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# Effect of phenolics concentration on apple juices and French ciders colors

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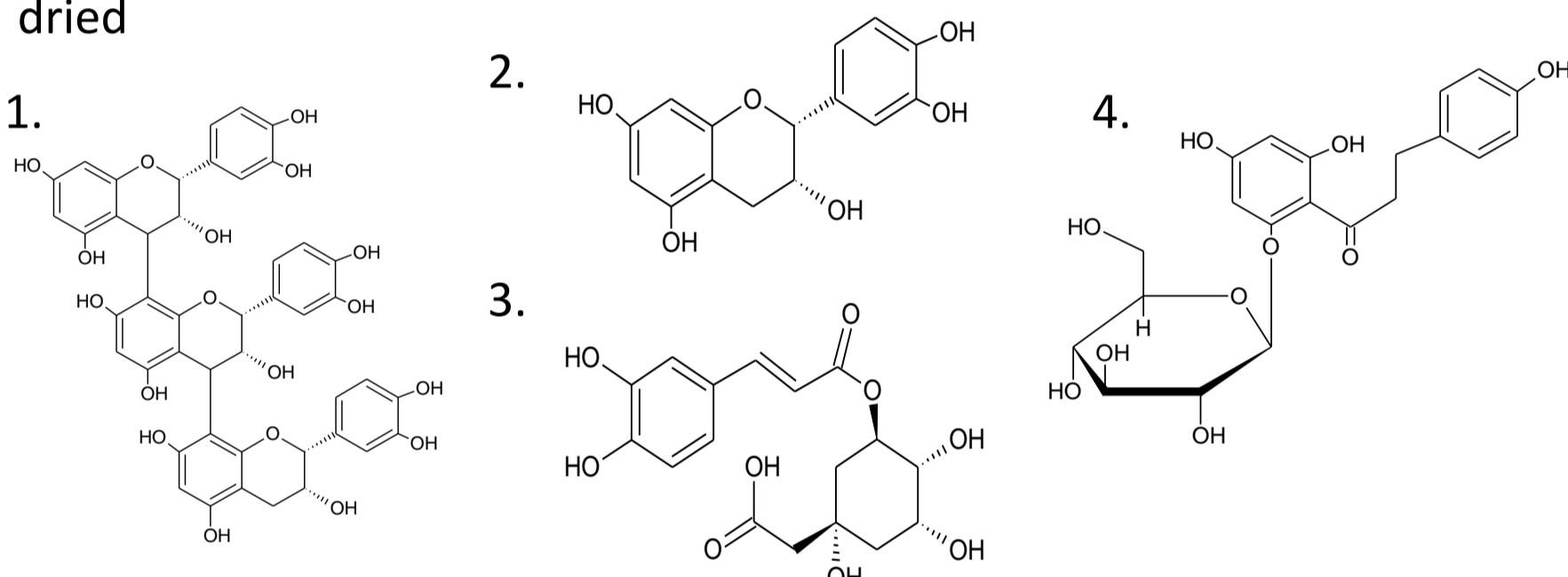
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## INTRODUCTION

The color of apple juices and ciders is an important criterion that may influence choice and acceptance of the consumers. This color is the result of polyphenol oxidation that occurs during fruit processing. It is catalyzed by polyphenoloxidase (PPO) in the presence of oxygen mainly during the crushing and the pressing of the raw material. Interestingly, apple varieties show a great diversity regarding their polyphenol profiles<sup>1</sup>. In this context, the purpose of the study was to investigate the impact of different proportions and concentrations of the major classes of polyphenols of apple juices in the formation of the colored and non-colored oxidation products. This investigation will help the producers to control and predict the color of the final product (apple juice or cider) depending on the composition of the raw material they used for juice and cider making. Regarding literature data, the main hypotheses were: 1) the color will decrease with the increase of procyanidins concentration, and 2) the color will increase with the increase of chlorogenic acid, epicatechin and phloridzin concentrations<sup>2,3</sup>.

