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Booklets

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Title: Obtención y caracterización de hidrolizados proteicos de quinoa y amaranto por digestión in vitro

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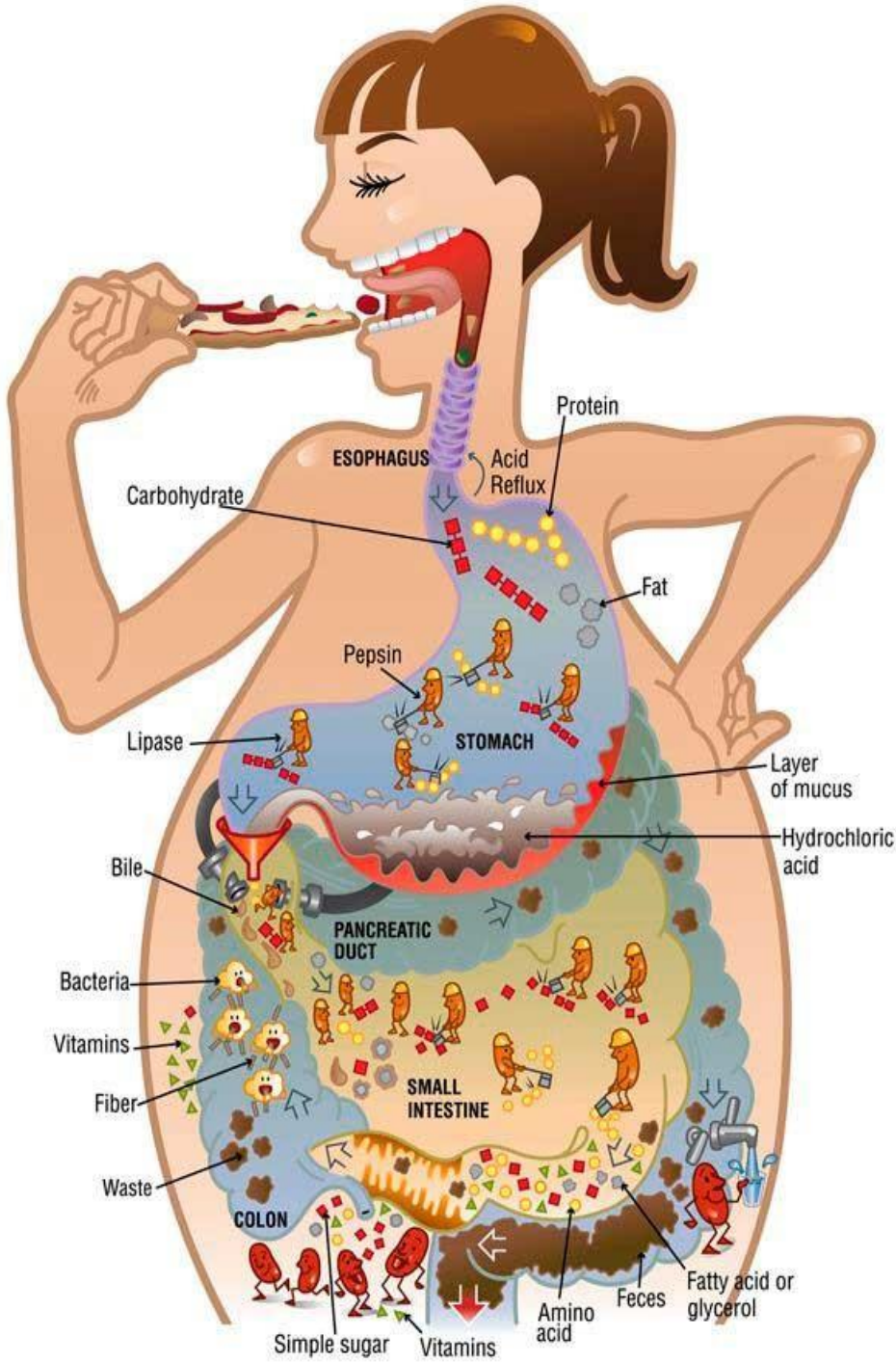
Introduction

Aminoacid mg/100g	Quínoa	**Wheat**	**Barley**	**Oats**	**Corn**	Amaranth
Isoleucine	**60**	32	32	24	32	28
Leucine	**104**	60	63	68	103	66
Lysin	**79**	15	24	35	27	58
Fenilanin	**79**	34	37	35	27	63
Tyrosin	**41**	16	17	16	14	+
Cystin	**68**	26	28	45	31	25
Methionine	**18**	10	13	14	16	+
Threonine	**40**	27	32	36	39	34
Tryptophan	**16**	6	11	10	5	11
Valine	**76**	37	46	50	49	35

Introduction



Methodology

ORAL PHASE

Solid

Quinoa and amaranth flours

Quinoa and amaranth flours

Liquid

Optional

Mix 1:1 SSF + Salivary amylase (75 U/mL) pH7

GASTRIC PHASE
Mix 1:1 SGF + papaína (2,000 U/mL) pH 3
0.17 mM Phospholipids (Non-standard condition)

Time
2 h

INTESTINAL PHASE
Mix 1:1 SIF + Enzymes pH 7

Time
2 h

Figure 1. In vitro simulator flow diagram.

