

Strategies for incorporation of Quinoa (*chenopodium quinoa* Willd) in cooked meat products as a health-promoting ingredient (#65)

Juana Fernández-López¹, Raquel Lucas-González¹, Manuel Viuda-Martos¹, Estrella Sayas-Barberá¹, Alba Roldan¹, Casilda Navarro¹, Asunción Martínez-Mayoral², Jose Angel Pérez-Alvarez¹

¹ Miguel Hernández University, EPSO, Dpt.Tecnología Agroalimentaria, IPOA Research Group, Orihuela (Alicante), Spain; ² Miguel Hernández University, Centro de Investigación Operativa, Elche (Alicante), Spain

Introduction

The meat industry, unsurprisingly, wishes to change the perception of meat products as being unhealthy by developing nutritionally improved meat products. In response to this, there has been a great deal of interest worldwide in the use of active ingredients and bioactivities of compounds originally present in plants to provide health benefits in foods. In this context, quinoa (*Chenopodium quinoa* Willd) offers considerable potential for the development of healthier foods. In fact, quinoa contains high biological value proteins and bioavailable essential aminoacids, unsaturated lipids, dietary fiber, complex carbohydrates and other beneficial bioactive compounds such as polyphenolic compounds [1]. In this work, two different procedures were considered for incorporation of black quinoa in cooked meat product matrixes: as whole seed in a bologna-type sausage and as flour in a pâté-type product. The effect of this addition in the chemical and technological properties of both products was evaluated.

Methods

Black Bolivian Real quinoa was purchased from a local market. Spread pork pâté and bologna-type sausages were made following traditional formula [2]. The original mixtures were used as control samples: control pâté (CP) and control sausage (CS). A 5% of quinoa was added to control samples: as flour to the original pâté mixture (PBQF) and as whole seeds to the original sausage mixture (SBQS). Proximate composition was determined according to Official Methods [3]. Residual nitrite level (mg NaNO₂/kg sample) was determined according to standards ISO/DIS 2918.26. Lipid oxidation was assessed by the 2-thiobarbituric acid (TBA) method of Rosmini et al. [4]. The colour was studied in the CIE L*a*b* colour space using a Minolta CM-700. The emulsion stability was evaluated as the percentage of total expressible fluid (TEF) [5]. Data analysis were performed using a one-way ANOVA test and differences were considered significant at $p < 0.05$.

Results

The addition of quinoa (both, as whole seed and as flour) modified the proximate composition in both cooked meat products (Table 1) following a similar trend: decreasing moisture and fat content and increasing ash and TDF content ($P < 0.05$). TBARS values (Table 1) were lower in samples with quinoa added than in control samples which means that quinoa could have some

antioxidant properties, mainly due to the polyphenol content in black quinoa [1]. In both meat products, the only colour coordinate affected by quinoa addition was the a* coordinate that decreased when quinoa (whole seed and flour) was added. Both cooked meat products added with quinoa showed higher residual nitrite level than their respective control samples (Figure 1). This might be due to quinoa seed accumulating nitrate in their structure [6]. Table 1. Proximate composition, lipid oxidation (TBARS values expressed mgMA/kg sample), and technological properties of cooked meat products.

	Moisture	Protein	Fat	TDF	Ash
CS	58.98±0.10b	13.85±0.25a	20.14±0.28a	-	2.80±0.03b
SBQS	62.21±0.25a	13.66±0.29a	18.17±0.24b	0.88±0.01	2.97±0.01a
CP	46.69±0.02y	13.85±0.15x	33.24±0.39a	-	2.19±0.01y
PBQF	52.93±0.06x	13.34±0.49x	27.54±1.03b	0.92±0.02	2.46±0.02x
	L*	a*	b*	TEF (%)	TBARS
CS	64.10±1.72a	6.02±0.43a	10.12±0.54a	2.01±0.13a	0.44±0.02a
SBQS	64.25±1.69a	6.02±0.43a	10.22±1.16a	2.57±0.11a	0.21±0.01b
CP	59.30±1.25x	4.96±0.69b	12.81±0.43x	17.12±0.98x	0.57±0.03a
PBQF	59.55±1.15x	5.27±0.50y	11.52±0.71x	16.56±0.89x	0.49±0.02b

Results are expressed as means ± standard deviation.

a-b, x-y for each meat product and parameter, values with a different letter are significantly different ($p < 0.05$)

Conclusion

In general, the strategies used to incorporate quinoa (as whole seeds or as flour) in cooked meat products are feasible and may be a good choice for enhancing their nutritional composition and healthier properties without adversely affecting the technological properties of the final product. In addition, the use of quinoa in cooked meat products could decrease the amount of nitrites added in its formulation.

ACKNOWLEDGEMENT

This work was financially supported by the grant of Ministry of Economy, Industry and Competitiveness (MEIC-Spain) for the project: AGL2016-75687-C2-2-R (AEI/FEDER, UE).

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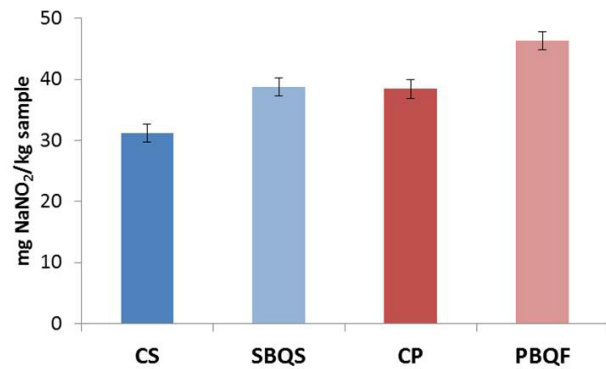


Figure 1. Residual nitrite level of cooked meat products

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Notes