

UNDERSTANDING SUCROSE AND RAFFINOSE FAMILY OF OLIGOSACCHARIDES IN SOYBEAN SEED FOR HUMAN AND ANIMAL UTILIZATION

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ABSTRACT

Many researchers have an interest in development of soybean lines producing high metabolizable energy with low anti-nutritional factors in the seed. The raffinose family of oligosaccharides (RFO), raffinose and stachyose are anti-nutritional carbohydrates. RFO cannot be digested by humans and monogastric animals due to the lack of α -galactosidase in the gut. However, RFO are microbially fermented in the lower gut resulting in flatulence and reduced feed efficiency. Sucrose is considered nutritionally useful. The objective of this project was to understand the variation in sucrose and RFO content in soybean seed for human and animal utilization. This work reports on the identification of a haplotype of raffinose synthase (*RS3*) which was completely associated with the ultra-low RFO trait in soybean. In addition, this study determined the environmental stability of seed carbohydrate profiles for soybean lines containing different *RS2* and *RS3* allele combinations over two years in two locations as well as multiple locations with different maturity genes. Soybean lines with *rs2W331*- alleles of the *RS2* gene were more stable for sucrose and RFO and were the best lines to use for animal and human utilization as those lines had high concentrations of sucrose and low levels of RFO. Through a genetic mapping study, the *RS2* allele was the most highly associated with high sucrose content, but two other genomic regions were identified with moderate effects. These results of these studies can be used in soybean breeding programs to develop improved soybean varieties for use in human and animals.