

Public Abstract

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Title:GENETICS OF SOYBEAN SEED LIPOXYGENASES AND LINOLENIC ACID CONTENT IN SEEDS OF THE SOYBEAN WILD ANCESTOR

Soybean seeds, valuable feed and food resources, have high protein and oil contents, with a fairly balanced amino acid profile and abundant essential fatty acids (FA). Linolenic acid (18:3), an essential omega-3 type of FA, makes up to 8% of typical soybean seed oil. In humans, omega-3 FAs play a crucial role in brain function as well as normal growth and development. The wild ancestor of cultivated soybean typically contains twice as much 18:3 as soybean, but very little is known about what causes the increased 18:3 accumulation. Various types of genes were investigated for their role in the 18:3 buildup in seeds of the soybean wild ancestor. Differences in the expression of genes involved in oil synthesis might be partially responsible for the higher 18:3 content in seeds of the wild ancestor. In addition, 18:3 in seeds is usually oxidized by enzymes known as lipoxygenases, resulting in the development of undesirable flavor and aroma. Soybean seeds contain three lipoxygenases. Even though non-functional variants for the three seed lipoxygenases have been previously identified in separate soybean lines, the cause of the mutations at the DNA level for two of them was not known. The genetic basis of the mutations at two of the seed lipoxygenase genes and the development of molecular markers which allow the identification of soybean plants carrying lipoxygenase mutant alleles are reported herein. This research may have an impact in the development of commercial soybean varieties with enhanced content of 18:3 and improved flavor and aroma. Such soybean cultivars represent an inexpensive source of healthy omega-3 FAs and are suitable for the manufacture of soyfoods.