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Instant Controlled Pressure Drop (DIC) as a process of extraction of volatile oils: the impact of the rate of pressure drop.

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After having studied the use of the Instant Controlled Pressure Drop (DIC) technology as a process of extraction of volatile oils in the cases of some aromatic flowers and herbs as lavender and Indonesian ylang-ylang (*Cananga odorata*) flowers, we investigated the real impact of the rate of dropping the pressure on the process efficiency.

The DIC process is based on the thermo-mechanical effects induced by subjecting the raw material for a short time steam pressure (about 1.10^5 Pa to 6 $.10^5$ Pa depending on the product), followed by an abrupt pressure drop towards vacuum (about 0.50 kPa.) (*1*). The fact of the use of abrupt pressure drop may provoke higher effect of autovaporization of volatile compounds, coupled to an instant cooling of the products allowing stopping thermal degradation, modification of the internal structure and eventually implies the rupture of cell walls, which enhances the internal diffusion.

In the present paper, we first describe the influence of process parameters, namely steam pressure (2.10^5-6.10^5 Pa), total processing time (30 sec - 20 min), and number of DIC cycles (1-9), on the oil yield and composition. The Instant Controlled Pressure Drop (DIC) (*1*) as a volatile oil extraction technique allows us to get a rapid, clean and environmentally friendly process: The DIC can be compared to the conventional technique of steam distillation (SD), but it is superior in terms of rapidity, oil yields and also oil quality. As an example, in the case of Indonesian ylang-ylang, the optimized total DIC processing time is 30 sec or 4 min versus 12 hours or 24 hours with steam distillation respectively; the oil yields are respectively 2.45% versus 2.4% or 2.74% versus 2.60%.

But we particularly studied the impact of the speed of pressure drop $\Delta P/\Delta t$. We increased this speed from 2.10^5 $Pa.s^{-1}$ up to 5.10^6 $Pa.s^{-1}$ with the same optimized processing parameters in terms of steam pressure, total processing time and number of DIC cycles. We proved systematically that the higher the pressure drop speed, the higher the total yields. In all cases, the total yield is doubled at the highest value of $\Delta P/\Delta t$; the characteristic of DIC as "instant" pressure drop may then be quantified.

References.

(*1*) K. Allaf, S.A. Rezzoug, F. Cioffi, M.P. Contento, *Processus de traitement thermo-mécanique par Détente Instantanée Contrôlée des fruits, jus et peaux d'agrumes*. PCT International Patent application WO 00/13352 (13/16/2000), Priority FR 98/11105 09/04/1998).

(*2*) H. Mellouk, G. Naji G, K. Allaf, in : Proceedings of 16th Agoral meeting, Nantes, France, 2004, pp. 265-269.