

Polyphenols and anthocyanins in the juice from strawberries harvested at two stages of ripeness after High Intensity Pulsed Electric Field (HIPEF) treatment

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INTRODUCTION & AIM

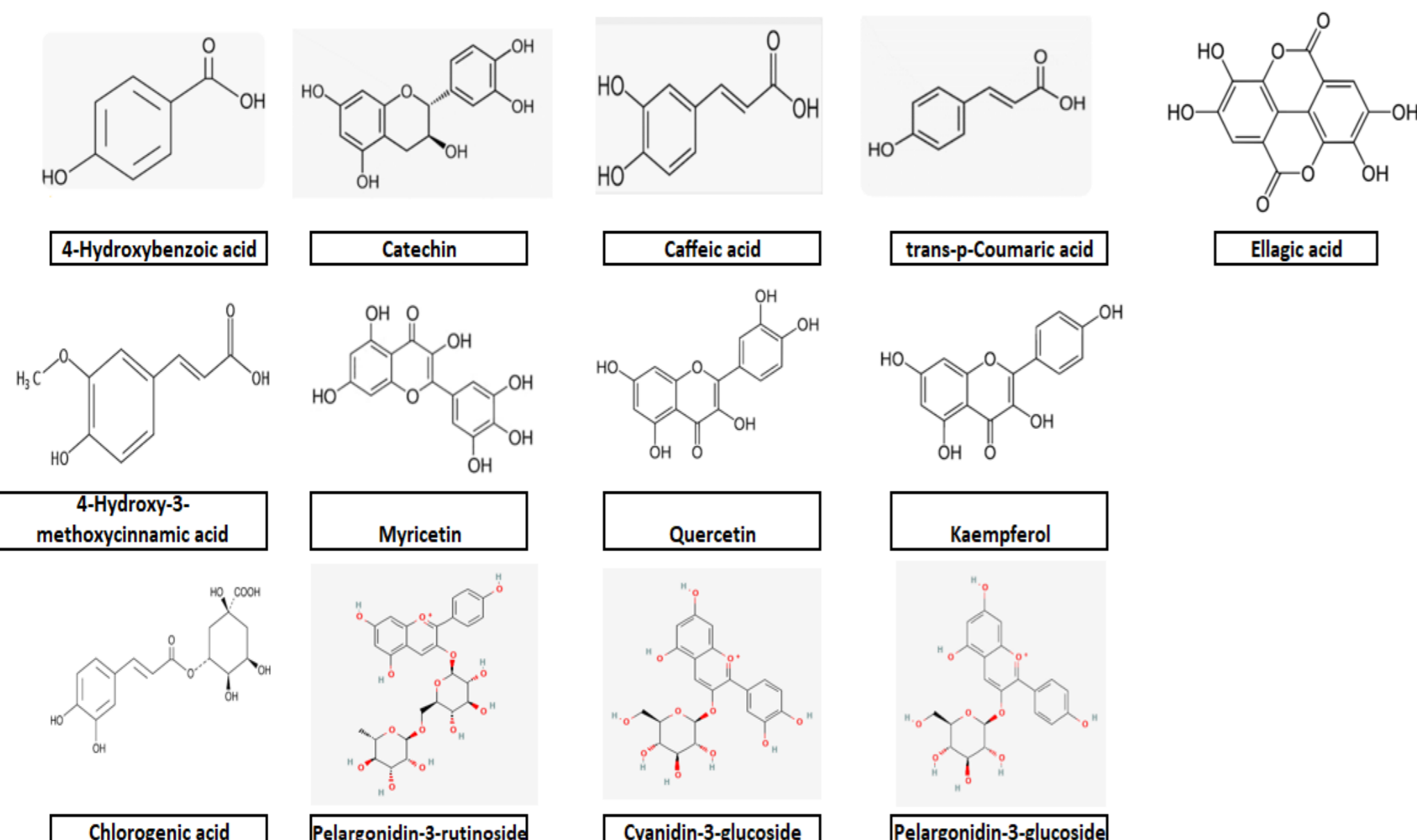
Looking for minimally processed products, and at the same time nutritional and safe, innovative technologies are needed. PEF is considered an innovative technology that preserves the quality characteristics of food at lower temperatures as an alternative to thermal processing while maintaining food quality and safety. A pulsed electric field (PEF) is a technology in which direct current and high-voltage pulses are passed through a material placed between two electrodes over very short periods of time.

This technology improves the extraction rates of the antioxidant bioactive substances in the juices and thus influences their biological value. HIPEF accelerates diffusion processes due to the cell membrane electroporation and electroperrmeabilization, saving valuable time in production processes while ensuring high product quality. The aim of this study was to analyze the effects of treatment of strawberry juice with

HIPEF on the content of selected bioactive substances (e.g. phenolic compounds). For this purpose, strawberry juices obtained from strawberries at two different stages of ripeness were treated with HIPEF at 40 and 50 kV cm⁻¹, frequencies 100 and 200 Hz for 3 and 6 minutes.



METHOD



RESULTS & DISCUSSION

MATURITY: The greatest influence of maturity is visible in the concentration of the pelargonidin-3-glucoside (412 mg L⁻¹ in J2 vs. 112 mg L⁻¹ in J1). Concentration of polyphenols caffeic acid (2.9 mg L⁻¹ in J1 vs. 8.4 mg L⁻¹ in J2) and ellagic acid (2.0 mg L⁻¹ in J1 vs. 5.7 mg L⁻¹ in J2) were also higher in juices obtained from strawberries of higher maturity. Myricetin was found only in juices obtained from strawberries of higher maturity as well as anthocyanin pelargonidin-3-rutinoside.

POLYPHENOLS: The catechin concentration increased by HIPEF treatment in juice sample obtained from strawberries of higher maturity (J1), while the concentration in juice sample obtained from strawberries of lower maturity (J2) did not change significantly. The highest catechin concentration in juices from less ripe fruit was found in sample 7, where the concentration was 164 % higher than in the untreated sample. The concentration of ellagic acid in sample J1 shows an increasing tendency, while in sample J2 it reaches the highest value at a HIPEF treatment of 50 kV/100 Hz/3 min and then decreases due to the application of a higher HIPEF strength and/or longer application time. Caffeic acid shows a similar behavior. With increasing frequency and/or a longer application time, the concentration of caffeic acid in the sample decreases. Myricetin was identified and quantified in the untreated sample J2 (sample 10), and its concentration did not change significantly with HIPEF treatment.

ANTHOCYANINS: The concentration of pelargonidin-3-glucoside shows an increasing trend. A slight decrease in the concentration of pelargonidin-3-glucoside in certain samples is probably due to the duration of longer (6 minutes vs 3 minutes) application of the electric field strength. In sample number 18, the conditions of HIPEF treatment are at the maximum values (200 kV, 50 Hz for 6 seconds) and the concentration of pelargonidin-3-rutinoside was undetectable, i.e. lower than the limit of quantification.

CONCLUSION

The content of polyphenols and anthocyanins is higher in juices from fruits with a higher degree of ripeness. When the HIPEF was applied to the fruit juices, the sample from 75 % strawberry ripeness was enriched with polyphenols and anthocyanins. The influence of HIPEF on the composition of the polyphenols depends on the conditions under which the HIPEF experiment is carried out. If the size and the number of pores overcome total membrane surface, breakdown of the cell occurs which results in decreasing extraction yield of polyphenols and anthocyanins.

FUTURE WORK / REFERENCES

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