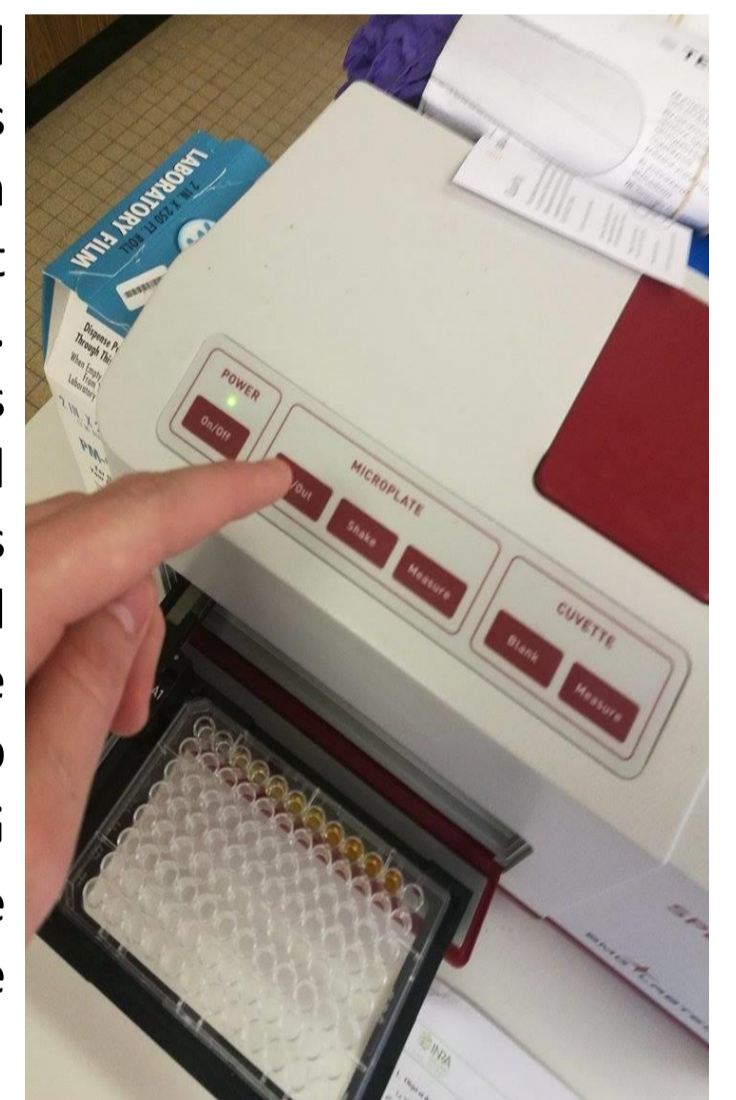
## MATERIALS

- A variety of model solutions with polyphenols made of 4 mother solutions (1. procyanidins, 2. chlorogenic acid, 3. epicatechins and 4. phloridzin).
- Malate buffer : 402 mg of malic acid per 100 ml ultra-pure water
- PPO solution: 275  $\mu$ l of crude extract per 5 ml of buffer (without O<sub>2</sub>)
- NaF (inhibitor of PPO solution): 1 g/L; 200  $\mu$ l-1 ml per tube, freeze-dried



