

# Effect of Roasting Method Conventional and Microwave in Colour Beans Inka Peanut (*Plukenetia Volubilis*) for the Production of Cream for Human Consumption

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**Abstract:** The study evaluates the effect of the method of roasting in color inchi seeds Sacha (*Plukenetia volubilis* L.) for the production of cream for human consumption. Analysis of chemical composition of the seed Sacha inchi (AOAC, 1998), then roasted at 120°C was performed conventional method 10, 15 and 20 minutes in microwave roasting 1.2 Kw for 4, 6 and 8 minutes, in order to evaluate the flavor (removing astringency) and grain color (sensory and instrumental method), physicochemical properties (acid value, peroxide, iodine, umedad). According to the Peruvian Technical Standard NTP (2009), the values do not exceed 1% acidity, awarded for Sacha inchi extra virgin same behavior for the peroxide index was higher for conventional roasting for roasted microwave and the iodine value decreases for both methods. It was determined time roasting 20 minutes at 120°C = 29.8 and brightness (color by colorimetry) and 8 minutes to microwave roasting (brightness = 21,85). In preparing cream for human consumption 9 mixtures were made by roasting method (conventional and microwave), adding 0.4% salt, sugar 0.5; 1.0 to 1.5%; Sacha inchi oil 0, 3 and 5%; being evaluated by ANOVA at 95% and Tukey test at 5% probability, determined, F1, F3 and F8 formulations for the toasted by the microwave method are statistically equal, but the formulation (F8 = 1% sugar, 5% oil) excels in taste, texture (FM oiliness) while creams made by conventional toasting (F1, F4 and F7) are similar statistically, excelling Formulation (F7 = 1.5% Sugar and 5% oil). Sensory evaluation of acceptance that compares creams (Cream Tan Conventional (F7), Cream Microwave Tostado (F8) and butter Mami) statistically analyzed by nonparametric Friedman test confirms the microwave toasted cream as the best for consumption human, nutritionally nutraceutical, which

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provides 31% protein, linolenic acid (43.82%), linoleic acid (38.45%) and microbiologically stable over the allowable limits by the ISO-725-2005, ISO-6888-1: 1999 / Adm.1.2003; ISO7954: 1987.

**Keywords:** Peanut Inca, toasted, Microwave, sacha inchi cream.

## **1. Introduction**

Sacha inchi is used by the Amazonian populations as highly nutritious food (Baez and Borja, 2013), almonds contain 27.4% protein, 41.7% fat (fatty acids: linolenic acid and 45.10% 36 , 80% linoleic acid) (Adriazén, et. al, 2011) and an apparent digestibility (67%) of the protein in Sacha inchi atomized powder (Obregon, 1996). Recent evidence in humans that the linolenic acid (omega 3) may prevent arrhythmias (Leaf, 2007), therefore the causation of poor nutritional habits that have led to higher risks of diseases: anemia, schizophrenia, visual acuity, obesity, malfunction of the nervous system, cardiovascular diseases; can be solved with nutrients and functions developed in this research, whose objective was to evaluate the effect of the method of toasting on the taste, color inchi seeds Sacha (*Plukenetia volubilis* L.) to develop inchi sacha cream color and consumer acceptable taste.

## **2. Materials and Methods**

Chemical composition analysis of the seed of Sacha Inchi (AOAC, 1998) was conducted from Lamas province, ecotype Apangura; then roasted at 120°C by conventional method 10, 15 and 20 minutes in microwave roasting 1.2 Kw for 4, 6 and 8 minutes, in order to evaluate the flavor (removing astringency) and grain color (instrumental and sensory methods), physicochemical properties (acid value, peroxide, iodine, humidity) and evaluate the development of the cream for human consumption (Figure 1). To quantify the acid value, peroxide value and iodine value, the oil is extracted toasted almonds in a cold hydraulic press and oil analysis for creams made by extraction in 96% alcohol and evaporated in rotavapor.

