Minnesota Department of Natural Resources Pesticide Environmental and Social Risk Assessment

Pesticide Active Ingredient: Clethodim

Version 1.1

2022

Environmental Assessment

Pesticide: Clethodim	**Hazard Status:** Clethodim is not considered a highly hazardous pesticide (HHP) per the FSC Pesticides Policy (FSC-POL-30-001 V3-0 EN) and the FSC Lists of Highly Hazardous Pesticides (FSC-POL-30-001a EN).
Specific Formulation (CAS#):	**Envoy Plus and Intensity One** (99129-21-2): clethodim – 12.6%; other ingredients – 87.4%
Environmental values	**Description of why/why not a risk**
Soil (erosion, degradation, biota, carbon storage)	**Minimal indication of adverse effects to soil was found when clethodim is used according to label instructions.** Clethodim is of low persistence in most soils with a half-life of approximately 3 days. Breakdown is mainly by aerobic processes, although photolysis may make some contribution. Volatilization loss and hydrolysis are probably not important processes in the soil breakdown of clethodim. Clethodim and its degraded components are weakly bound to soils. While it may be somewhat mobile in the soil environment, it is very short lived. According to the EPA, "under present use patterns and under most circumstances clethodim does not appear to threaten groundwater." In field studies, no vertical movement of the parent compound or residues was observed below the top 8inches of the soil (3).
Water (ground water, surface waters, water supplies)	**Minimal indication of adverse effects to water was found when clethodim is used according to label instructions.** According to the EPA, "under present use patterns and under most circumstances clethodim does not appear to threaten groundwater." Clethodim may be highly persistent in the aquatic environment. Reported half-lives for clethodim in the aquatic environment are 128 days in the aqueous phase and 214 days in the sediment. The reported hydrolysis half-life at pH 7–9 is approximately 300 days. The main pathway for degradation of clethodim in the aquatic environment is anaerobic metabolism by microorganisms. However, due to the low persistence and mobility of the compound, it is unlikely to be found in surface or ground water (3).
Atmosphere (air quality, greenhouse gasses)	**Minimal indication of adverse effects to atmosphere was found when clethodim is used according to label instructions.** As clethodim easily becomes vapor, absorption from inhalation exposure could be significant, particularly at higher temperatures. Clethodim is harmful if inhaled, but does not produce known risks to the atmosphere (1, 2).
Non-target species (vegetation, wildlife, bees and other pollinators, pets)	**Risk of adverse effects from clethodim varies with non-target species.** Clethodim is practically non-toxic to birds and honeybees. It is slightly toxic to fish and aquatic invertebrate species, but is unlikely to reach water when used according to the label and the contract stipulations. The EPA has stated that "available…wildlife data indicate that the proposed uses on cotton and soybeans will result in minimal hazard to non-target and endangered beneficial

	insect, avian and freshwater fish and mammalian species." Pets are generally not allowed in natural areas. Clethodim may be highly persistent in the aquatic environment (3).
Non-timber forest products (as FSC-STD-01-001 V5-2 FSC Principles and Criteria, criterion 5.1)	**Minimal indication of adverse effects to non-timber forest products was found when clethodim is used according to label instructions.** Clethodim is selectively toxic to plants, affecting only grass species. It does not bio-accumulate in the food chain.
High Conservation Values (particularly HCV 1-4)	**Minimal indication of adverse effects to HCV 1-4.** Clethodim is applied in HCV forest areas within and adjacent to natural areas to target invasive, exotic, and/or noxious weed species. This is done to restore and conserve native plant and animal species and restore and retain ecological balance. Clethodim is potentially toxic to rare plant species (1, 2).
Landscape (aesthetics, cumulative impacts)	**Minimal indication of adverse effects to landscape values was found when clethodim is used according to label instructions, but that is dependent on location and scale of use.** Application of clethodim at expected levels for the purposes of vegetation management in natural areas is expected to enhance the landscape through invasive species control and establishment of native tree species. Clethodim is slightly toxic to fish and is persistent in water, but typical use is not expected to result in delivery to water. Clethodim has no soil residual activity, and does not bioaccumulate in the food chain.
Ecosystem services (water, soil, carbon sequestration, tourism)	**Minimal indication of adverse effects to ecosystem services if clethodim moves into surface or ground water during or following applications.** Clethodim is not expected to degrade ecosystem services such as soil quality and the land's ability to sequester carbon. Beyond the limited entry interval, clethodim does not decrease access to the forests. Clethodim may be highly persistent in the aquatic environment. However, due to the low persistence and mobility of the compound, it is unlikely to be found in surface or ground waters.

