# Latest Sunflower Diseases Research Progress and Management

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## Abstract

Sunflower diseases have been and remain a major limiting factor in successful sunflower production in the world. From a historical point of view, in last several years new disease agents did not occur, however, new races have emerged. "Virulent pathotypes", usually called pathogenic races occurred in some important diseases. Many disease agents have been present in the whole sunflower production regions, and despite the extensive marketing of resistant hybrids throughout the world, they have persisted in some regions. The exception is the *Phomopsis*/*Diaporthe* complex in which several new species in the genus *Phomopsis* appeared. Broomrape should also be added to this list, but as it will be discussed elsewhere. We shall restrict our discussion only to diseases. Many disease agents are present throughout sunflower producing regions and some of them, despite high turnover and migration of seeds in the world remained present in some areas. Their spread is evident just due to seed exchange. Considering all sunflower pathogens, it should be noted that 13 of them are significant to a greater extent for sunflower production, in terms of yield and oil quality reduction, although historically in this significant oil crop, much higher number of them have been described. Diseases are by far the most important factor in yield, oil, and protein reduction, although there are different intensities each year and growing region. Significant progress has been made in better identification and comparison of certain parasite races in the world, and in some regions due to new research techniques at the molecular level. Good international cooperation using a series of isogenic lines in determination of the intensity and the appearance of certain disease inducing races of downy mildew, rust, Verticillum wilting and others has

contributed to this. As new parasite races emerge, pesticides have remained one of the more significant tools in control of disease agents, in addition to the other control measures such as genetic resistance. This requires a joint effort of researches in plant protection, breeding, and others struggling with the reduction of losses caused by disease agents. It is, therefore, important to organize periodic surveys that would uncover their exact distribution and harmfulness in certain regions of sunflower production. Taking into account the tendency of soil tillage, i.e. no tillage or minimum tillage, it leads to the fact that many parasites remain on the surface as dry-desiccated or in infected plant residues. They are truly brown bridges for many sunflower parasites. This primarily refers to Argentina, USA, part of France, Australia and many other countries. Increased problems in sunflower arise in such situations. Deep tillage and incorporation of plant residues into deeper layers, and not leaving them on the soil surface eliminates infection pressure of many parasites. In this process, it is most important for the Diaporthe complex, *Scletotinia*, *Phoma*, *Plasmopara, Puccinia* and others. Crop rotation as a system to combat diseases does not have such significance if no tillage technology, i.e. crop cultivation is performed. The same situation is with weeds that should be controlled since they are reservoirs as alternate hosts for many disease agents including viruses; therefore they need to be eliminated from the sunflower crop. Wild sunflower plants should be added to this, since wild sunflower plants are in fact weedy plants in all cultivated crops, and should be eliminated and destroyed as they often serve to parasites for crossing over and as one kind of a green bridge. Use of tractors and sprayers with high clearance for other agricultural cultures enables their application for treatment of sunflower crops against diseases. This is a way to obtain particularly high yields, especially in confectionary sunflower type that has a higher price and can serve as a place for the multiplication of certain parasites because it is generally less resistant to many parasites.

**Key words**: Sunflower diseases, pathogen identification, host resistance.

# 向日葵新病害研究最新进展及防治

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## 摘要

向日葵病害已经成为世界上限制向日葵生产的重要因素。从历史角度看，过去几年没有新的病原菌发生，但是近来有新的小种出现。在一些重要的病害中，出现了“有毒力的致病型”，又常称为致病生理小种。许多病原菌在世界向日葵产区中广泛出现；尽管抗病杂种已经广泛推广，在一些地区仍存在病害。一个极个别的事例是，近年来发现了拟茎点霉属的新种。列当也应被列入重要的病害，但是我们将在其它地方讨论。许多病原菌在向日葵整个产区或部分区域存在；尽管抗病种子广泛推广，病原菌仍然在一些地区继续出现。病原菌的传播很明显是由于种子的交换引起的。在所有的向日葵病原菌中，13 种病原菌对向日葵产量和品质具有重要影响。尽管病害发生程度在年份和种植区间有所不同，但总体上是导致产量、含油量及蛋白质含量降低的重要因素。由于新的分子水平的研究技术的应用，针对世界上或特定地区特定的寄生性小种的研究已经取得了重要进展。我们在国际合作中也取得了成功，如通过国际合作，成功地使用一系列近等基因系来确定特定病害生理小种的发生强度，尤其是是针对霜霉病、锈病、黄萎病及其它病害的强度确定。随着新的寄生性小种的出现，杀虫剂仍然是除培育抗性品种外控制病原菌的重要手段之一。然而，我们需要在植物保护、育种以及其它方面的共同努力来减少病害造成的损失。因此，组织针对向日葵特定产区病原菌的分布和危害的定期调查显得尤为重要。免耕或少耕导致许多寄生菌仍然留在土壤表面或被侵染的病残体，它们成为了许多向日葵寄生菌的桥梁。这主要发生在阿根廷、美国、法国的部分地区，以及澳大利亚以及许多其它国家。这种情况会使向日葵产业面临的问题更加严重。建议通过深耕或将植物残体埋入土壤深层，

不让其留在土壤表面，来减少寄生菌的侵染。该方法对茎溃病、菌核病、黑茎病、霜霉病、锈病和一些其它病害的防治尤为有效。如果不采取特定的耕作技术，轮作对病害的防治并不是很重要。同样，应当清除向日葵中的杂草，因为杂草是许多病原菌、包括病毒的储存库。野生向日葵对栽培向日葵而言也是杂草，也应当被清除和消灭，因为寄生菌经常在野生向日葵上过渡。对其它农业上的植物使用高清除率的拖拉机和喷雾器可以防治向日葵病害。这是获得高产的一种方法。尤其是价格较高的食用向日葵是某些寄生菌的繁殖场所，因为它们一般很少抗多种寄生菌。

**关键词：**向日葵病害、病原菌识别，寄主抗性