SUT
SEATUC2023 | The 17th South East Asian Technical University Consortium
"Empowering Communities through Innovative Engineering, Science and Technology"

VERIFICATION OF REDOX PROPERTIES OF POLYPHENOLS

Chie Hirahata[(1)], Daichi Shinmura[(2)], Taiki Fushimi[(1)], Yasuyuki Fujii[(3)], Naomi Osakabe[(2)]
[(1)]Graduate School of Engineering and Science, Shibaura Institute of Technology, Japan,
[(2)]Department of Engineering and Science, Shibaura Institute of Technology, Japan, [(3)]Shibaura Institute of Technology, Japan

Background

More than 8,000 polyphenols as secondary metabolites in plants have been reported. Their activities are suggested to be different, because of variations in their molecular weight and/or steric structure. It was well investigated the antioxidant action of polyphenols, while the relationship between the chemical structure are still unknown. In this study, we compared the redox properties of polyphenols by using chemiluminescence method and the Folin-Ciocalteu method.

Materials and methods

[test reagents]

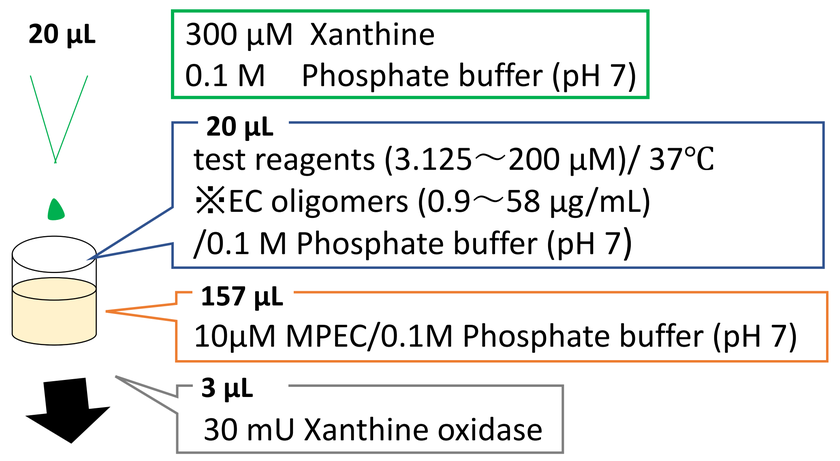
- Epicatechin (EC)
- Procyanidin B2 (B2; dimer of EC)
- Procyanidin C1 (C1;trimer of EC)
- Cinnamtannin A2 (A2; tetramer of EC)
- Epigallocatechin (EGC)
- Epicatechin gallate (ECG)
- Epigallocatechin gallate (EGCG)
- Quercetin

[Folin-Ciocalteu method]

Redox reagent: Folin-Ciocalteu reagent
→forming blue complexes with polyphenols
These blue complexes are measured spectroscopically at 765 nm.

[chemiluminescence method]

Chemiluminescence:
2-methyl-6-p-methoxyphenylethynyl-imidazopyrazinone (MPEC)
→for superoxide radical ($O_2^{-\cdot}$)detection
Measuring instrument:
2030 ARVO X4 multi-label reader (PerkinElmer, Inc)