Table 1. Preparation of stock solutions of simulated digestion fluids. Source: Minekus et al., 2014.

Composition	Stock concentration		SSF pH 7		SGF pH 3		SIF pH 7	
			Volume	Concentration SSF	Volume	Concentration SGF	Volume	Concentration SIF
	g L^{-1}	mol L^{-1}	Ml	mmol L^{-1}	Ml	mmol L^{-1}	Ml	mmol L^{-1}
KCl	37.3	0.5	15.1	15.1	6.9	6.9	6.8	6.8
KH_2PO_4	68	0.5	3.7	3.7	0.9	0.9	0.8	0.8
$NaHCO_3$	84	1	6.8	13.6	12.5	25	42.5	85
NaCl	117	2	-	-	11.8	47.2	9.6	38.4
$MgCl_2(H_2O)_6$	30.5	0.15	0.5	0.15	0.4	0.1	1.1	0.33
$(NH_4)_2CO_3$	48	0.5	0.06	0.06	0.5	0.5	-	-
pH adjustment								
	mol L^{-1}		Ml	mmol L^{-1}	Ml	mmol L^{-1}	Ml	mmol L^{-1}
NaOH	1		-	-	-	-	-	-
HCl	6		0.09	1.1	1.3	15.6	0.7	8.4
$CaCl_2(H_2O)_2$ not added to simulated digestion fluids								
	g L^{-1}	mol L^{-1}		mmol L^{-1}		mmol L^{-1}		mmol L^{-1}
$CaCl_2(H_2O)_2$	44.1	0.3		1.5 (0.75 *)		0.15 (0.075*)		0.6 (0.3*)

Results and discusion

Table 2. Concentration of total proteins in amaranth and quinoa flour.

	Amaranth flour		Quinoa flour	
Incubation time (h)	Total protein (mg/mL)	Soluble protein (mg/mL)	Total protein (mg/mL)	Soluble protein (mg/mL)
0	3.9 ± 0.02	0	3.6 ± 0.08	0
24	3.5 ± 0.1	0.48 ± 0.01	3.5 ± 0.1	0.21 ± 0.01
48	3.4 ± 0.04	0.44 ± 0.4	3.6 ± 0.03	0.23 ± 0.1
72	3.7 ± 0.01	0.49 ± 0.02	3.7 ± 0.01	0.25 ± 0.02

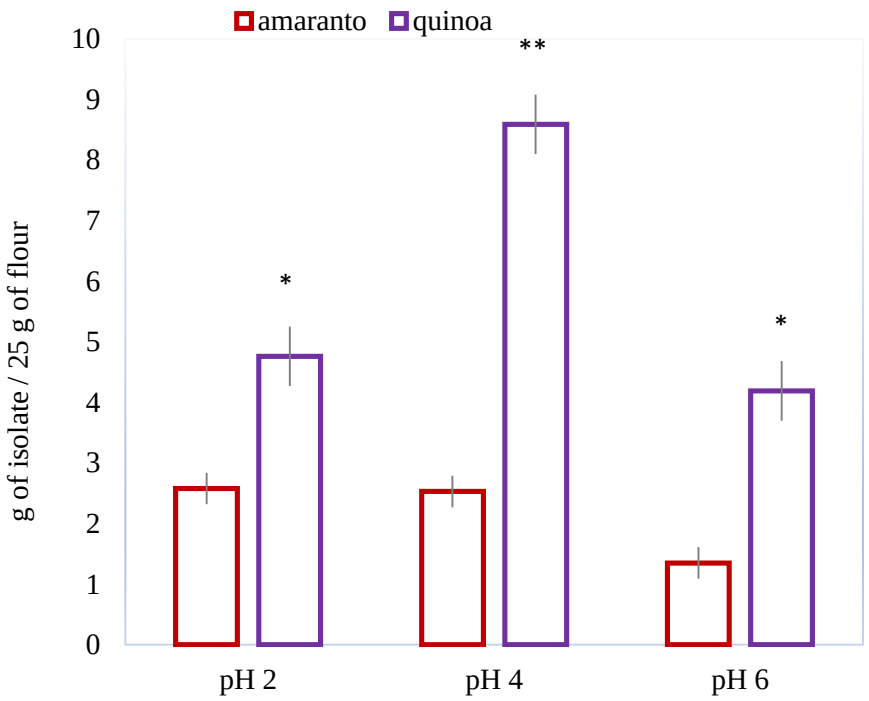


Figure 2. Average yield of the peptide isolation process at different pH values.

