



## Differential Regulation of Local and Induced Systemic Resistance in Soybean by Peroxisome Proliferators and Redox Active Compounds

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Soybeans are a major crop in the Midwest, and Ohio ranks fifth in the nation in soybean production. Unfortunately, a number of diseases are associated with soybean that can severely affect production. For instance, losses to a single soybean pathogen, Phytophthora root and stem rot, lead to an estimated \$250 million in losses annually in the United States.

Members of Terry Graham's laboratory have been focusing on the molecular processes involved in the effective deployment of general resistance in soybean. General resistance is considered a preferred mechanism for resistance because it is usually both broad spectrum and more durable. Moreover, general resistance responses, if properly activated, can protect the entire plant.

## OBJECTIVES

The objectives of this work were to look at the molecular processes that are responsible for the expression of general disease resistance in soybeans and to develop and test chemicals that are capable of inducing this form of disease resistance in soybean.

## ACHIEVEMENTS

The Graham lab was among the first to describe a very important connection that limits the deployment of general resistance, at least in soybean. That is, the effective activation of general resistance is often “locked into” the expression of certain aspects of race-specific resistance—a form of resistance effective only against certain races of a single pathogen. Stated somewhat differently, the capacity of the plant to express general resistance responses is tightly linked to molecular signals associated with expression of race-specific resistance. Using a variety of molecular techniques, the Graham lab has explored several mechanisms for “unlocking” general resistance and allowing it to be expressed in the absence of race-specific resistance.

These efforts led to the discovery of several classes of novel chemicals that mimic the natural molecular signals from race-specific resistance and directly activate general resistance. Lactofen, the active ingredient of a popular pesticide was found to be particularly potent in this regard, and it was discovered that it could induce systemic resistance in soybean against several pathogens. This is among the first demonstrations of truly systemic defense activation in soybean.

## THE FUTURE

These efforts have yielded many very promising results and potential approaches and have led to several patent applications. Work will continue with the support of an industry partner. Other candidate chemicals and also genetic means to achieve the same effect are currently being examined. The unlocking and deployment of general resistance responses could lead to novel means to achieve broad-spectrum and durable disease control in soybean.

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