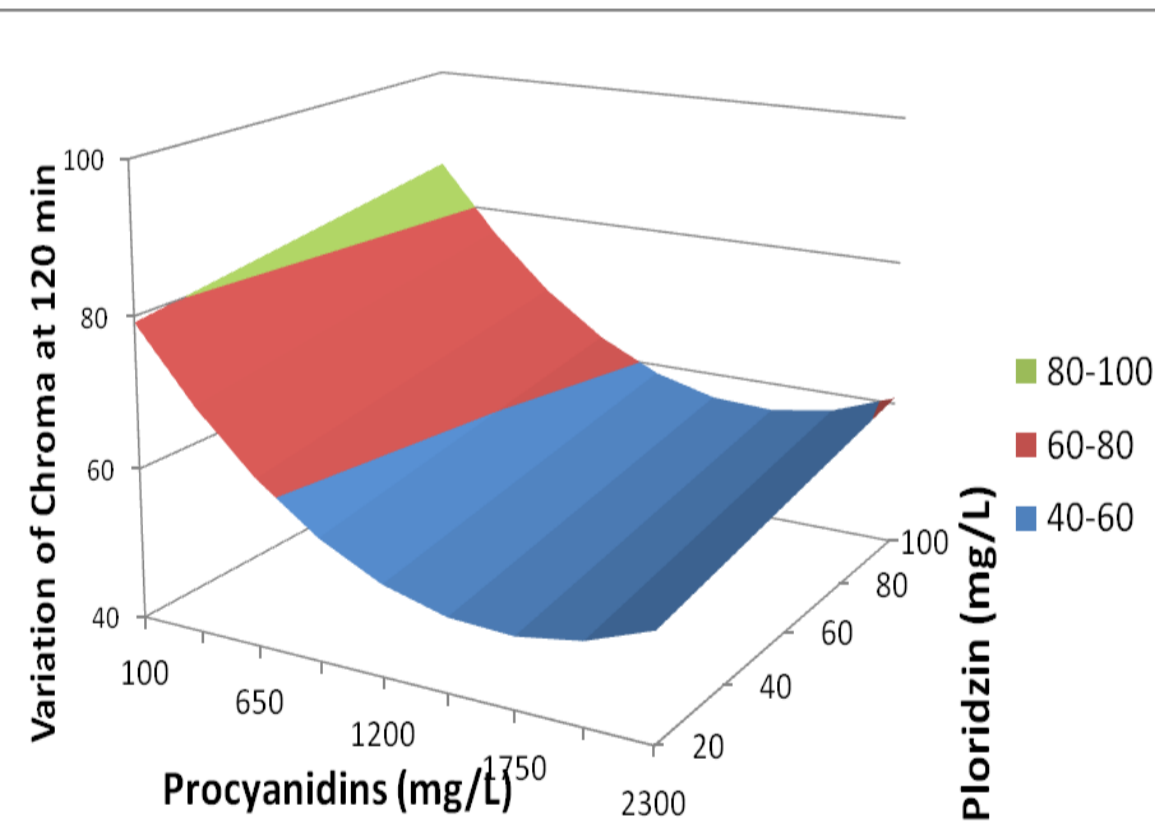
## METHOD

Research were carried out using Central Composite Design method which the first stage were Factorial Design, with considering 4 factors (procyanidins, chlorogenic acid, epicatechins and phloridzin). Each factor was coded in five levels (-2, -1, 0, 1, 2) of concentrations that were chosen to cover the range of French cider apple varieties. Finally, 36 model solutions were prepared and the incubation was started by incorporating a crude concentrated PPO extract obtained from a cider apple variety (i.e. *Kermerrien*). Three incubation times were chosen (0, 10, 120 min.) stopped with NaF solution. At the end of each incubation time, aliquots were withdrawn and filtered. The color of the solutions was characterized by measuring the CIE L a b parameters with a spectrophotometer (SPECTROstar Nano, BMG Labtech, Ortenberg, Germany - photo on the right). Data were processed by "Statgraphic" software. Results have shown the correlation between factors and colour parameters.

