Table 2
Biochemical profile of ewes of the CON and PEARS group (ALT: Alanine aminotransferase, GGT: Gamma glutamyl transferase).

	Diet		SED[1]	*P*-value		
	CON	PEAR		Diet	Day	Diet × Day
Albumin, g/L	40.7	41.0	1.48	0.822	<0.001	0.125
ALT, U/L	24.4	22.3	1.57	0.193	0.023	0.134
GGT, U/L	63.8	71.7	4.26	0.081	<0.001	0.035
Ca, mg/dL	10.1	9.78	0.191	0.164	0.292	0.866
Creatinine, mg/dL	0.53	0.57	0.040	0.286	0.237	0.923
Glucose, mg/dL	59.7	55.2	1.76	0.022	<0.001	0.434
Urea, mg/dL	50.7	49.3	3.54	0.694	0.440	0.362

[1] Standard error of the difference.

posal, avoiding the need for costly waste management programs, reducing feeding costs and fostering circular bioeconomy, especially when used locally.

Funding
Funding from the Spanish State Research Agency (AEI) and the European Regional Development Fund is gratefully acknowledged (Project AGL2016-75322-C2-2-R). Alba Martín gratefully acknowledges receipt of a pre-doctoral grant (PRE2019-089288) from Ministerio de Ciencia e Innovación (MCIN/AEI/10.13039/501100011033, El FSE invierte en tu futuro).

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doi: 10.1016/j.anscip.2022.07.148

O139 Carob pulp and high levels of Vitamin E do not affect performance trait and metabolic profile in fattening lambs

D.N. Bottegal [a], J. Álvarez-Rodríguez [a], M.A. Latorre [b], J. Espinal [c], M. Verdú [c], S. Lobón [d]

[a] Universitat de Lleida, Lleida, Spain
[b] Universidad de Zaragoza, Zaragoza, Spain
[c] bonÀrea Agrupa, Guissona, Spain
[d] CITA-Aragón, Zaragoza, Spain

Keywords: Carob pulp; Metabolic status; Lambs; Vitamin E

Introduction
Carob pulp (Cp) is a by-product from *Ceratonia silique* L. which contains a high concentration of antioxidant compounds as condensed tannins. However, a high dietary inclusion (56% of Cp) may negatively affect palatability, digestibility and hence the lamb's performance (Priolo et al., 2000). Nowadays, high doses of synthetic antioxidant (vitamin E, Vit E) are used in animal fed, and condensed tannins may protect Vit E from oxidation improving animal health and meat quality. This study aimed to investigate whether the inclusion of carob pulp and high doses of Vit E may affect the performance and metabolic profile in fattening lambs.

Material and Methods
This study was carried out in the bonÀrea Agrupa experimental farm. A total of 72 (entire males and females) crossbreds (Berberina × INRA 401 × Ripollesa) weaned lambs of 48 ± 5.8 days old and 15.07 ± 1.46 kg of body weight (BW) were used. According to the initial BW, the animals were randomly distributed in homogeneous group and housed in 12 indoor pens (3 lambs per sex/pen; 0.87 m^2/animal). Each group were fed *ad libitum* with one of four concentrate-based diet plus barley straw. Diets were formulated (with the same ingredients) to be iso-energetic (7.76 MJ net energy/kg feedstuffs) and iso-protein (15.46% crude protein) in a 2 × 2 factorial design with two Cp levels (0 *vs.* 20%) and two Vit E levels (40 *vs.* 300 IU/kg). The feed offered and refused were recorded and the lambs were weighed individually every week. At day 1, 21 and 35 of the trial, blood samples were collected in vacuum tubes with EDTA by puncture of the jugular vein from the same four selected animals per pen (two lambs/sex). Haematocrit was measured and plasma concentrations of creatinine, glucose, urea, and lactate were determined with an automatic analyzer (Olympus AU400, Germany). Plasma cholesterol, triglycerides, and non-esterified fatty acids concentration (NEFA) were analyzed only at day 35. After 40 days of feeding trial, and without a fasting period, the animals were slaughtered in bonÀrea Agrupa facilities (3 km away), where hot carcass weight and carcass yield were registered. An ANOVA was carried out for productive data. Physiological variables were analyzed through mixed models with repeated measurements, means were separated by Tukey test when significant fixed effects (Cp, Vit E or sampling day) were detected.