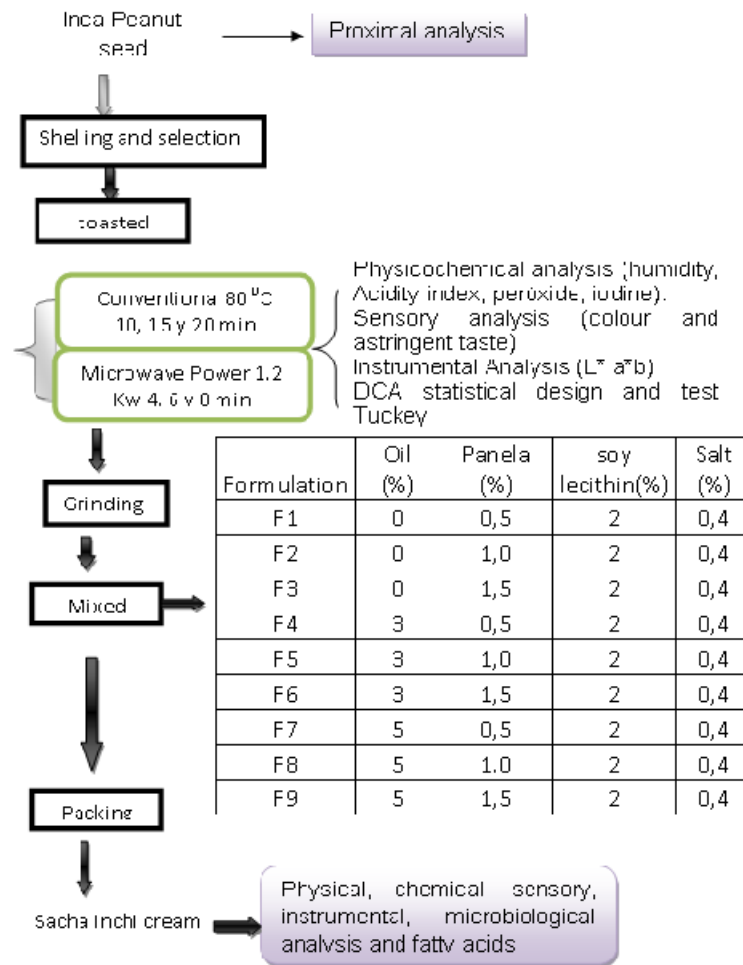


Fig. 1 Experimental flow for obtaining Inca Peanut cream

### 3. Results and Discussion

#### 3.1 Characterization Almonds Sacha Inchi

Sacha inchi almonds, presented 46.9% fat, 24.69% protein, carbohydrates 15.61%), ash 2.1% and 5.6% humidity, similar to reports of (Adriazén, et. al, 2011, Valles, 2012).

#### 3.2 Evaluation of the method of roasting almonds Sacha Inchi

Table 1 shows the amount of acid value, peroxide value, less for the microwave roasting method over the conventional method, and a similar reduction for moisture (%) and iodine value, influenced by the time roasted beans sachu inchi. According to the Peruvian Technical Standard (NTP, 2009), the values of acid treatments for each method of roasting, do not exceed 1%, indicated for Sacha inchi extra virgin, the index is higher for peroxide conventional roasting for roasted in microwave and iodine decreases for both methods, indicating minimal damage to the structure of the fatty acid chain (NTP, considered the limit of 199 gI / 100g

of fat, for cold. The color instrumental method, the brightness (L) on the inner face and outer face of Sacha inchi almonds, toasted in conventional in 20 minutes and decreases to 61.1 and 29.3 in the microwave toasted decreases in 8 minutes to 21.9 and 42.0 respectively, which shows a change in color of the beans (white cream to dark cream) by Maillard reaction with formation of Melanoidins (Sánchez, 2013). The chroma of the inside was more pronounced than the outside and these intensities depending on the tone (hab) is in the first quadrant, and the predominant color in orange roasted beans. The Tukey test at 5% probability for the attribute color and flavor is highly significant. The color for both methods is dark tan cream (it would not be favorable for the production of cream for human consumption), but in the analysis of flavor, the same samples were scored without astringency; determine what the best examples of roasting TC3 (20 min) and TM3 (8 min).

