THE USE OF PELARGONIC ACID AS A WEED MANAGEMENT TOOL

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In 1995, the Mycogen Corporation introduced Scythe®, a burn-down herbicide containing 60% of the active ingredient, pelargonic acid. Pelargonic acid is a naturally occurring, saturated, nine-carbon fatty acid (C9:0). Pelargonic acid occurs widely in nature in products such as goat's milk, apples and grapes. Commercially it is produced by the ozonolysis of oleic acid (C18:1) from beef tallow.

Pelargonic acid has very low mammalian toxicity (oral, inhalation), is not mutagenic, teratogenic or sensitizing. It can cause eye and skin irritation and thus the formulated product carries a WARNING signal word (Category II). It has a benign environmental profile.

As a herbicide, pelargonic acid causes extremely rapid and non-selective burn-down of green tissues. The rate of kill is related to temperature, but under all but the coolest conditions the treated plants begin to exhibit damage within 15-60 minutes and begin to collapse within 1-3 hours of the application. Pelargonic acid is not systemic and is not translocated through woody tissues. It is also active against mosses and other cryptograms. Pelargonic acid has no soil activity. As with most burn-down herbicides, pelargonic acid does not prevent re-growth from protected buds or basal meristems. Many annual herbaceous weeds can be killed completely while larger weeds, grasses and woody plants may re-grow.

There are many practical applications of the rapid burn-down activity of pelargonic acid. It can be used for spot weeding, edging, lining, turf renewal, chemical pruning and suckering. It is particularly useful as a directed spray for killing annual weeds in container-grown woody ornamentals, under greenhouse benches and in other places where systemic herbicides can cause unwanted damage. If the spray of pelargonic acid does come in contact with some desired plants, the damage is strictly limited to those leaves which are actually sprayed. Pelargonic acid should be applied in at least 75 gallons/acre of total spray volume as activity declines at lower gallonages.

Evidence from P_{31} NMR studies suggests that the mode of action of pelargonic acid is not based on direct damage to cell membranes. Pelargonic acid moves through the cuticle and cell membranes and lowers the internal pH of the plant cells. Over the next several minutes the pools of cellular ATP and Glucose-6-phosphate decline. Only later is there evidence of membrane dysfunction which eventually leads to cell leakage, collapse and desiccation of the tissue. This chain of cellular events appears to allow pelargonic acid to synergize the activity of certain systemic herbicides such as glyphosate.

In general, burn-down herbicides are antagonistic to the activity of systemic herbicides, but in a tank mix pelargonic acid has been shown to allow greater and more rapid uptake of glyphosate without interfering with translocation. This type of synergy is completely distinct from the enhancement seen with various surfactants used as adjuvants or formulation components for glyphosate. By using high volume applications of a tank mix it is possible to combine the rapid kill of pelargonic acid with the systemic action of glyphosate. At low application volumes (e.g. 20-30 GPA), pelargonic acid still enhances glyphosate uptake and improves its overall performance, but there is no immediate burn of the treated foliage.

Scythe herbicide was registered for non-crop use in 1995 and a crop registration is expected in 1996. This commercial formulation of pelargonic acid has a wide range of weed control applications both as a contact, non-selective agent and as a tank mixing partner with systemic herbicides such as glyphosate.