Table 1
Performance, carcass traits and blood parameter of lambs fed a concentrate with carob pulp (0 *vs.* 20%) and Vit E (40 *vs.*300 IU/kg).

Variable	Carob pulp		Vitamin E		SEM	*P*-value	
	0%	20%	Low	High		Carob pulp	Vit E
Final BW, kg	25.17	25.12	24.77	25.52	0.41	NS[3]	NS
ADG[1], kg BW/day	0.26	0.25	0.25	0.26	0.01	NS	NS
ADFI[2], kg FI/day	0.86	0.89	0.87	0.89	0.02	NS	NS
Feed to gain, F:G	3.42	3.60	3.66	3.36	0.12	NS	NS
Hot carcass weight, kg	11.83	11.84	11.65	12.02	0.25	NS	NS
Carcass yield, %	46.93	47.14	46.97	47.10	0.46	NS	NS
Cholesterol, mg/dL	41.20	45.58	40.91	45.87	3.20	NS	NS
Triglycerides, mg/dL	15.67	14.43	14.65	15.45	0.93	NS	NS
NEFA, mmol/L	0.15	0.20	0.15	0.20	0.04	NS	NS

[1] ADG, average daily gain.
[2] ADFI, average daily feed (concentrate) intake.
[3] NS, no significant ($P > 0.05$).

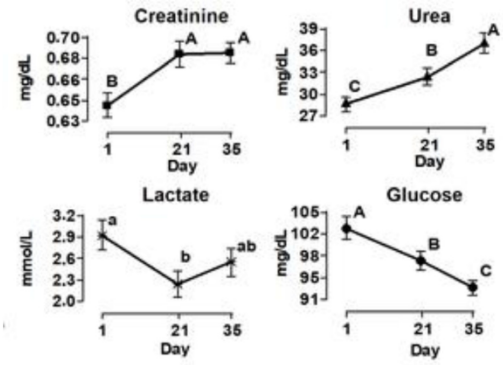

Figure 1. Evolution of plasma metabolites (means and SE) throughout the trial period. a,b (P < 0.05) and A,B (P < 0.01).

Results and Discussion

The lamb's performance and the carcass traits were not affected ($P > 0.05$; Table 1) by Cp or Vit E inclusion (nor interaction effect). Similarly, Noor-Ehsan Gobindram et al. (2016) reported no impact when the inclusion of Cp was up to 24–35% in heavy lambs. In relation with blood parameters, no variable was affected by the diets ($P > 0.05$), except the haematocrit level, that was higher in 20% *vs.* 0% Cp (39 *vs.* 36 ± 1%) and in high Vit E level diets (39 *vs.* 37 ± 1%). Although Noor-Ehsan Gobindram et al. (2016) reported that Cp increased urea and NEFA levels, but decreased blood concentration of cholesterol and triglycerides. Day effect was found in plasma concentration of urea, creatinine, glucose, and lactate concentration (Figure 1). Throughout the study, creatinine and urea concentration increased probably due a higher daily protein intake.

Conclusion and Implications

Moderate levels of carob pulp, as alternative feedstuff, and high levels of Vit E can be included in the fattening concentrate without deleterious effects on performance and metabolic profile in light lambs. Even so, for a complete recommendation of its inclusion, studies regarding the effect on meat quality should be done.

Acknowledgments

To bonÀrea Agrupa for provide the facilities and the daily management of the animals.

Funding

European Union H2020 research & innovation programme under Marie Sklodowska-Curie grant N° 801586.

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doi: 10.1016/j.anscip.2022.07.149