**Nonlinear microscopy and time resolved fluorescence spectroscopy of *Chelidonium majus* L.**

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Greater celandine (*Chelidonium majus* L.) is a well known healing plant. It has segmented laticifers filled with yellowish - brown content that is rich in biologically active substances (alkaloids, flavonoids and phenolic acids)[1,2]. The concentration of these components can change significantly, depending on the time of year, from flowering period in spring to the fruit - bearing time in autumn [3]. Flavonoids (plant pigments) are responsible for the yellow color of the greater celandine flower [4]. The antioxidant activity was also correlated with the concentration of total phenolics (including flavonoids), which is the highest in the spring months [4].

This study presents the analysis of the physical phenomena diagnosed in Chelidonium majus components. Time resolved optical characteristics were analyzed by using TRLS (Time Resolved Laser Spectroscopy) experimental setup. Nonlinear optical properties of the plant have been studied using two-photon excited autofluorescence (TPEF), second - harmonic generation (SHG) and upconversion luminescence (UCL) simultaneously. The benefits of using UCL for biological applications are in reducing the photobleaching and providing photostability. Upconversion emission is also more efficient than the TPEF and SHG. Moreover, UCL could be achieved with a low power continuous wave (CW) laser.

REFERENCES

[1] K. Seidler-Łożykowska, B. Kędzia, J. Bocianowski, A. Gryszczyńska, Z. Łowicki,

 B. Opala, A. Pietrowiak, Acta Sci. Pol. Hortorum Cultus,15(4), 161 (2016).

[2] V.N. Deulenko, R.Y. Marunych, V.O. Chernyshenko, A.V. Rebriev, E.V. Lugovskoy, L.V. Garmanchuk and O.V. Pavliuk, Biochem Anal Biochem 7(4), 1000370 (2018).

[3] D.Z. Jakovljevic, M.S. Stankovic, M.D. Topuzovic, EXCLI Journal 12, 260 (2013).

[4] P. C. H. Hollman, [Pharmaceutical Biology](https://www.tandfonline.com/toc/iphb20/current) 42, 74 (2004).