**Table 1.** Effect of roasting method in the physical and chemical properties and colour of inka peanut seeds

Method toasted	Toasting time (min)	physicochemical properties									
		Humidity(%)	Acidity index (% oleic acid )			Peroxide (meleq/..)	Iodine (g I/100 g of fat )				
Conventional T = 120 °C	10	3.02	0.32			4.83	167.93				
	15	2.22	0.36			5.49	162.51				
	20	1.15	0.46			6.29	154.37				
Microwave Power 1.2 Kw	4	2.43	0.11			3.93	177.88				
	6	1.49	0.15			4.60	172.79				
	8	1.09	0.20			5.68	163.79				
		Colour (measurement instruments)									
		external surface					internal surface				
		L*	a*	b*	C*ab	hab	L*	a*	b*	C*	hab
Conventional T=120°C	10	37,1	5,1	8,3	9,7	58,4	71,1	3,2	8,1	8,7	68,4
	15	29,5	6,4	6,7	9,3	46,3	71,1	8,8	22,2	23,9	68,4
	20	29,3	9,3	7,9	12,2	40,3	61,1	10,1	20,5	23,2	63,8
Microwave Power 1,2 Kw	4	40,0	5,3	9,6	11,9	61,1	54	3,35	11,5	11,9	73,8
	6	37,7	6,3	8,8	10,7	54,4	54,4	6,88	17,2	18,5	68,2
	8	21,9	7,5	7,1	10,3	43,4	42	7,14	15	16,7	64,5

### 3.3 Evaluation of the Inka peanut cream formulation

The cream for human consumption (Table 2) 9 mixtures were made by roasting method (conventional and microwave), adding 0.4% salt, sugar 0.5; 1.0 to 1.5%; Sacha inchi oil 0, 3 and 5%, the results evaluated by ANOVA at 95% and Tukey test at 5% probability, determined, F1, F3 and F8 formulation for toasting

microwave, statistically equal, but the formulation (F8 = 1% sugar, 5% oil) excels in taste, texture (spreadability and oiliness) while creams formulated for conventional roasting (F1, F4 and F7) are similar statistically, excelling Formulation (F7 = Sugar 1.5% to 5% oil).

**Table 2.** Chemical composition and physicochemical properties of inka peanut cream toasted conventional and microwave.

Method toasted		Cream formulation Sacha inchi								
		F1	F2	F3	F4	F5	F6	F7	F8	F9
		No oil addition			3 % oil (*)			5 % oil		
Acidity index										
Conventional		0,7cd	0,79d	0,76d	0,66bc	0,67bc	0,66b	0,617a	0,619a	0,623ab
Microwave		0,7cd	0,71d	0,68bc	0,667b	0,657b	0,608a	0,603a	0,606a	0,622ab
% Humidity										
Conventional		1,1a	1,13a	1,15a	1,22b	1,15a	1,15a	1,15a	1,17a	1,17a
Microwave		1,3c	1,26b	1,31c	1,33c	1,37c	1,371c	1,38c	1,41d	1,41d
% total solids										
Conventional		98,9	98,86	98,85	98,78	98,85	98,85	98,85	98,84	98,83
Microwave		98,8	98,63	98,74	98,69	98,67	98,62	98,62	98,59	98,59
Colour (measurement instruments)										
Conventional	L	31,2	31,4	31,16	33,12	32,33	31,75	33,40	30,24	30,73
	a	5,32	6,1	6,02	4,89	5,65	5,07	5,47	6,00	6,18
	b	3,78	4,3	4,37	3,88	4,61	4,09	4,79	5,75	5,93
	c	6,5	7,4	7,43	6,20	7,20	7,02	7,3	8,30	8,6
	h	35,4	35,2	35,5	38,4	39,2	38,90	41,2	43,70	43,8
Microwave	L	22,15	22,26	22,09	21,41	22,74	23,12	23,89	23,80	23,56
	a	6,93	6,28	6,18	5,25	7,25	6,78	4,96	4,73	5,06
	b	5,64	5,32	6,18	4,97	6,47	5,71	5,82	5,55	5,89
	c	8,90	8,20	8,70	7,20	9,70	8,90	7,60	7,30	7,80
	h	39,10	40,30	45,00	40,40	41,70	40,10	49,60	49,50	49,30

