

# EFFECT OF INNOVATIVE SALT SUBSTITUTES ON THE MINERAL COMPOSITION OF DRY-CURED FOAL CECINA

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## I. INTRODUCTION

Nowadays, the reduction of global population salt intake is at the center of the attention of the health authorities since most of European countries consume more than twice of the recommended amounts (5 g/day of salt) [1], increasing the incidence of serious health problems. Meat and meat products represent one of the main contributors of salt intake in great part of Europe, especially cured meat products. In this regard, meat industry is pushed to find solutions in order to decrease the sodium content of their products. Hence, the purpose of this study is to assess the impact of two innovative potential NaCl alternatives, the commercial salt mixture Pansalt® or Kombu seaweed powder, on the mineral composition of dry-cured foal cecina, a characteristic Spanish meat product.

## II. MATERIALS AND METHODS

A total of forty-eight knuckles from Jaca Navarra foals were arbitrarily distributed in three batches and salted in a saturated brine: control (CON) – salted with NaCl (100% NaCl); Treatment 1 (T1) - salted employing Pansalt® salt mixture (Oriola Finland Oy, Espoo, Finland) (57% NaCl, 28% KCl, 12% MgSO<sub>4</sub>, 2% lysine hydrochloride, 1% SiO<sub>2</sub> and 0.0036% KI) and Treatment 2 (T2) – salted with 50% NaCl and 50% of *Laminaria ochroleuca* (Kombu) seaweed powder (Porto Muiños, S.L., Cerceda, Spain). All batches were salted for 0.3 day/kg of meat at 2-5 °C with a relative humidity (RH) between 85-90%. Then, all pieces were washed and moved into a post-salting room for 60 days (2-5 °C, 85-90% RH), and then smoked with oak wood in a smoking chamber for 2 h (25 °C). Finally, the cecinas were dry-cured during 105 days regulating temperature (8-14 °C) and RH (65-80%). Each batch was replicated three times in three different months. The mineral contents were determined according to Lorenzo et al. [2], with some modifications. The results were examined using a one-way ANOVA.

## III. RESULTS AND DISCUSSION

Salt treatments had a significant ( $P < 0.001$ ) impact on the mineral composition of equine cecinas. As could be expected, sodium contents diminished significantly ( $P < 0.001$ ) in reformulated samples, which presented the lowest values in batch T2, followed by batch T1, reaching reductions of 48% and 39% in comparison with the CON cecinas, respectively. Thus, T1 and T2 cecinas could be claimed as “reduced in sodium” [3]. Moreover, it was observed a considerable ( $P < 0.001$ ) increase in potassium contents both in T1 and T2 cecinas, where the samples salted with Pansalt® reported the highest amounts, three-fold more than those obtained in CON samples. Health guidelines (for individuals  $\geq 16$  years) strongly recommend a sodium intake of less than 2 g/day and consume more than 3.5 g/day of potassium to maintain a healthy blood pressure and reduce the risks of heart problems and strokes [4]. In our case, although CON samples exceeded the recommended limit for Na and obtained the lowest K amounts, our alternative salt treatments presented contents below the maximum Na intake

recommended (in particular T2 batch) and improved potassium values (especially T1 samples). Moreover, salt treatments also ameliorated the concentrations of minerals such as magnesium (T1 and T2) and calcium (T2) and, for this, their application (in particular T2) in dry-cured meat products could provide a potential supplementation in order to avoid diseases as osteoporosis and hypertension [5]. Furthermore, T2 group stood out for its mineral profile, since it also reported higher ( $P < 0.001$ ) values of P, Zn and Fe, which are other important minerals for our health.

**Table 1.** Mineral composition of dry-cured foal cecinas.

Minerals (mg/100 g)	Treatments			SEM	p-Value
	CON	T1	T2		
Ca	10.3 <sup>b</sup>	9.11 <sup>a</sup>	23.3 <sup>c</sup>	0.948	0.001
Fe	3.15 <sup>a</sup>	2.98 <sup>a</sup>	4.30 <sup>b</sup>	0.100	0.001
K	844 <sup>a</sup>	2698 <sup>c</sup>	1599 <sup>b</sup>	111.639	0.001
Mg	36.6 <sup>a</sup>	64.0 <sup>c</sup>	45.6 <sup>b</sup>	1.714	0.001
Na	2740 <sup>c</sup>	1676 <sup>b</sup>	1423 <sup>a</sup>	84.172	0.001
P	388 <sup>a</sup>	382 <sup>a</sup>	439 <sup>b</sup>	4.150	0.001
Zn	8.17 <sup>a</sup>	8.08 <sup>a</sup>	9.16 <sup>b</sup>	0.094	0.001

<sup>a-c</sup> Mean values in the same row (corresponding to the same parameter) with different letter differ significantly ( $P < 0.05$ ; Duncan test); SEM: Standard error of the mean; Sig.: Significance: \*\*\* ( $P < 0.001$ ). Treatments: CON - 100% NaCl; T1 - 100% Pansalt®; T2 - 50% NaCl and 50% Kombu seaweed.

#### IV. CONCLUSION

In conclusion, our outcomes highlighted that T1 and T2 could favor not only a diminution of sodium intake, but they could also help to meet the nutritional needs in relation to other minerals. Thus, these treatments, especially the partial salt replacement by Kombu alga, could be considered a promising approach to obtain a healthier dry-cured foal cecina.

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