For more than 100 years researchers have recognized that a plant can be preconditioned to respond more quickly to disease if it has already been exposed to a pathogen. It was later discovered that avirulent microbes and some chemicals could induce a similar preconditioned response. This reaction has been termed Induced Resistance (IR).

Induced Resistance is made up of two similar but physiologically different pathways, Systemic Acquired Resistance (SAR) and Induced Systemic Resistance (ISR).

**Induced Systemic Resistance**
- Root induction
- Jasmonic Acid and Ethylene Mediated
- Can activate NPR1
- Production of PR Proteins
- Up-Regulation of other functions

**Systemic Acquired Resistance**
- Foliar induction
- Salaclic Acid Mediated
- Activates NPR1
- Production of PR Proteins
- Up-Regulation of other functions

Numerous fungicide products on the market today claim Induced Resistance as either their primary or secondary mode of action. This mode of action relies on the ability of the product to trigger an immune response in the plant even in the absence of a pathogen. There is a measurable physiological response inside the plant when these products are used and if they are used properly they can greatly add to a disease control program.

Successfully using IR compounds - whether the product contains conventional or biologically derived active ingredients – requires a different approach to disease control.

- Apply before disease presence is suspected
  - Allow for Induction time
  - Many product labels call for application 3-5 days before expected disease
- Use in a program with other effective modes of action
- Can be used in addition to or to replace other modes of action
  - As part of a resistance management plan
  - To boost overall control of hard to manage diseases
Diagram 1: Although IR compounds (LifeGard) may not be a standalone option, using it in a program can offer good disease control. Here the IR compound replaces 2 applications of other modes of action and retains control.

- LifeGard (BmJ) applied at 1.2 oz/A.
- Luna Tranquility (fluopyram + pyrimethanil, Bayer) applied at 11.1 fl oz/A - WetGit at 3 pt/100 gal.
- Brevo WeatherStik (chlorothalonil, Syngenta) applied at 1.5 pt/A.

Diagram 2: SAR compounds demonstrate efficacy on bacterial diseases both alone and in programs. Here two IR compounds are added to a grower standard to boost disease control and yield.

Other effects of the IR reactions can include increased nutrient uptake and plant growth and thickened cell walls. These factors can often result in yield enhancement in addition to disease control.

If used properly, IR compounds offer another effective tool to help growers successfully manage disease in many of their crops.