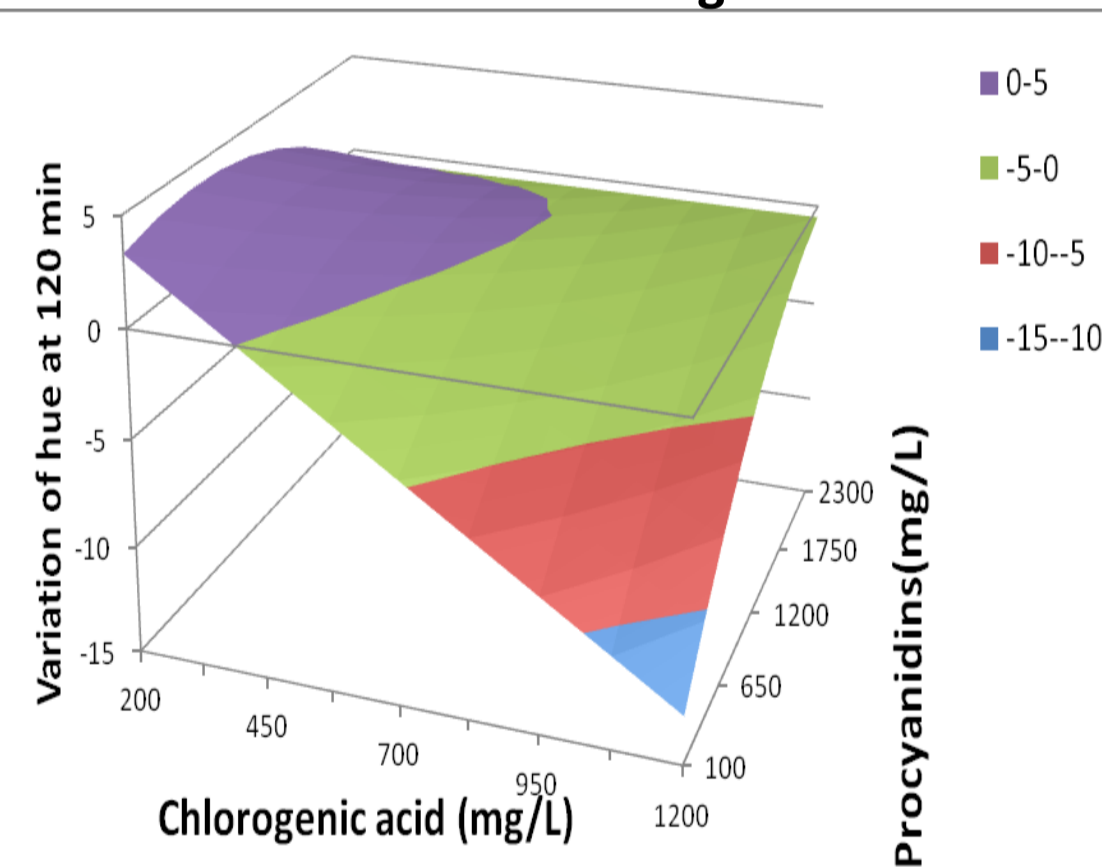


## RESULTS AND DISCUSSION

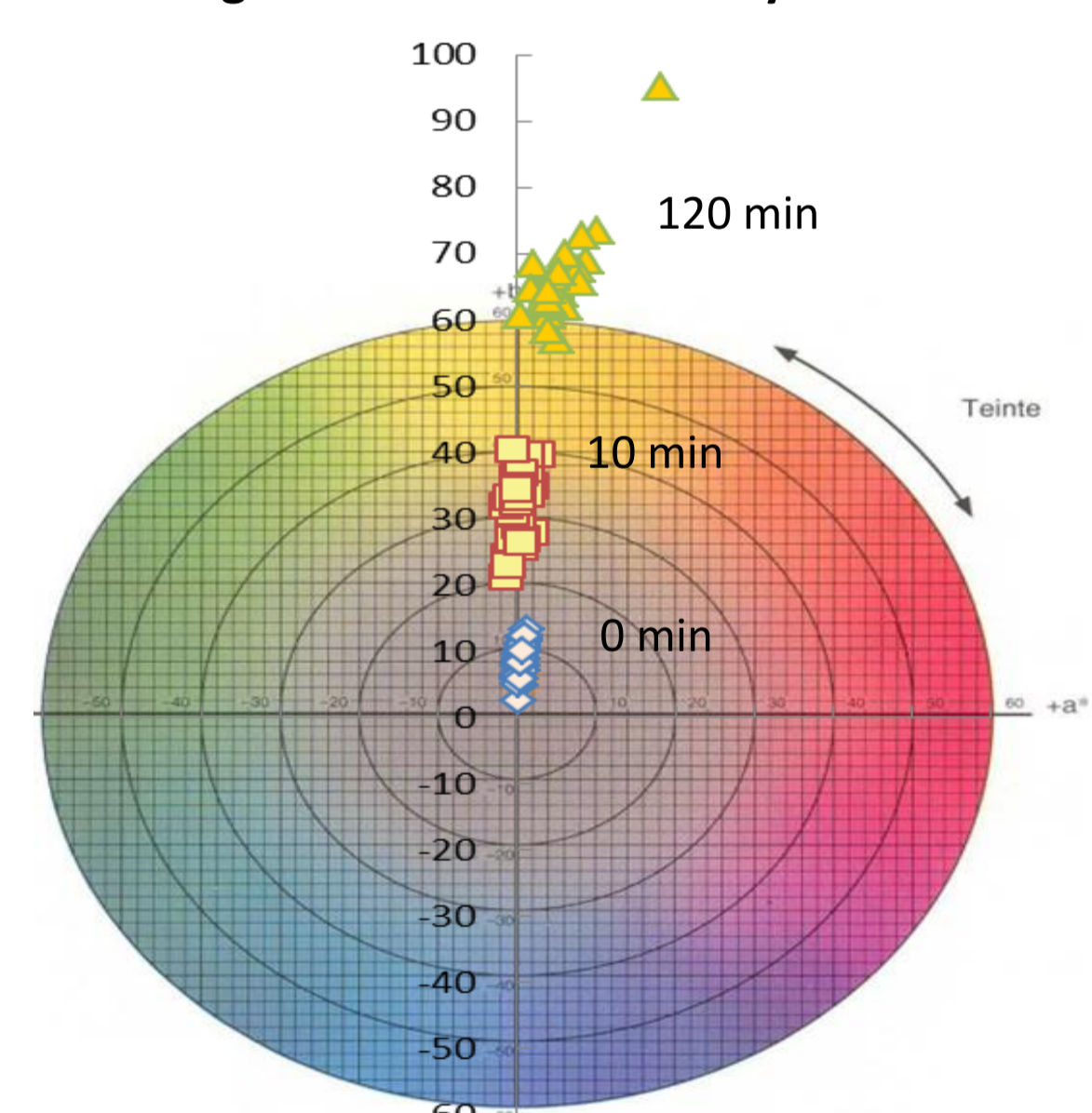
Variation of Chroma



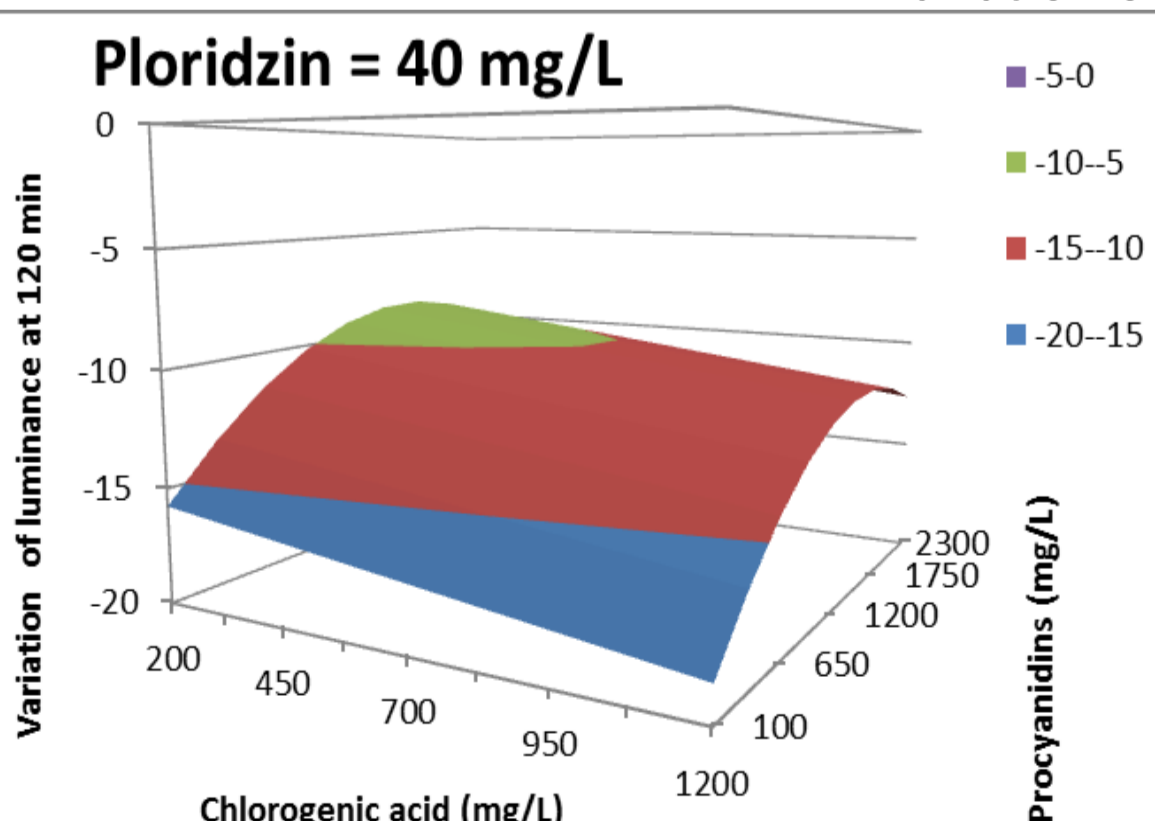
Variation of Hue angle



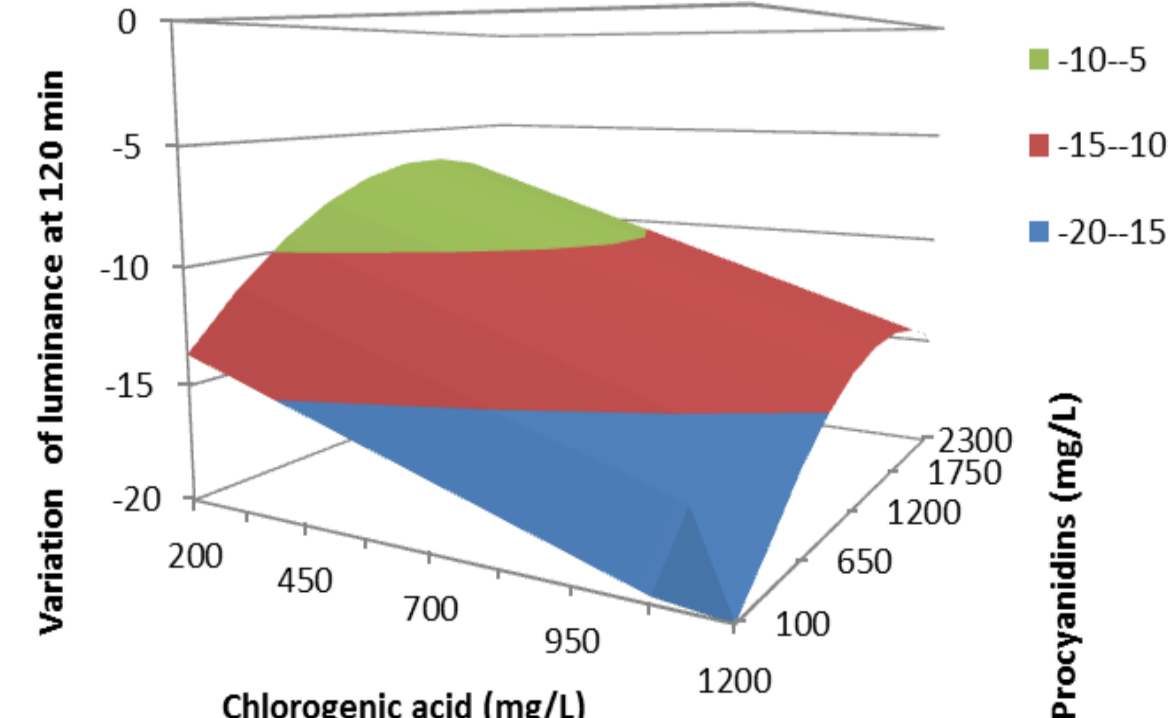
Change of the colour intensity in time



Variation of Luminance



Phloridzin = 40 mg/L



Phloridzin = 80 mg/L

## Conclusions

- Epicatechin had no marked effect on the formation of the color;
- Procyanidins have the highest **negative impact** on each of the parameters (C,L,h) and appeared to be the main inhibitors of the color formation;
