**FACTA UNIVERSITATIS**
Series: **Physics, Chemistry and Technology** Vol. 16, N° 1, Special Issue, 2018, p. 40
49th International Symposium on Essential Oils (ISEO2018) • Book of Abstracts

49th ISEO

# OP8. Chemical composition, antibacterial and antioxidant activities of a citrus essential oil and its fractions

*Carmen M. S. Ambrosio*[1]*, Elena Stashenko[2], Carmen J. Contreras Castillo[1], Eduardo M. Da Gloria[1]*

*Keywords*: fractional distillation, limonene, *E. coli*, *Lactobacillus*

The prohibition of antibiotic use in animal feed since 2006 by the European Community, due to the concern about the growing emergence of bacterial resistance, has led to the search for alternatives to substitute antibiotics. Essential oils (EOs) could be a possible alternative because of their antimicrobial properties. Specifically, citrus EOs, that are by-products of orange juice production, could be an excellent alternative since they have shown a good potential to fight pathogenic bacteria and their use in animal feed could become feasible since there is a high availability of them in the worldwide market. The aims of this study were to evaluate the chemical composition, antibacterial and antioxidant activities of a commercial citrus EO, Brazilian orange terpenes (BOT), and its fractions. Initially, the antibacterial activity of BOT was tested on *Escherichia coli* U21 (K88 LT/STb/F18/STa) isolated from pig gut and on *Lactobacillus rhamnosus* ATCC 7469 by a microdilution method. MIC and MBC results showed that *E. coli* (MIC=MBC=1.85 mg/mL) was more sensitive than *L. rhamnosus* (MIC=3.7 and MBC=7.4 mg/mL) to BOT, thus it displayed a selective antibacterial activity, affecting more the pathogenic than the beneficial bacteria. Limonene (78.7%) was determined as the major compound in BOT by GC-MS. After that, BOT was subjected to fractional distillation in a pilot system of continuous distillation. Four fractions were obtained: F1, F2, F3, and F4. The first three fractions were characterized by a high relative amount of limonene (86.9; 91.8; 91.9%,) followed by *cis*-limonene oxide, *trans*-limonene-oxide, and myrcene. Conversely, F4 was characterized by having the lowest amount of limonene (0.96%) and as having *trans*-carveol, carvone, *cis-p*-mentha-2,8-dien-1-ol, and *trans-p*-mentha-2,8-dien-1-ol as the major compounds. Only F4 was demonstrated to have an activity on *E. coli* (MIC=MBC=3.7 mg/mL) and *L. rhamnosus* (MIC=MBC=14.8 mg/mL). The F4 fraction also possessed the highest antioxidant activity (845.7 $\mu mol_{trolox}/g$ - ORAC) in contrast to the others fractions (479.7; 334.4; 209.1 $\mu mol_{trolox}/g$, respectively), and even to the EO itself (785.1 $\mu mol_{trolox}/g$). The results imply that the minor compounds were responsible for the biological activity of this EO instead of its major compound limonene.

*Acknowledgments*: The authors thank the "Consejo Nacional de Ciencia, Tecnología e Innovación" (CONCYTEC) from Peru for Carmen M. S. Ambrosio's scholarship.

[1]Department of Agri-Food industry, Food and Nutrition, ESALQ, São Paulo University-Brazil; [2]Research Center of Excellence CENIVAM, CIBIMOL, Universidad Industrial de Santander, Bucaramanga, Colombia.
**Corresponding author*: carmensincheambrocio@gmail.com, emgloria@usp.br