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# Curd sensory properties as affected by feeding dairy ewes with cold-pressed oilseed cakes and sainfoin

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**Abstract.** A lactation study utilizing 72 dairy ewes was performed to determine effects of cold-pressed oilseed cakes, including cold-pressed sunflower cake and cold-pressed rapeseed cake, and their interaction with tanniferous sainfoin hay, on curd sensory properties. A 2 x 3 factorial arrangement involving two forages (tall fescue and sainfoin hay) and 3 experimental concentrates was used. Concentrates were formulated to contain cold-pressed rapeseed cake, cold-pressed sunflower cake or palm as fat sources and to provide equal amounts of crude protein fat and energy. Concentrate type did not affect acceptance traits. Non-significant differences were found between forages in terms of overall acceptability, odour, texture or flavour, but curd appearance was improved when the forage was sainfoin (6.9 vs. 6.4,  $P=0.011$ ) compared to fescue.

**Keywords.** Tannins – Rapeseed – Sunflower.

**Effet d'une distribution de tourteaux d'oléagineux pressés à froid et de sainfoin aux brebis laitières sur les propriétés sensorielles du fromage blanc**

**Résumé.** Un essai a été mené avec 72 brebis laitières en début de lactation dans un schéma factoriel 2 x 3 impliquant deux fourrages (fétuque et sainfoin) et 3 concentrés expérimentaux. Les concentrés ont été formulés pour contenir du tourteau de colza, de tournesol ou de palme comme sources de lipides, et pour fournir des quantités égales de lipides, de protéines brutes et d'énergie. Le type de concentré n'a pas affecté l'intensité d'acceptation du fromage. Des différences non significatives ont été trouvées entre les fourrages en termes d'acceptabilité globale, d'odeur, de texture ou de saveur, mais l'aspect du fromage blanc a été amélioré avec le sainfoin par rapport à la fétuque.

**Mots-clés.** Tanin – Colza – Tournesol.

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## I – Introduction

Cold-pressed oilseed cake (CPOC) is a cheap by-product of oil-manufacturing. It is widespread in the European area and it can be obtained on-farm after simple mechanical extraction of the oil from the seeds. CPOC has been shown to have higher crude fat content than those of conventional solvent and expeller meals (up to 230 g kg<sup>-1</sup> compared to 30 and 100 g kg<sup>-1</sup>, respectively, Benhissi *et al.*, 2014) which make it an attractive energetic feedstuff for livestock. Sainfoin (*Onobrychis viciifolia*) is a temperate forage legume which has a moderate to high content of condensed tannins (Scharenberg *et al.*, 2007). Condensed tannins are known to alter rumen microflora activity, inhibiting the last step of rumen biohydrogenation (Vasta *et al.*, 2009). Any alteration in milk composition and quality must be accompanied with the concomitant sensory acceptance of milk or dairy products. In fact, during the past thirty years companies have recognized the consumer as the key driver for product success. For today's consumers, the primary consideration for selecting and eating a food commodity is the product's palatability or eating quality. With this regard the effects of CPOCs on dairy product's eating quality to our knowledge is still unknown. Therefore, the objective of the current study was to ensure that feeding strategy CPOC does not compromise curd sensory acceptance.

## II – Material and methods

The experiment was carried out in accordance with Spanish Royal Decree 53/2013 for the protection of animals used for experimental and other scientific purposes.

### 1. Animals and experimental diets

The trial was carried out at the Neiker-Tecnalia experimental station. We used 72 blackfaced Latxa dairy ewes at early lactation in a 2 x 3 factorial arrangement involving two forages (fescue and sainfoin hay) and 3 experimental concentrates. Concentrates were formulated to contain cold-pressed rapeseed cake (RPS), cold-pressed sunflower cake (SUN) or palm (CTR) as fat sources. Concentrates were formulated to provide equal amounts of crude protein (CP), energy and fat. Ingredients of experimental concentrates and forages are shown in Table 1. Ewes were divided into 6 equilibrated groups of 12 ewes each, according to milk yield ( $2094 \pm 520$  ml) and days in milk ( $15 \pm 8$  d postpartum). The experimental concentrates were offered in individual feeders in the milking parlour as two equal meals (450 g DM) during the morning and evening milkings. Tall fescue (*Festuca arundinacea*) hay or sainfoin hay was group fed *ad libitum* in a feed bunk and water.

