Understanding the Chemistry Behind XtendiMax with VaporGrip Technology

VaporGrip® Technology, within Monsanto's low-volatility dicamba formulation XtendiMax®, helps control volatility by managing the equilibrium in the spray tank between dicamba in its salt form – the anionic (negatively charged), non-volatile form of dicamba – and dicamba acid – the volatile form of dicamba. VaporGrip Technology works by removing protons from the system, which in turn keeps dicamba in its salt form.

- Dicamba in salt form is non-volatile; Dicamba acid increases volatility
- Protons increase volatility potential; Anions minimize volatility potential
- VaporGrip Technology manages the equilibrium by removing protons

THE KEY TO DEVELOPING A LOW VOLATILITY DICAMBA FORMULATION IS TO KEEP DICAMBA IN ITS SALT FORM –

Also known as its anionic or negatively charged form. VaporGrip Technology manages the equilibrium to keep dicamba in its salt form.

1. For dicamba to remain in salt form and maintain low volatility, a dicamba formulation must avoid anything that could introduce a proton to the system – such as Ammonium Sulfate (AMS) or other protonated amine cations.
    a. The addition of protons to the system increases the chances of dicamba acid forming, which increases volatility potential.
    b. When AMS is added to the spray tank, ammonia volatilizes leaving behind protons. This undermines the equilibrium and supports the formation of dicamba acid, significantly increasing volatility potential. That is why AMS and ammonium-based additives are prohibited with XtendiMax with VaporGrip Technology.
2. In conjunction with all label requirements, including prohibiting AMS and using only approved tank mix partners, XtendiMax with VaporGrip Technology provides a low-volatility dicamba formulation.

EQUILIBRIUM WITHIN THE SPRAY TANK MUST BE MAINTAINED TO CONTROL VOLATILITY.

1. Within a spray tank are components containing cations capable of producing protons and anions. Protons can increase volatility potential while anions help control volatility, and any component added to the spray tank can affect the equilibrium.
2. VaporGrip® Technology helps to control the equilibrium by removing protons from the system, creating balance within the tank and maintaining a low volatility formulation. It also creates a buffer against other outside influences that could affect the solution.

MONSANTO AND THIRD-PARTIES CONDUCTED EXTENSIVE RESEARCH AND GLP TESTING TO CONFIRM VOLATILITY REDUCTION.

1. Monsanto identified conditions to effectively create a low-volatility dicamba formulation.
2. Testing and evaluation included GLP-compliant studies and over 1,200 distinct tests in controlled environments, e.g. humidome and hoop house, and over 25 field studies representing multiple field conditions including varying geographies, temperatures and surfaces.