Improvement process and treatment for fruit and vegetable products

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STATE OF ART

During the last years, the demands for more convenient and varied food products have grown exponentially, together with the need for faster production rates, improved quality and extension in shelf life. These requests together with the severity of the traditional food processing represent driving forces for improvements in existing technologies (i.e. conventional heat treatment and aseptic processing) for the development of new food preservation technologies. Conventional heating is one of the most important technologies employed for producing processed food, which are stable for a long time at room temperature as well the aseptic processing which has widely used in food industry for the pasteurization and sterilization of liquid food such as milk and fruit juices (Ito *et al.*, 2014; Pataro *et al.*, 2011).
Anyway, the conventional heat treatments like sterilization/pasteurization guarantee an efficient reduction of microorganisms, but, at the same time a significant reduction of thermolabile compounds and negatively affect food sensory, physico-chemical, and nutritional properties occurred (Morales - de la Peña *et al.*, 2019).
The new technological approaches for food preservation are serious candidates to replace the traditional well-established preservation processes like ohmic heating as novel thermal and high-pressure processing as non-thermal treatment (Pereira & Vicente, 2010).

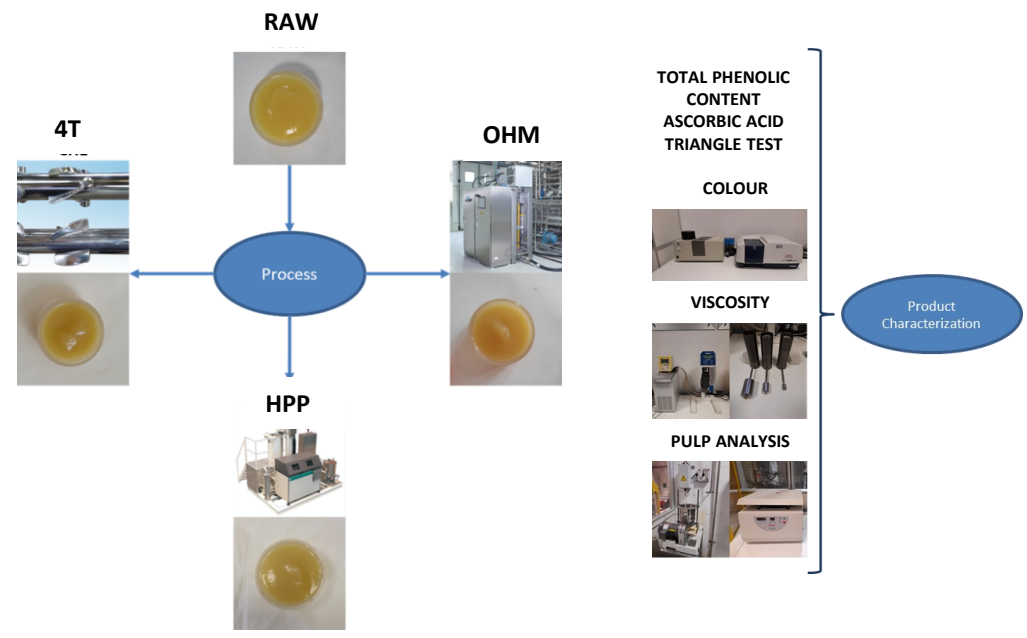
Objectives/Milestones

MS1: Defining products of interest: we identified 3 products as reference of the whole PhD thesis that represented the main milestones as described below: Apple Puree (MS 2): high viscosity product; Orange Juice (MS 3): low viscosity product; Peach Dices in Syrup (MS 4): particulate food; Thesis preparation (MS 5)

MS 2: Apple puree characterization and treatment

1. Approaching to stabilization treatments (conventional heat exchanger (4T), ohmic heater (OHM) and hydrostatic pressure process (HPP): optimization of process parameter with due attention at microbiological safety in according to refrigerated/non-refrigerated storage; setting and control of the production plant.
2. Experimental treatment of selected products by means of industrial plant: JBT Sterideal® QT (CHE); JBT Sterideal ® Ohmic (OHM) and JBT/AVURE 35 L unit (HPP)
3. Evaluation of quality parameters: evaluation of the quality traits of treated products with particular reference to physical (viscosity/texture, pH, °Bx, color), chemical (total antioxidant capacity, molecules with nutritional relevance) and sensorial (trained/untrained panel) analyses.

Abstract: Apple Puree MS 2



Results

	K (Pa)	n	Bostwick (cm)	A_{420}	σ (Sm^{-1})
RAW	13.32 (2.01) a	0.298 (0.02) b	5.83 (0.29) c	0.144 (0.021) b	0.161 (0.022) c
4 T	10.58 (1.76) c	0.329 (0.02) a	6.93 (0.12) b	0.164 (0.015) a	0.186 (0.020) a
Ohmic	13.02 (0.32) a	0.306 (0.01) b	7.67 (0.58) a	0.149 (0.020) b	0.177 (0.018) b
HPP	12.32 (0.88) b	0.314 (0.01) ab	6.67 (0.28) b	0.148 (0.013) b	0.168 (0.011) c

a, b, c Same letters within each column do not significantly differ ($n = 3$; $p < 0.05$); standard deviation given in parenthesis

This is the first-time study dealing with the quality traits of apple puree treated using industrial-scale equipment; with conventional, ohmic heating and high-pressure processing, comparatively. It was evidenced that, firstly the OHM and HPP treatments showed the higher preservation of quality traits of the apple puree compared to conventional thermal treatment.

WORK PLAN: Gantt chart

Milestones	MS 1						MS 2									MS 3									MS 4									MS5	
Activity / Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1. Collection of scientific literature																																				
2. Defining products of interest																																				
3. Approaching to stabilisation treatments of selected products																																				
4. Experimental treatment of selected products by means of industrial plant																																				
5. Approaching to Quality Parameters																																				
6. Thesis and Paper Preparation																																				

Activity: 1 published paper Rinaldi M, Langialonga P, Dhenge R, Aldini A, Chiavaro E (2021). Quality traits of apple puree treated with conventional, ohmic heating and high-pressure processing. *European Food Research and Technology.* 247, 1679–1688;
1 submitted paper;
1 accepted poster to an International (4th Food Structure and Functionality Symposium-19-20 October 2021).

References

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Morales de la Peña M, Welti-Chanes J, Martin-Belloso O (2019). Novel technologies to improve food safety and quality. *Current Opinion in Food Science* Volume 30 (1-7)
Pataro G, Donsì G, Ferraro G (2011). Aseptic processing of apricots in syrup by means of a continuous pilot scale ohmic unit. *LWT-Food Science and Technology* Volume 44 (1546-1554)
Pereira R N, Vicente A A. (2010) Environmental impact of novel thermal and non-thermal technologies in food processing. *Food Research International* Volume 43 (1936-1943)