

Several combinations of members of the pyridines are available, e.g. **triclopyr** + **2,4-D** (Crossbow, Turflon II Amine, Turflon D); **clopyralid** + **triclopyr** (Confront)

Uses

Triclopyr and **picoloram** are selective herbicides for most annual and perennial broadleaf weeds in monocot crops. They also are used for bush control in reforestation, rights-of-ways, and other industrial sites. **Dithiopyr** is a recent proposed member of the pyridines. It is a preemergence herbicide with control similar to the dinitroanilines. **Picoloram** has a restricted product use label in the state of Florida. Its main use is currently for the spot treatment of stumps or suckers. **Clopyralid** is a recent introduction not as persistent in soils as **picoloram** or **triclopyr** and it has a greater potential for selective use in crops. It also controls many broadleaf and woody plants in rangeland and mono-crop areas. Various combinations of **clopyralid** with a **2,4-D**, **MCPA** or other herbicides are available to extend its spectrum of control. Current uses in turf exist, but are generally restricted to cool-season grasses.

Behavior in Plants

Absorption and translocation

Picoloram, **clopyralid**, and **triclopyr** are absorbed by roots and foliage. They translocate in phloem or xylem and accumulate in meristematic regions. **Picoloram** penetrates leaves similar to phenoxy (2,4-D) but is freely mobile, readily penetrates roots and is highly phytotoxic. **Picoloram** also can be exuded by roots. A rain-free period of 4 hours is required. **Dithiopyr's** behavior in plants is not entirely known. Foliar absorption may occur with limited translocation and effects vary with species.

Selectivity

Picoloram, **clopyralid**, and **triclopyr** are used postemergence to control most annual and perennial broadleaf weeds. Most grasses are resistant. **Picoloram**, **triclopyr** and **clopyralid** are much more active on susceptible species than 2,4-D or other phenoxy herbicides and are more effective on certain resprouting woody species.

Dithiopyr provides selective preemergence annual grass and small-seeded broadleaf control with some early postemergence activity. **Dithiopyr's** selectivity is

similar to the members of the dinitroanilines, with a wider range of broadleaf weed activity.

Mechanism and mode of action

Triclopyr and **picoloram** both exhibit a hormonal or growth regulatory mode of action. **Picoloram** and **triclopyr** effect nucleic acid synthesis and metabolism, regulating protein synthesis in cells and affecting enzymes and enzyme systems. The mechanism of action for **clopyralid** is not known but appears to be similar to that of the phenoxy herbicides. With these herbicides, leaf shape is effected at low dosages. The tips of new leaves may develop into narrow extensions of the midrib. Thickening of the mesophyll and distinct puckering of young leaves may also develop. With increased dosage, cupping and stunting of leaves is observed and terminal growth ceases. Tissue proliferation along the stem may take place, first at the stem tips, then nodes, and finally throughout the length of the stem. Meanwhile, epinasty, bending and splitting of the stem occurs and the roots deteriorate. **Dithiopyr** disrupts spindle microtubule formation, inhibits cell division and results in an accumulation of mitotic cells in late pro-metaphase. Seed germination is not inhibited but subsequent developmental processes do not proceed normally.

Degradation

Picoloram and **triclopyr** are stable in plants and degraded slowly. **Picoloram** appears to dissipate readily in grasses but not in broadleaf plants. Due to **dithiopyr's** limited translocation in plants, degradation is not a basis of selectivity. **Clopyralid** remains unchanged in plants.

Behavior in soils

Adsorption and leaching

Picoloram is formulated as a potassium salt and can dissociate forming an anion which interacts only slightly with soil colloids. **Picoloram** leaches readily in coarse sandy soils containing small amounts of organic matter. **Triclopyr** and **clopyralid** are presumed to behave in the same fashion. **Clopyralid** is not strongly absorbed. **Dithiopyr** has limited movement in soils.

Persistence

Picoloram is persistent in soils and slowly degraded by soil microorganisms, which is why it is a restricted use herbicide. **Picoloram** is not lost by volatility or