RECENT DEVELOPMENTS IN BREEDING FOR RESISTANCE TO SUNFLOWER BROOMRAPE

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Abstract

Sunflower broomrape (*Orobanche cumana* Wallr.) remains as one of the most serious issues that sunflower breeders are facing nowadays. The capacity of the parasite to expand to new areas and to develop more aggressive forms poses new challenges for sunflower breeding. In addition to the well-known capacity of the parasite to overcome resistance mechanisms through mutation, a recent study in Spain has illustrated how virulence can be increased from genetic recombination between genetically distant individuals. Considering the large variability between sunflower broomrape populations and their expansion ability, sunflower breeding for resistance to broomrape must necessarily focus on pyramiding known resistance genes rather than relying on individual genes plus a "favorable" genetic background. This will require extensive research on i) genetic characterization of sunflower broomrape populations; ii) identifying novel resistance genes; iii) genetic and physiological characterization of resistance genes in sunflower; iv) genetic and physiological characterization of avirulence genes in the parasite and v) developing accurate molecular markers for avirulence genes in the parasite and for resistance genes in the sunflower. These will be central research topics in the coming years, but important advances have already been achieved in recent years. This paper reviews such recent developments in breeding research for broomrape resistance in sunflower and envisages how the availability of increasingly powerful tools such as the complete genomes of the crop and the parasite as well as the popularization of gene editing techniques can boost breeding advances in this field.

Keywords: avirulence genes, breeding, broomrape, genetic resistance, *Helianthus annuus*, Wild *Helianthus* sp.