Mitigation strategies defined to minimize environmental risk[1]
Follow all pesticide label application instructions. Follow applicable criterion and indicators from the FSC US FM Standard V1.0 (e.g., Criterion 4.3 for worker safety, Criterion 7.3 for worker training, Criterion 6.5 for protecting water resources, and Criteria 8.1 and 8.2 for Monitoring). Additional risk mitigation strategies are provided below. Applicators should take reasonable steps to avoiding environmental and social impacts by considering the mitigation strategies provided below as well as application-, organization-, or location-specific strategies. **General consideration of exposure variables designed to mitigate risk:** - Know and understand the specific pesticide formulation and/or tank mixture, as its unique formulation may provide a different risk characterization. - Seek to minimize the frequency, interval, and amount of application.

- Use the most efficient and effective method of application by seeking to minimize risk to environmental and social values.
- Understand the site (e.g., soil type, topography, etc.) and climatic (e.g., wind, temperature, and humidity) conditions and the likely effect on risk to environmental and social values.
- Have appropriate waste management systems in place.

To mitigate risk to the environment, project proposers, applicators, and workers should:
- Use appropriate rates by geographical area, as specified on this label.
- Choose proper mixing/loading site.
- Follow appropriate application procedures to minimize potential for clethodim movement into surface and ground water.
- Not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply where runoff will occur. Do not contaminate water when disposing of equipment wash waters or rinsate (1, 2).
- Not apply under conditions of plant stress where active growth is not occurring (1, 2).
- Not apply if rain is expected within 1-hour of application (1, 2).
- Not apply a post-emergence broadleaf pesticide within one day of clethodim treatment (1, 2).
- Not apply or otherwise permit this product or sprays containing this product to come into contract with any non-target crop or desirable vegetation (1, 2, 3).
- Not apply if site-specific characteristics and conditions exist that unmitigated could contribute to movement into surface and ground water (1, 2).
- Not make applications when circumstances favor movement from treatment site (1, 2).
- Not apply to grasses that have tillered, formed seedheads, or exceeded recommended growth stage (1, 2).
- Not mow treatment area two-weeks prior (1, 2).
- Not use more than one application per year (1, 2).
- Ensure, a level and well-maintained vegetative buffer strip (of at least 100 feet) is present between treatment unit and surface water features such as ponds, streams, and springs.
- Ensure applications are only made when there is little or no hazard from spray drift. Avoid high temperature, low relative humidity, steady winds of 10 mph or greater, and gusty wind conditions. Very small quantities of spray, which may not be visible, may seriously injure susceptible grasses (1, 2).

[1] Mitigation strategies have been categorized to avoid redundancy.

(1) Valent Professional Products. Pesticide Product Label [Envoy Plus]. Retrieved from: https://www.cdms.net/ldat/ld82U002.pdf
(2) Loveland Products. Pesticide Product Label [Intensity One®]. Retrieved from: https://s3-us-west-1.amazonaws.com/agrian-cg-fs1-production/pdfs/Intensity_One_Label9.pdf
(3) USDA/Forest Service. 2014. Scoping/Screening Level Risk assessment on Clethodim: Final Report. Prepared by Syracuse Environmental Research Associates, Inc. under USDA Forest Service Contract AG-3187-C-12-0009. Retrieved from: https://www.fs.fed.us/foresthealth/pesticide/pdfs/Clethodim_Report.pdf

