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### Effect of essential oil of *Citrus cinensis* cv new hall – *Citrus aurantium* (indigenous in Greece) upon growth of *Yarrowia lipolytica*

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The effect of essential oil from *Citrus cinensis* cv new hall – *Citrus aurantium* (indigenous in Greece) upon growth of the dimorphic non-conventional yeast *Yarrowia lipolytica* strain ACA-DC 50109 was studied. The microorganism was aerobically cultivated in batch mode in carbon-limited media. The essential oil was added into the culture medium in different quantities while the control experiment was carried out without addition. The essential oil caused a relatively important decrease of the highest concentration of biomass produced. Additionally, biomass yield on glucose consumed was significantly decreased with the addition of the oil on the cultivation medium. Moreover, the addition of the essential oil considerably increased the lag time of the culture. In all trials, a remarkable drop the pH value of the medium was observed due to the biosynthesis of small amounts of organic acids. Given that one principal component of this membrane is the one of cellular lipids, it was assumed that the extraction and the analysis of cellular lipids could provide information about the microbial behaviour. Total lipids were extracted, methanolized and analyzed with the aid of G.L.C. In the control experiment, the culture conditions did not favour accumulation of storage lipid inside the yeast cells and, hence, lipid produced corresponded to 5–9% (wt/wt) in dry cell mass. Similar concentrations of cellular lipids were produced when essential oil was added in various amounts. When essential oils were added, an increase of lower aliphatic chain saturated fatty acids was observed, suggesting an alteration in the membrane function. **Acknowledgements:** This study has been co-funded by 75% from E.E. and 25% from the Greek Government under the framework of the Education and Initial Vocational Training Program – Archimedes II. **References:** 1. Aggelis, G., Komaitis, M. (1999), *Biotechnol. Lett.* 21: 747–749 2. Aggelis, G. et al. (1998), *Anton. Leeuw. Int. J. G.* 73: 195–198.

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### Simultaneous determination of ginsenosides and polyacetylenes in American ginseng (*Panax quinquefolium* L.) using high-performance liquid chromatography

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*Panax quinquefolium* L. (American ginseng) is native to North America, and is one of the most widely used medicinal herbs in the world together with other ginseng species. The alcoholic extract of ginseng roots has been widely used as a tonic against cancer, diabetes, cardiovascular disorders, and immune functions [1]. The active principles of ginseng roots appear to be polyacetylenes and dammarane saponins (ginsenosides), which are normally determined by different analytical methods. The aim of this study was to develop a method for simultaneous determination of both ginsenosides and polyacetylenes of *P. quinquefolium* roots. A high-performance liquid chromatography (HPLC) method was developed for simultaneous determination of ginsenosides and polyacetylenes from ginseng extracts. Polyacetylenes and ginsenosides were extracted from fresh

ginseng roots with 100% methanol followed by extraction with 80% methanol, which ensured a complete extraction of both types of bioactive compounds. The combined methanol extracts were subjected to HPLC analysis on a reversed-phase (RP) C18 column using a gradient consisting of acetonitrile and water. The major polyacetylenes were identified as falcarinol and panaxydol by 1D- and 2D-NMR spectroscopy and the major ginsenosides as R<sub>b1</sub>, R<sub>b2</sub>, R<sub>c</sub>, R<sub>d</sub>, R<sub>e</sub> and R<sub>g1</sub> by comparison with authentic standards on HPLC. The HPLC method was validated and used to quantify the content of polyacetylenes and ginsenosides in root hairs, lateral roots and main roots of 5-year old American ginseng. The total mean concentration of polyacetylenes and ginsenosides was approximately 4.5 and 2 times higher in root hairs, respectively, compared to the main roots, indicating possibilities for production of differentiated ginseng preparations. The developed HPLC method can also be used as a quality control of fresh ginseng roots as well as dried root material and various ginseng preparations. **Reference:** 1. Sticher, O. (1998), *Chemtech.* 28: 26–32.

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### Determination of flavonoids in extracts of *Epilobium angustifolii* herba by HPTLC-densitometry

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*Epilobium angustifolium* L., *Oenotheraceae* is used in folk medicine. The herb is rich in polyphenolic compounds such as flavonol-3-O-glycosides, phenolic acids and tannins [1]. Flavonoids analyses have shown that quercetin glycosides are predominant in *Epilobium angustifolium* [2]. Several studies suggest that at least flavonoids are partly responsible for the biological action of the herb [3, 4]. The separation and quantitative determination of quercetin glycosides in methanolic and aqueous extracts of *Epilobium angustifolii* herba by HPTLC-densitometry was established. Ethyl acetate/formic acid/water 68:2.5:0.3 was used as a mobile phase and silica gel as a stationary phase. The flavonoids were more abundant in the aqueous extract than in the methanolic one. In both extracts quercetin glucuronide was the dominating compound, 2.12% and 1.78% respectively. Our method is fast, easy and selective particularly for quercetin glucuronide determination in *Epilobium* extracts. **References:** 1. PDR for Herbal Medicines (1998), Medical Economics Company, Montvale, New Jersey 2. Ducrey, B. et al. (1995), *Phytochemistry* 38: 129 3. Tita, B. et al. (2001), *Farmaco* 56: 341 4. Kiss, A. et al. (2006), *Pharmazie* 61: 66.

## P 315

### Effect of herbal formula tonics for reinforcement of yin or yang deficiency on the inhibition of whole blood aggregation

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Herbal formula tonics for reinforcement of yin or yang deficiency are commonly used in Korea traditional medicine [1, 2]. This study examined the possible inhibitory effects of 30 kinds of these herbal formula tonics on platelet aggregation induced by collagen in human whole blood using the impedance method of aggregometry [3]. Among them, 4 kinds of yin-tonic and 3 kinds of yin-yang-tonic water extracts were selected to be the most effective candidates ( $p < 0.001$ ). Also, through *in vivo* study, the anti-thrombotic effects of Igyeongtang-, Gamisipjeondaebotang-, and Gamisoyosan-treated groups, with recovery rate of 60%, 50%, 45.45%, respectively, were observed to be higher than the control group (36.8%) in a mouse acute thrombosis. The results from this experiment provide pharmacological evidence for the traditional use of tonics with yin-yang theory of traditional medicine, suggesting that yin-tonics could be