Australia

3 key factors that can affect performance of soil-applied fungicides

Potatoes
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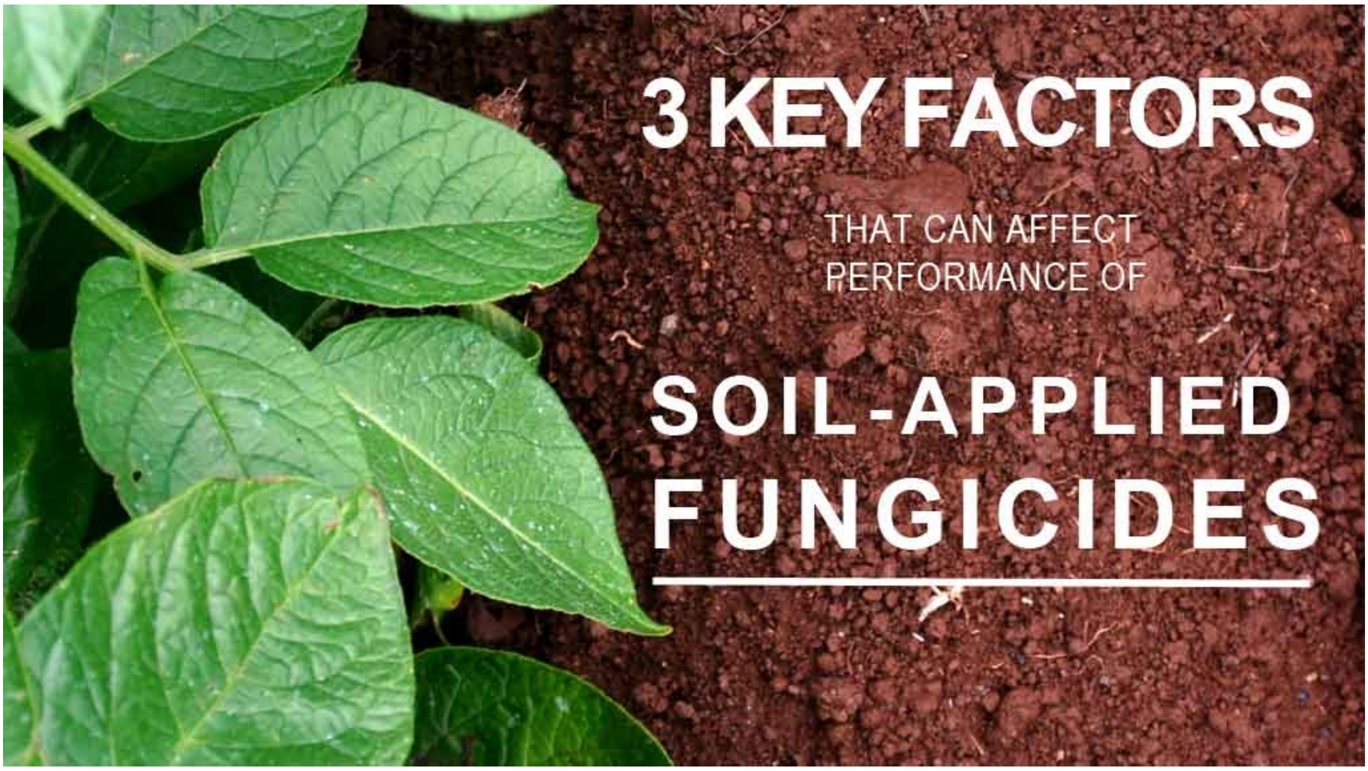

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Soil-applied fungicides are used to control a number of important soil-borne diseases, such as *Rhizoctonia solani* (Black Scurf) and *Phytophthora erythroseptica* (Pink Rot), in potatoes. These fungicides, when applied at planting as an in-furrow application, need to be applied around the seed piece and in the area where the daughter tubers will be formed. This provides protection against these two diseases.

The physical and chemical properties of a fungicide are a measure of how the fungicide interacts with the environment. The unique chemical characteristics of a fungicide influence its behaviour in soil.

Three of the key properties that we use to help predict both availability and mobility in the soil include: water solubility; soil adsorption and fungicide half-life. In basic terms, the solubility and soil adsorption coefficient (Koc) will determine the amount of the fungicide that will be available to fight disease, whereas the half-life relates to the persistence of the fungicide in the environment.

1. **Water solubility;** is a measure of how readily the chemical will dissolve in water. It is typically expressed as the maximum amount of pesticide that will dissolve in one litre of water, and is usually expressed in parts per million (ppm). The higher the solubility, the more chemical that will dissolve in the water and the more likely the chemical will move through the soil away from the site of application.

1. **Soil adsorption coefficient (Koc);** is a measure of how strongly a chemical adheres to soil in

preference to remaining dissolved in water. Koc values can vary substantially, depending on soil type, soil pH and the properties of the fungicide. Fungicides with a high Koc value are typically not very water soluble and will preferentially adhere to soils rather than be dissolved in water. Such pesticides are unlikely to be carried off-site in runoff as dissolved substances; instead, they may be transported on sediment particles.

1. **Fungicide half-life;** refers to the length of time it takes for 50 per cent of the fungicide to breakdown to secondary compounds. For example, if 200 g of active ingredient with a half-life of 45 days is applied, we would expect 100 g of active ingredient to have degraded or dissipated 45 days after application, with another 100 g remaining. After another 45 days, 50 g of active ingredient should be left in the field.

There are several different types of half-lives:

1. Soil half-life is the amount of time taken for half of the pesticide to degrade in soil. This half-life is influenced by the presence of soil micro-organisms, which can breakdown the pesticide; soil type (e.g. sand, loam, clay); soil pH; sunlight; temperature and the presence of oxygen.
2. Photolysis half-life is the amount of time taken for half of the pesticide to degrade from exposure to light.
3. Hydrolysis half-life is the amount of time taken for half of the pesticide to degrade from reaction with water.

The half-life of Metalaxyl-M (e.g. RIDOMIL® GOLD) and Azoxystrobin (e.g. AMISTAR® Technology) varies with soil characteristics and environment.

Product (Active Ingredient)	Solubility (avg, mg/L)	Koc	Soil Half Life (avg. days)	Hydrolysis half-life (avg. days)
Metalaxyl-M	26000	163	60 (aerobic soil)	1000
Azoxystrobin	6	581	112 (aerobic soil)	31

(Source: PAN Pesticides Database – Chemicals)