevisiae* CBS 493.94) sur le comportement et la réactivité émotionnelle de chèvres laitières en acidose subclinique. Rencontre Recherche Ruminants, 13, 137.

El Hassan SM, Newbold CJ, Wallace RJ (1993) The effect of yeast in the rumen and the requirement for viable yeast cells. Animal Production, 54, 504.

Hancock DL, Brake AC, Montgomery AL, Dominey JR, Mattingly CA, Cecava MJ (1994) Influence of yeast addition and Compudose implantation on feedlot performance and carcass characteristics of growing and finishing steers. Journal of Animal Science, 72, 300.

Jarrige R, Ruckebusch Y, Demorquilly C, Farce MH, Jaurnet M (1995) Nutrition des ruminants domestiques, ingestion et digestion. Mieux comprendre, ISSN : 1144, 7605. Editions Quae, 921.

Marden JP, Julien C, Monteils V, Auclair E, Moncoulon R, Bayourthe C (2008) How does live yeast differ from sodium bicarbonate to stabilize ruminal pH in high-yielding dairy cows? Journal of Dairy Science, 91, 3528-3535.

Mohamed-Brahmi A, Khaldi R, Khaldi G (2010) L'élevage ovin extensif en Tunisie : Disponibilités alimentaires et innovations pour la valorisation des ressources fourragères locales. Innovation et Développement Durable dans l'Agriculture et l'Agroalimentaire (ISDA), 1-12.

Moncoulon R, Auclair E (2001) Utilisation du BIOSAF® Sc 47 pour la production de viande de taurillon. Rapport de Recherche, 17.

Mutsvangwa T, Edwards IE, Topps JH, Paterson GFM (1992) The effect of dietary inclusion of yeast culture (Yea-Sacc) on patterns of rumen fermentation, food intake and growth of intensively fed bulls. Animal Production, 55, 35-40.

Najari S (2005) Caractérisation zootechnique et génétique d'une population caprine. Cas de la population caprine locale des régions arides tunisiennes, Institut National Agronomique, Tunisie.

SAS User's Guide (2000) Statistics, 8 Ed, SAS Inst., Inc., Cary, NC.

Sauvant D, Peyraud JL (2010) Calculs de ration et évaluation du risque acidogène. INRA Production Animal, 23: 333-342.