- Phloridzin **is important for creation** of the color and shows an interaction with chlorogenic acid.
- The intensity of the colour is increasing with the time

## ACKNOWLEDGEMENT

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## BIBLIOGRAPHY

- Sylvain Guyot, Nathalie Marnet, Philippe Sanoner, Jean-Francois Drilleau. Variability of the Polyphenolic Composition of Cider Apple (*Malus domestica*) Fruits and Juices. *J. Agric. Food Chem.*, 2003, 51 (21), pp 6240–6247
- Erell Le Deun, Remmett Van der Werf, Gildas Le Bail, Jean-Michel Le Quéré, Sylvain Guyot. HPLC-DAD-MS Profiling of Polyphenols Responsible for the Yellow-Orange Color in Apple Juices of Different French Cider Apple Varieties. *J. Agric. Food Chem.* 2015, 63, 7675–7684.
- Carine Le Bourvellec, Jean-Michel Le Queäreä , Philippe Sanoner, Jean-Franc, Ois Drilleau, Sylvain Guyot. Inhibition of Apple Polyphenol Oxidase Activity by Procyanidins and Polyphenol Oxidation Products. *J. Agric. Food Chem.* 2004, 52, 122–130.
- Monika Kosmala, Krzysztof Kołodziejczyk. Procyanidyny najpopularniejszych w polsce deserowych odmian jabłek. *Żywność. Nauka. Technologia. Jakość.* 2006, 2 (47) Supl., 124 – 134 (in Polish)