

Hydrolysis of triglycerides in oil palm fruits induced by freezing

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Palm fruits are subject to the hydrolytic action of mesocarp and fungi lipases, which explains the high free fatty acid (FFA) levels found in artisanal red palm oils (RPO). To study the effect of freezing of palm fruits on the hydrolysis level of RPO, palm fruits were stripped from palm bunches (*Elaeis guineensis* var. Tenera) after 1, 3, 5, 7 and 9 days of storage at room temperature (25-30°C). The oil was extracted with a manual screw press, either immediately (control), or after frozen storage of the fruits (-18 ± 0.5°C; 4 months). Oils samples were analyzed to determine their lipolysis level (FFA content and composition), oxidation level (peroxide value: PV), fatty acid (FA) composition, carotene and tocol (vitamin E) contents. Storage of the bunches at room temperature led to increase of oil yield (15 to 28.6 g oil /100 g palm fruits) and FFA (0.52 to 9.97 mg KOH/g oil) content, decrease (18.4%) of carotene content but to no or few modifications of FA composition, vitamin E content and PV (0 to 0.81 meq. active oxygen/kg oil). As compared to control, freezing resulted in an increase of 35 to 69% of the oil yield. FA composition of the oil was not affected but its vitamin E and carotene contents decreased by 37.5% and 52%, respectively. The FFA content was multiplied by 86 to 2.6 for fruits frozen from 1 to 9 days after harvest while PV increased slightly (1.53 to 2.06 meq. active oxygen/kg oil). While at room temperature palmitic acid tended to be more released than other FA, during freezing, it would concern more unsaturated fatty acids (C18:1 and C18:2). However our results showed few differences in FFA compositions for frozen or control fruits evidencing limited specificity of the lipases at frozen or room temperature. Freezing induces breakage of palm fruit cell structures resulting in a facilitated extraction of the oil and but also favors deteriorative reactions (lipolysis, oxidation), leading to an overall decrease of RPO quality (FFA, antioxidants).

Keywords: lipase, freezing, free fatty acids, red palm oil