Obtaining Sunflower Genotypes, Resistant to Imidazolinone or Sulfonylurea Herbicides with Improved Genetic Resistance to *Plasmopara halstedii* Pathogen and *Orobanche cumana* Parasite

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Abstract

New sources of genes for improving different characteristics in sunflower breeding are needed. Genetic resources in sunflower, which could to be used as a base to create new inbred lines or as donor sources for genes controlling different characteristics are made up of old or new varieties, hybrids and inbred lines, induced mutations, synthetic populations, as well as wild sunflower species. Herbicide resistant crops are becoming increasingly common in agricultural production. A wild population of annual *Helianthus annuus* was the source for developing cultivated sunflower genotypes resistant to imidazolinone and sulfonylurea herbicides. There have been inbred lines created that serve as sources for transferring genes into elite lines. The sunflower genotypes resistant to herbicides can be used in the CLEARFIELD or Express-Sun systems. The virulence of *Plasmopara halstedii*, which produces downy mildew in sunflower, has increased in recent times with new virulent races of this fungus appearing. The parasitic plant *Orobanche cumana* (broomrape) is the most important biotic constraint to the production of sunflower in all countries where sunflower is grown, except North and South America. There is a diversity of *O. cumana* races identified worldwide. The

appearance of new races of this parasite has considerably reduced the available sources of resistance in cultivated sunflower. A high level of resistance for both the *P. halstedii* pathogen and *O. cumana* parasite have been found in the wild *Helianthus* spp. Resistance to the most virulent races of the pathogen and parasite has been transferred from wild *Helianthus (H. debilis and H. argophyllus)* into cultivated sunflower by interspecific hybridization. The inbred lines created by interspecific hybridization have been used for the improvement of resistance to the pathogen and parasite and lines resistant to imidazolinone and sulfonylurea herbicides using backcross or recurrent selection methods.

Key words: sunflower, herbicides, resistance, downy mildew, broomrape

同时具有抗向日葵除草剂咪唑啉酮、抗霜霉病和抗列当性状的向日葵基因型材料的获得

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摘要

如果要通过育种来改善向日葵中特定的性状，我们就需要特定的基因供体资源。在向日葵自交系选育中，由已有品种或新的品种、杂交种/自交系、诱变体、杂交群体以及野生种组成的向日葵遗传资源可以用作创建新的向日葵自交系的基础，或者可以作为改良不同性状的遗传资源。农业生产中，使用具有除草剂抗性的作物越来越普遍。在本研究中，我们利用一个野生的一年生向日葵群体，将其作为培育抗咪唑啉酮和脲璜隆除草剂的向日葵栽培品种的基因供体。我们已经创建了可转移至优良自交系的基因源。除草剂抗性品种可以用于 CLEARFIELD 和 Express-Sun 系统。

由单轴霉属引起的向日葵霜霉病发病率在过去的一段时间有所增加，并且出现了该真菌的新的生理小种。此外，寄生性列当是除美洲以外的所有国家向日葵生产的最大的生物胁迫。世界上已经鉴定出多种列当生理小种。新的列当生理小种的出现极大的减少了栽培向日葵可利用的抗性资源。我们发现，野生向日葵种质对霜霉病和列当均具有很高的抗性。我们进一步通过种间杂交，从野生向日葵材料中，将抗霜霉病和和针对致病力最强的列当生理小种抗性的基因转移至栽培向日葵。总之，我们通过种间杂交创建自交系，并通过回交和轮回选择，提高了向日葵对霜霉病、列当、以及咪唑啉酮和脲璜隆除草剂的抗性。

关键词：向日葵，除草剂，抗性，霜霉病，列当