**Table 1. Ingredients and chemical composition (g kg<sup>-1</sup> DM) of experimental concentrates**

Ingredients	Concentrate		
	CTR	SUN	RPS
Cold pressed rapeseed cake	0	0	400
Cold pressed sunflower cake	0	560	0
Soybean meal	150	0	0
Barley	160	150	360
Corn	180	210	100
Oats	200	0	0
Molasses	50	50	50
DDGs	150	0	60
Hydrogenated palm fat	80	0	0
Vitamin-mineral premix*	30	30	30

CTR: control, SUN: sunflower, RPS: rapeseed, \*Vitamin and mineral premix contained per kg of DM: 2500 IU of vitamin A, 400 mg of vitamin D, 2.5 IU of vitamin E, 4.9 mg of Zn, 4.05 mg of Mn and 0.1 mg of Se (Calseaphos, Saint Malo, France).

### 2. Curd sensory acceptance test

On d-35 of the experimental period, a composite milk sample (7 L) from each treatment was collected into stainless steel milk cans. Raw milk was pasteurized at 72°C for 20 s using a continuous plate heat exchanger (ATA tecnologia alimentaria, Irun, Spain). Pasteurized milk samples were dispensed in individual 125 mL containers, coagulated at 35°C by calf rennet (Laboratorios Arroyo, Santander, Spain), and conserved covered at 4°C.

The curd acceptance test was carried out using a non-trained sensory panel, composed of 26 women and 34 men, regular consumers of curds, using a 10-point line scale, with 1 being the lowest and 10 representing the highest intensity, for the attributes of appearance, flavour, odour, texture and overall acceptability. A balanced incomplete block design was used to assign 4 tempered curd samples to each panellist.

### 3. Statistical analyses

Sensorial data (n=60) were analysed using the GLM procedure. The statistical model included fixed effects of concentrate (CON), forage (FOR) and their interaction. Least squares means for treatments are reported. Treatment means were compared using a Tukey test.

## III – Results and discussion

Mean effects on curd acceptance traits can be seen on Table 2. No interactions between concentrate type and forage type were observed for any of the evaluated traits. Concentrate did not affect acceptance traits. Non-significant differences were found between forages in terms of overall acceptability, odour, texture or flavour, but curd appearance was improved when the forage was SAIN (6.9 vs. 6.4, P=0.011) compared to FES.

**Table 2. Effects of concentrate (CTR, SUN, RPS) and forage (FES, SAIN) type on curd acceptance**

Item	FES			SAIN			SEM	P-value		
	CTR	SUN	RPS	CTR	SUN	RPS		CON	FOR	CONx FOR
Overall acceptability	6.3	6.4	6.4	6.4	6.6	6.6	0.56	0.762	0.363	0.766
Appearance	6.6	6.4	6.4	6.8	6.8	7.1	0.49	0.985	0.011	0.319
Odour	5.9	5.6	5.9	5.7	5.7	5.7	0.29	0.672	0.555	0.735
Texture	6.5	6.5	6.4	6.2	6.5	6.8	0.6	0.676	0.943	0.424
Flavour	6.1	5.8	6.3	6.2	6.3	6.3	0.23	0.812	0.456	0.508

CON: concentrate, FOR: forage, CTR: control, SUN: sunflower, RPS: rapeseed, FES: fescue hay, SAIN: sainfoin hay.

Feeding diets rich in fat such those used in the current trial could lead to dietary products more susceptible to oxidation, and as a consequence could also have negative consequences from a consumer's point of view. It is, therefore, important to ensure that the final product (milk or dairy products) still has a pleasant taste and is free of off-flavours. The results observed in the current trial are in agreement with Lightfield *et al.* (1993) who observed that cheese made from milk obtained supplementing diets with sunflower contained higher concentrations of UFA while maintaining acceptable flavour.

## IV – Conclusions

The current study demonstrated that the effects of CPOCs or SAIN on the sensory properties and acceptance of curd were limited.

## References

- Benhissi H., García-Rodríguez A. and Beltrán de Heredia I., 2014.** Effect of type and inclusion level of cold-pressed oilseed cakes on *in vitro* rumen fermentation, *Anim Prod Sci*, 54, p. 1709-1713.
- Lightfield KD., Baer RJ., Schingoethe DJ., Kasperson KM. and Brouk MJ., 1993.** Composition and flavor of milk and cheddar cheese higher in unsaturated fatty acids, *J Dairy Sci*, 76, p. 1221-1232.
- Theodoridou K., Aufrère J., Andueza D., Pourrat J., Le Morvan A., Stringano E., Mueller-Harvey I. and Baumont R., 2010.** Effects of condensed tannins in fresh sainfoin (*Onobrychis viciifolia*) on *in vivo* and *in situ* digestion in sheep, *Anim Feed Sci Technol*, 160, p. 23-38.
- Vasta V., Mele M., Serra A., Scerra M., Luciano G., Lanza M. and Priolo A., 2009.** Metabolic fate of fatty acids involved in ruminal biohydrogenation in sheep fed concentrate or herbage with or without tannins, *J Anim Sci*, 87, p. 2674-2684.