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Developing CRISPR/Cas9 genome editing for soybean disease resistance

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Soybean growth and production are often subject to attacks by various diseases and pathogens, resulting in enormous yield loss each year. Development of soybean with disease resistance is important for sustainable crop production. Research indicates that certain soybean genes are involved in pathogen infection. Modification of specific soybean endogenous genes may break the interaction of soybean and pathogens, resulting plants with disease resistance. CRISPR/Cas9 is a new and effective genome editing tool to modify endogenous genes. Developing an efficient CRISPR/Cas9 genome editing method for soybean has a great potential to edit various soybean endogenous genes and develop soybean with disease resistance. We initiated research to develop CRISPR/Cas9 genome editing for soybean germplasms grown in Canada. Using regular transformation vectors, we first developed *Agrobacterium rhizogenes*-mediated hairy root transformation system. The system can be used to quickly test various ideas and concepts for genome editing. Soybean cyst nematode (SCN) is major disease that affects soybean yield significantly in Canada and worldwide. We identified several soybean genes that might be involved in SCN infection. We made a series of genome editing vectors to mutate these soybean genes or replace the particular nucleotides in the genes aiming to interrupt the interaction of soybean with SCN. Some of the vectors have been transferred into hairy root system for genome editing of target genes and subsequently for disease resistance evaluation. The desired genes and genome editing vectors identified in hairy root system will then be introduced into soybean whole plants to further confirm disease resistance. Once genome editing methods are developed and SCN disease resistance is achieved, the methods will be used for developing soybean for resistance of other diseases and for modification of other traits.