

# Free Radical Scavengers from *Cymbopogon citratus* (DC.) Stapf Plants Cultivated in Bioreactors by the Temporary Immersion (TIS) Principle

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The biomass production of *Cymbopogon citratus* shoots cultivated in bioreactors according to the temporary immersion (TIS) principle was assessed under different growth conditions. The effect of gassing with CO<sub>2</sub>-enriched air, reduced immersion frequency, vessel size and culture time on total phenolic and flavonoid content and free radical scavenging effect of the methanolic extracts was measured. From the TIS-culture of *C. citratus*, seven compounds were isolated and identified as caffeic acid (**1**), chlorogenic acid (**2**), neochlorogenic acid (**3**), *p*-hydroxybenzoic acid (**4**), *p*-hydroxybenzoic acid 3-*O*- $\beta$ -D-glucoside (**5**), glutamic acid (**6**) and luteolin 6-*C*-fucopyranoside (**7**). The occurrence of compounds **1**–**7** and their variability in *C. citratus* grown under different TIS conditions was determined by HPLC. The free radical scavenging effect of the methanolic extract and compounds was measured by the discoloration of the free radical 1,1-diphenyl-2-picrylhydrazyl (DPPH). The main metabolites in 6- and 8-week-old cultures, both in 5 and 10 l vessels, were chlorogenic acid (**2**) (100–113 mg%) and neochlorogenic acid (**3**) (80–119 mg%), while in the cultures with CO<sub>2</sub>-enriched air and reduced immersion frequency the main compound detected in the extracts was glutamic acid (**6**) (400 and 670 mg% for the green and white biomass and 619 and 630 mg% for the green and white biomass, respectively). The most active compounds, as free radical scavengers, in the DPPH discoloration assay were caffeic acid (**1**), chlorogenic acid (**2**), neochlorogenic acid (**3**) and the flavonoid luteolin 6-*C*-fucopyranoside (**7**).

*Key words:* *Cymbopogon citratus*, TIS Culture, Free Radical Scavengers