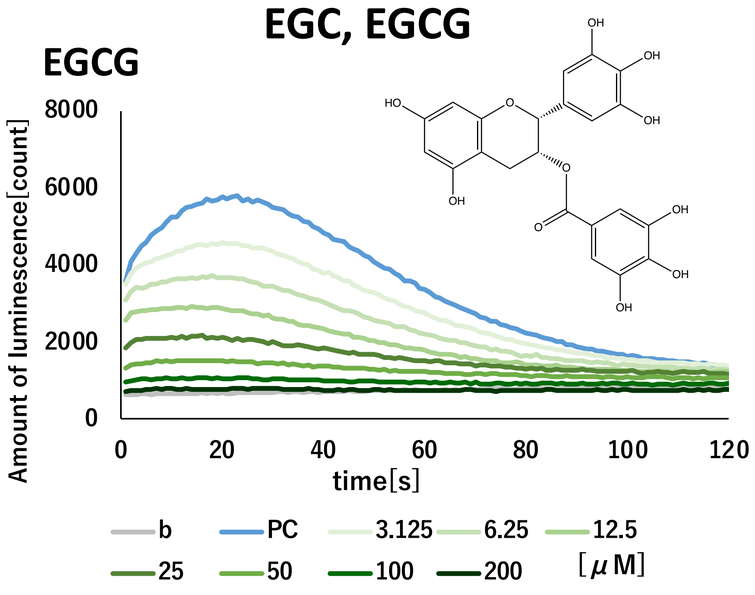


Result

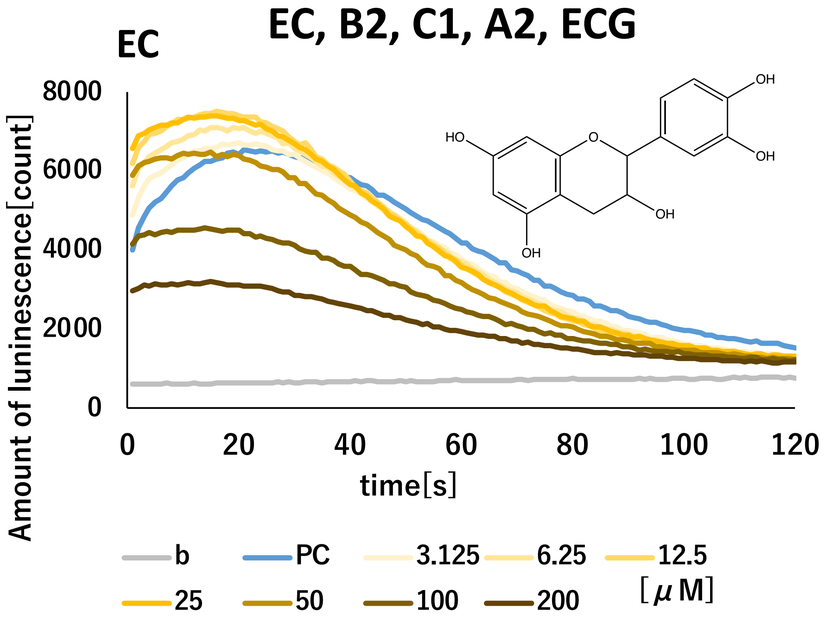
[chemiluminescence method]

In this study, the test reagents measured could be classified into three groups: ① those only showing antioxidant activity, ② those showing both prooxidant and antioxidant activity, and ③ those showing antioxidant activity and decreased reaction rate.

