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Challenges and opportunities of breeding for oil quantity and yield in soybean
*Istvan Rajcan**, Department of Plant Agriculture, University of Guelph, Ontario, Canada
Milad Eskandari, Department of Plant Agriculture, University of Guelph, Ontario, Canada

Soybean [*Glycine max* (L.) Merrill] is the largest oil seed crop in the world, which accounted for 61% of global oilseed production in 2016. Soybean seeds contain on average 18 to 20% of oil on a seed weight basis. The soybean oil is used primarily for human consumption but also as renewable raw material for a wide variety of industrial products including biodiesel. Oil concentration in soybean seeds is a complex quantitative trait that is controlled by a number of genes with mostly small effects and influenced by the environment. A well-documented negative correlation between seed oil and protein makes the breeders' efforts to increase both compounds in the seed concurrently challenging. Over the last couple of decades, molecular markers have been used by a number of different research groups, including ours, to tag quantitative trait loci (QTL) associated with seed oil concentration in soybean. The main goal has been improve our understanding of the genetic control of oil concentration in soybean seed and develop markers that can be used in marker-assisted selection (MAS). It has been reported that not all high oil QTL alleles were correlated with reduced protein concentration. Candidate genes have also been identified within or in the vicinity of oil QTL regions, which can facilitate efforts to increase oil concentration when developing new soybean cultivars.