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Environmental stability of carbohydrate profiles in different soybean genotypes

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Soybean is an important annual crop. The raffinose family of oligosaccharides (RFOs) raffinose and stachyose are anti-nutritional carbohydrates. Consumption of soybean seed products with low RFOs reduced flatulence in humans and increased metabolizable energy efficiency in chickens, pig and dog. Many researchers have an interest in development of soybean lines producing high metabolizable energy with low anti-nutritional factors in the seed. Soybean lines with low RFOs were discovered and the causative mutation positions were identified in the soybean genome. The objective of this study was to determine the environmental stability of the carbohydrate profiles for soybean lines containing different RS2 and RS3 allele combinations in two locations over two years. This research was conducted with six different genotypic classes with three different alleles of the RS2 gene and two different alleles of the RS3 gene. Although this study was conducted in two different locations over two years with different genetic backgrounds, the results indicate that carbohydrate profile in soybean seed is mostly determined by genotype and galactinol and sucrose content was mainly affected by environmental factors, whereas genotype effect is a major factor to accumulate raffinose and stachyose component in soybean lines. In addition, soybean lines with rs2W331- allele were more stable with sucrose and RFO over four environments, which means that those phenotypes had high level of sucrose content and low level of RFO in different environments and can be good varieties for animal feed or human food. Further research will develop soybean lines to evaluate the environmental stability of the carbohydrate trait in all US soybean production environments. An environmentally stable improved carbohydrate profile is an important component of developing soybeans with increased metabolizable energy for animal feed.