### 3.4 Evaluation chemical an fatty acids inka peanut cream toasted conventional and microwave

In Table 3, the protein content excels in the microwave toasted cream (31%), beating the spreadable cream peanut (*Juglans regia* L.) having protein (14.5%), fat (65.7% ) with 2% oil (Millan, 2007). The slight increase of peroxide would be associated with the inclusion of oxygen during the mixing cream; Reyes Ulloa (2003) reported in peanut butter, a peroxide 5.0 meq.O<sub>2</sub> / kg, roasted at 150°C and 9 minutes. The quantification of essential fatty acids Sacha inchi cream for human consumption, are similar to extra virgin sachu inchi (NTP, 2009) oil, which shows that the method of roasting, do not affect its composition.

Proof of acceptance at the consumer level the Sacha inchi cream can compete in the market in similar responses with peanut butter, cream and toasted confirms microwave as the best for human consumption, nutritionally nutraceutical, which provides 31% protein, linolenic acid (43.82%), linoleic acid (38.45%) and

microbiologically stable over the allowable limits by the ISO-725-2005, ISO-6888-1 : 1999 / Adm.1.2003; ISO7954: 1987.

**Table 3.** Proximate composition (g / 100 g) and fatty acids inka peanut cream toasted conventional and microwave.

Components (%)	Cream toasted Conventional	Cream toasted Microwave
Humidity	1,00	1,50
Protein	26,50	31,00
fat	53,50	50,00
carbohydrates	17,00	16,50
Fiber	0,50	0,50
Ash	2,50	2,00
Energy (Kcal/100g)	655,5	640,00
Acid index (Meq O <sub>2</sub> /Kg)	6,54	5,69
Iodine ( g I <sub>2</sub> / 100g)	136,34	140,03
Linolenic acid	43,76	43,82
linoleic acid	38,28	38,45
oleic acid	9,67	0,0

## 4. Conclusions

- ⚙ Sacha inchi almonds toasted Microwave for 8 minutes conventional roasting for 20 min at 120 C, presented taste (astringency) and color hue of orange cream to dark.
- ⚙ The best technology option for a fresh cheese was the ratio 70:30 v / v (cow's milk and sachá inchi suspension) at 0.15M calcium sulphate and citric acid 50% w / v.
- ⚙ The nutritional value of cheese (30% suspension mixture of sachá inchi) is 50.98% moisture,
- ⚙ The cream formulation F7 (1.5% sugar, 0.4% salt, 5% oil and 2% soya lecithin) for conventional roasting and F8 cream (1% sugar, 0.4 and 5% salt oil) for toasting microwave, presented better textural characteristics (FM acetosidad) and cream (instrumental measurement) with brightness values (L = 31.21 and 22.15) respectively.
- ⚙ The nutritional value of cream Sachá Inchi provides protein for human consumption (31% roasting in microwave and conventional 26.5% toasted) plus omegas 3 and 6; therefore a functional and nutraceutical
- ⚙ Acceptance testing indicates that Sachá inchi cream obtained by roasting oven excels compared with peanut butter cream and roasted by conventional method.

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