Low-saturated fat macadamia nuts - is it possible?

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Macadamia kernels consist of approximately 76% oil. Of that, 77-80% is monounsaturated, 1-7% is polyunsaturated, and the remaining 14-21% is saturated fat. Whereas unsaturated fats are considered 'good' for health, there is a general belief that saturated fats are of less benefit. In fact, it is possible to make a low-saturated fat health benefit claim if saturated fat is less than 1.5% of total product weight (~ 2% of oil content), or a reduced-saturated fat claim if saturated fat is 25% less than a reference foodstuff. It is therefore of interest to see if it is possible to reduce the percentage of saturated fat in macadamia, based on an understanding of the fatty acid pathway. While the vast majority of oil is monounsaturated oleic acid (C18:1) and to a lesser degree, palmitoleic acid (C16:1), a significant amount of saturated fat exists as palmitic acid (C16:0) and stearic acid (C18:0). During kernel development, saturated fats are extended in length by an enzyme called 'elongase', which adds 2 carbon atoms at a time (consequently, palmitic acid is elongated to stearic acid). Each of these saturated fats then has a double bond added by an enzyme called 'desaturase', and they become monounsaturated. Therefore, to have a low saturated fat variety, it would be an advantage to have efficient desaturase enzymes, to convert the saturated to monounsaturated fats. In an analysis of 34 macadamia lines (14 cultivars and 20 breeding accessions), it was found the ability to convert stearic (C18:0) to oleic acid (C18:1) was reasonably efficient, with the stearic:oleic ratio varying from 1:17 to 1:29. By contrast, the ability to convert palmitic (C16:0) to palmitoleic acid (C16:1) was much less efficient, with a low palmitic:palmitoleic ratio ranging from 1:2 to 1:4. Although one might expect varieties with the most efficient desaturase enzymes to have the lowest saturated fat, this was not always the case. In some varieties, elongating more C16:0 to C18:0 could compensate for poorer desaturation of C16:0, as C18:0 is much more efficiently desaturated than C16:0. Ideally, lowest saturated fats in macadamia would be maximised by combining efficient elongase enzymes with strong desaturase enzymes. Although, it is likely that this would still be insufficient to qualify for a <1.5% saturated fat health claim, a reduced-saturated fat claim is potentially well within reach. Further exploration within macadamia germplasm may yield more efficient enzymes to make this eventually feasible.