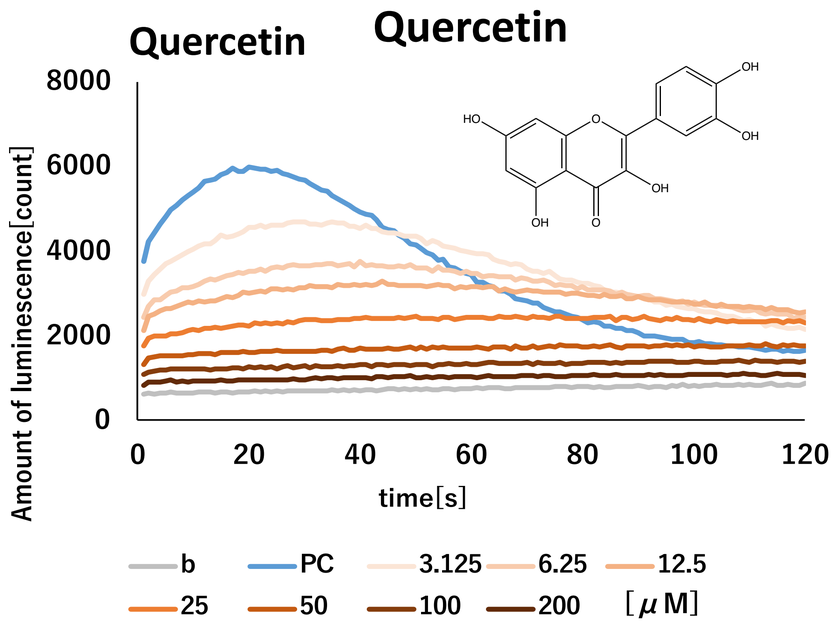
① antioxidant



② prooxidant and antioxidant

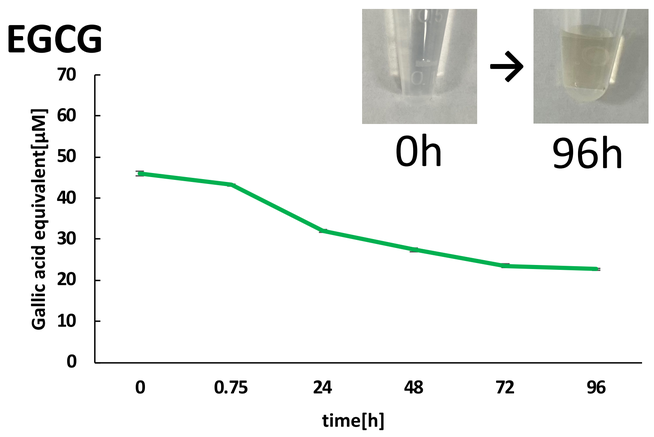


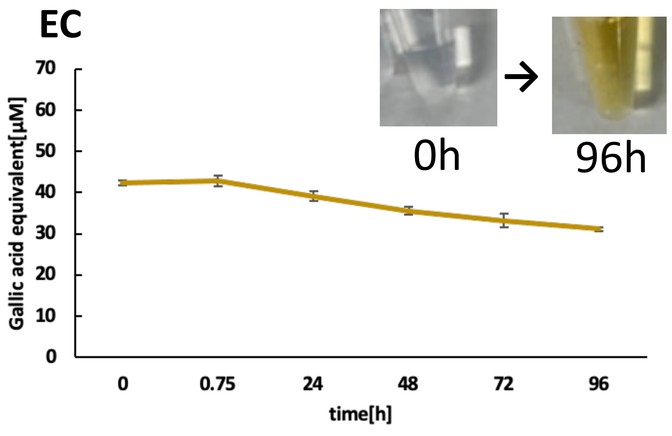
③ antioxidant and decreased reaction rate

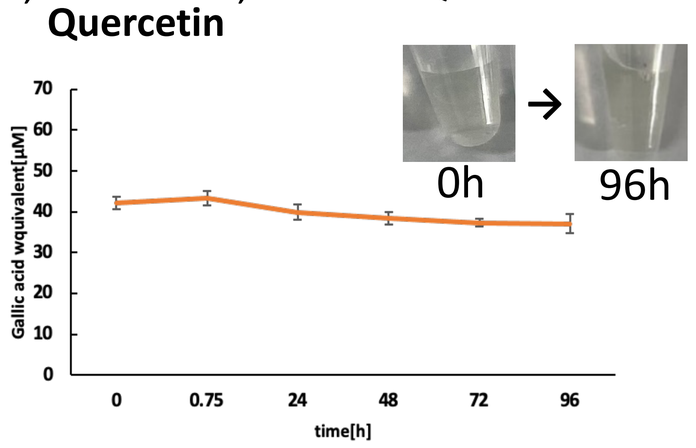


[Folin-Ciocalteu method]

In addition, we determined their concentration during incubation in phosphate buffer (pH7) by using the Folin-Ciocalteu method. A significant decrease of the concentration was observed for EC and its oligomers, EGC, ECG, and EGCG, but not Quercetin.







Conclusion

These results suggest that the redox properties of polyphenols on $O_2^{-\cdot}$ scavenging and/or productions and their stability are different depending on chemical structure such as basic skeleton and the number and position of hydroxy groups.

Contact

Chie Hirahata
Graduate School of Engineering and Science,
Shibaura Institute of Technology, Japan
e-mail: mf22107@shibaura-it.ac.jp