



# TURFAX™

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## Fungicides: Plant Uptake and Mode of Action

Peter H. Dernoeden

Fungicides are somewhat mysterious chemicals because their behavior on or inside of plants, and how they physiologically affect microorganisms, is not clear. **Fungicides are divided into three types: contacts, penetrants, and systemics.** Fungicides also are classified by mode of action or chemical composition. These classification systems or groupings, and some other terms associated with fungicides, are confusing and sometimes misleading. For example, most fungicides are not fungicidal, and penetrants can provide activity on the surface of tissues as well as from within tissues. Most fungicides are actually fungistatic. That is, most fungicides only prevent growth or development of fungi

and do not actually kill them in soil. Several contact fungicides can kill fungal spores as they germinate, but even most contacts tend to be fungistatic. Another contradiction centers on the use of the word systemic. A systemic chemical by definition is capable of moving throughout a plant from leaves to stems to roots or vice versa. In fact, **the only truly systemic turf fungicide is fosetyl aluminum (Aliette Signature®).** Most other so-called systemics are better referred to as penetrants, because they either remain localized inside tissue or primarily move upward in the xylem in response to the transpiration stream. The translocation behavior and mode of action of penetrants are described below and are summarized in the table on page 3.

The largest number of fungicides in the turf market having the same mode of action are the **sterol inhibitors (SI).** They also may be referred to as DMI or demethylation inhibitors. Most of the SI fungicides are chemically classified as triazoles. When applied to a turfgrass plant, **an SI fungicide will penetrate tissue and move upward (i.e., acropetal penetrant) from the point of tissue contact. The SI's also are capable of lateral diffusion from the upper to lower surface and vice versa,** and may exhibit limited downward movement. Downward or basipetal movement of SI's, however, is only a few millimeters. Hence, **the molecules of an SI fungicide that contact leaf tissues are highly unlikely to translocate to roots.** However, chemical that contacts basal leaf sheaths, or runs down between leaf sheaths, may be transported into axillary buds and possibly stems.

Azoxystrobin (Heritage®) is chemically classified as a strobilurin fungicide. Strobilurin was derived from a mushroom fungus and stabilized to prevent rapid deterioration in the environment. **Azoxystrobin is a penetrant that moves across leaves from upper to lower leaf surfaces and vice versa, and also moves upward**

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