Milestone\textsuperscript{TM}*: A New Broad Spectrum Preemergence Herbicide for Tree Fruit, Tree Nut and Vineyard Crops.

(*pending registration)

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Milestone\textsuperscript{TM} (azafenidin, DPX-R6447) is a new broad spectrum preemergence herbicide for use in tree fruit, tree nut and vineyard crops. Milestone is currently under development in the U. S. and registration is pending further EPA review. Field testing continues in citrus, grapes, sugarcane, vegetation management (rail roads, road sides, industrial weed control, hybrid poplar, eucalyptus and Christmas trees), pome fruit, some stone fruit, tree nuts, blueberries, coffee, asparagus, grass seed and sunflower.

Milestone is an N-phenyl heterocycle triazolone herbicide developed by DuPont Crop Protection. Milestone acts by inhibiting the porphyrin biosynthetic pathway at a site that causes the accumulation of a photodynamic porphyrin intermediate, protoporphyrin IX. Protoporphyrin IX absorbs light and transfers this energy to O\textsubscript{2}, creating a highly reactive singlet oxygen species that indiscriminately reacts with cellular components, resulting in cell membrane disruption. The diphenyl ether, oxadiazole, iso-urazole, N-phenylpthalimides and triazolinone herbicides also act as inhibitors of protoporphyrinogen oxidase (1, 2, 3).

The toxicological and ecotoxicological studies completed thus far indicate that Milestone presents a very low risk to humans, animals and the environment. In mammals, the technical active ingredient in Milestone has shown to have low acute oral (rat, >5000 mg/kg) and dermal (rabbit, >2000 mg/kg) toxicity. It is not an eye irritant or skin sensitizer and was negative for the Ames mutagenicity test. A study done in fish with the technical active ingredient indicates that Milestone does not bioaccumulate. In chronic toxicological tests with the formulated product (80 WG), Milestone was shown to be non-oncogenic (mouse), and not a teratogen (rabbit).

The primary mode of degradation is by soil microbes. The soil degradation half-lives (disappearance time in days) for several locations within the US were: CA – 129 days, FL – 4 days, MD – 47 days and WA – 72 days. Soil photolysis plays a minor role in the degradation process. The soil photolysis half-life was 79 days. In laboratory studies, Milestone is stable in water for 39 days at pH’s of 5, 7, and 9 at temperatures of 77° F and 98.6° F. Although Milestone is stable to hydrolysis it rapidly photo degrades in aquatic systems with a half-life of 1.5 - 2 days (natural sunlight equivalents). Milestone is not volatile.

Milestone provides very effective weed control at lower than current standard herbicide use rates. The labeled use rate will vary from 4 – 16 ounces active ingredient per acre (oz ai/a) depending on either the crop, weed species or application program (single or sequential applications). The maximum single application rates are 12 and 16 oz ai/a (16 oz ai/a only in citrus, all other crops will have maximum single application rate of 12 oz ai/a). The maximum
yearly use rates are 24 and 32 oz ai/a. At use rates of 8 – 16 oz ai/a applied preemergence, Milestone provides four to eight months residual control of some of the most important broadleaf weeds and grasses in orchard crops and vineyards. A partial list of weeds controlled include: wild radish (*Raphanus sativus*), cheeseweed (*Malva parviflora*), pannicle willowherb (*Epilobium paniculatum*), common groundsel (*Senecio vulgaris*), puncturevine (*Tribulus terrestris*), Russian thistle (*Salsola australis*), barnyardgrass (*Echinochla crus-galli*), witchgrass (*Panicum capillare*), annual bluegrass (*Poa annua*), large crabgrass (*Digitaria sanguinalis*) and seedling johnsongrass (*Sorghum halepense*).

At suggested use rates Milestone has provided excellent selectivity across a wide range of tree fruit, tree nut and grape cultivars. These tests have included Milestone at the proposed X and 2X use rates applied in single applications, sequential applications and multi-year application programs for the proposed labeled crops. Further field tests are underway to evaluate the potential for Milestone use in young orchards and vineyards and to refine use rates and programs for crops grown in very sandy soil conditions.

In summary, Milestone applied preemergence is an excellent broad spectrum, residual herbicide for use in many fruit and nut crops grown in the US. Its low use rate, low soil mobility and good toxicological profile make it an excellent herbicide choice for weed management programs in the proposed crops.

**References**


2. www.psu.missouri.edu/agronx/weeds/herbinjsymptoms/cellmem.html

3. www.ext.nodak.edu/extnews/weedpro/hma/herbcm03.txt