Results and discusion

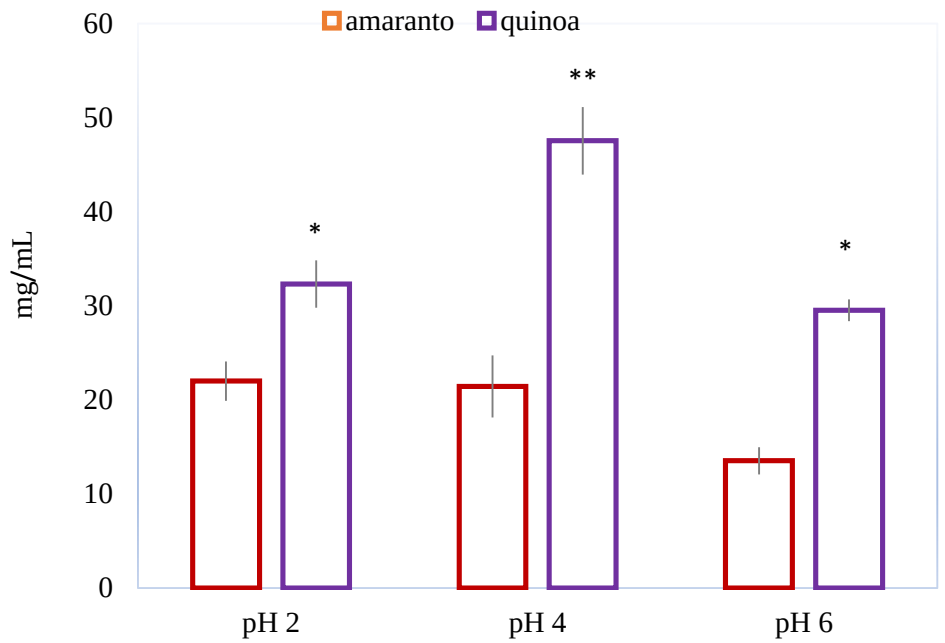


Figure 3. Protein content in isolates of quinoa and amaranth.

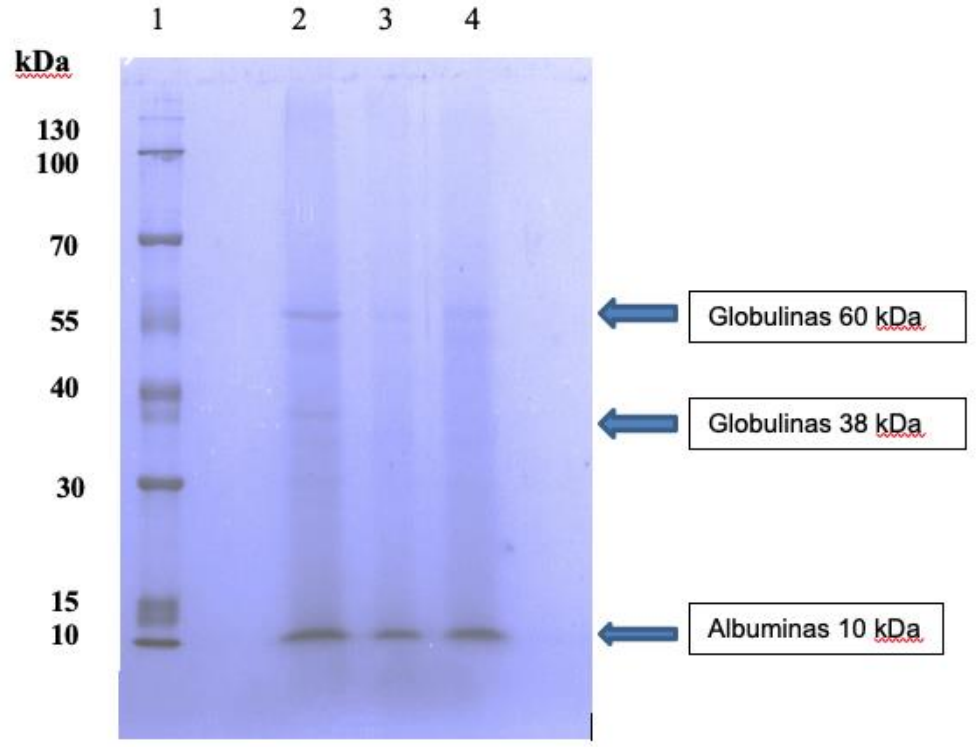


Figure 4. SDS-PAGE electrophoresis of isolate of quinoa and amaranth proteins.

Conclusions

- Quinoa protein isolates at pH 4 were the ones with the highest yield and with the highest protein content, even higher than those of amaranth in all the treatments tested.

- The quinoa and amaranth proteins obtained during gastric simulation and determined by electrophoresis were globulins and albumins, with molecular weights between 60 and 10 kDa.

- Duodenal digestion was complete for both pseudocereals, as was observed in the electrophoresis gels obtained, so we could speak of a good bioavailability of quinoa and amaranth proteins.

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