Pesticide: Clethodim	**Hazard Status:** Clethodim is not considered a highly hazardous pesticide (HHP) per the FSC Pesticides Policy (FSC-POL-30-001 V3-0 EN) and the FSC Lists of Highly Hazardous Pesticides (FSC-POL-30-001a EN).
Specific Formulation (CAS#):	**Envoy Plus and Intensity One** (99129-21-2): clethodim – 12.6%; other ingredients – 87.4%
Social values	**Description of why/why not a risk**
High Conservation Values (especially HCV 5-6)	**Minimal indication of adverse effects to high conservation values was found when clethodim is used according to label instructions.** Beyond the limited entry interval following application, clethodim does not decrease access to the forests. However, during that interval, anyone accessing treated lands for traditional hunting and gathering or for any other reason could introduce hazards to themselves or the people around them. Threats to HCVs beyond the limited entry interval are not significant.
Health (fertility, reproductive health, respiratory health, dermatologic, neurological and gastrointestinal problems, cancer and hormonal imbalance)	**Minimal indication of adverse effects to human health was found when clethodim is used according to label instructions.** Clethodim is readily absorbed in the gastrointestinal tract, where it is rapidly metabolized and eliminated. Clethodim is moderately toxic by ingestion (3). Mitigation for this risk can be found on the commercial product labels under "First Aid; If Swallowed," using proper PPE, and by following the label's user safety recommendations, especially where they pertain to washing hands before eating, drinking, chewing gum, or using tobacco (1, 2). Clethodim is practically non-toxic by dermal absorption and inhalation. The liver was the primary organ affected in chronic animal studies. In a one-year feeding study of dogs, doses of 75 mg/kg/day resulted in increased relative and absolute liver weights, with anemia-like alterations in blood chemistry such as reduced hemoglobin, erythrocyte and hematocrit counts. In a two-year chronic study of rats, no compound-related effects on the structure and function of the liver were observed, and no changes in liver weights were observed at the highest dose tested. No effects on fertility, length of gestation, or growth and development of offspring were observed at doses up to and including the highest dose tested. Evidence suggests that while there have been documented teratological effects in animal studies, such effects are unlikely in humans under normal conditions of exposure. Mutagenicity studies indicated that clethodim did not show mutagenic potential. Based on the available data, it appears that clethodim is not carcinogenic (3).
Welfare	**No indication of adverse effects to welfare was found when clethodim is used according to label instructions.**
Food and water	**Minimal indication of adverse effects to food was found when clethodim is used according to label instructions.** Clethodim does not bioaccumulate in the food chain as clethodim degrades quickly in soil and is therefore not likely to reach surface water or groundwater.
Social Infrastructure; (schools and hospitals, recreational infrastructure,	**Minimal indication of adverse effects to social infrastructure was found when clethodim is used according to label instructions.** Natural area applications of clethodim are not expected to introduce risk to nearby social infrastructure such as schools, hospitals, or recreational infrastructure—either in the short or long term.

infrastructure adjacent to the management unit)	
Economic viability (agriculture, livestock, tourism)	**Minimal indication of adverse effects to economic viability was found when clethodim is used according to label instructions.** Natural area applications of clethodim are not known to introduce risk to the economic viability of DNR lands or adjacent lands, particularly since natural areas are not managed for economic returns.
Rights (legal and customary)	**Minimal indication of adverse effects to rights was found when clethodim is used according to label instructions.** Application of clethodim has no known impacts upon legal or customary rights or access for hunting and gathering purposes. Clethodim is most often applied to non-native, invasive, and noxious grasses. When applied properly, clethodim will have no impact upon native, traditional, customary, or legal rights to gather native species or access areas where hunting and gathering is permitted.
Others	**No additional values were identified in this assessment.**

Mitigation strategies defined to minimize social risk[1]
Follow all pesticide label application instructions. Follow applicable criterion and indicators from the FSC US FM Standard V1.0 (e.g., Criterion 4.3 for worker safety, Criterion 7.3 for worker training, Criterion 6.5 for protecting water resources, and Criteria 8.1 and 8.2 for Monitoring). Additional risk mitigation strategies are provided below. Applicators should take reasonable steps to avoid environmental and social impacts by considering the mitigation strategies provided below, as well as application-, Organization-, or location-specific strategies. **General consideration of exposure variables designed to mitigate risk:** - Know and understand the specific pesticide formulation and/or tank mixture, as its unique formulation may provide a different risk characterization. - Seek to minimize the frequency, interval, and amount of application. - Use the most efficient and effective method of application by seeking to minimize risk to environmental and social values. - Understand the site (e.g., soil type, topography, etc.) and climatic (e.g., wind, temperature, and humidity) conditions and the likely effect on risk to environmental and social values. - Have appropriate waste management systems in place. **To minimize risk to workers and the public, project proposers, applicators, handlers and workers should:** - Not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. Follow label recommended Personal Protective Equipment (PPE) which includes:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves, such as barrier laminate or viton >= 14 mils.
- Protective eyewear
- Shoes plus socks

- Avoid contact with eyes or clothing.
- Wash hands thoroughly with soap and water before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove and dispose of clothing immediately if pesticide drenches.
- Clean PPE separately from clothing.
- Reduce the possibility of public consumption of contaminated wild food (e.g., fruit or fungi) and public exposure to pesticides through public outreach and engagement, limiting access, and/or appropriate signage.
- Consider effects on local communities and indigenous peoples when considering limiting access to treatment areas.

To minimize risk to food and water resources, project proposers, applicators, handlers, and workers should:
- Make applications only when there is little or no hazard from spray drift. Very small quantities of spray, which may not be visible, may seriously injure susceptible plants (1, 2).
- Not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash waters or rinsate (1, 2).
- Not apply through any type of irrigation system (1, 2).
- Not contaminate water intended for irrigation. To avoid injury to crops or other desirable vegetation, do not treat or allow spray drift or run-off to fall onto banks or bottoms of irrigation ditches, either dry or containing water, or other channels that carry water that may be used for irrigation purposes (1, 2).
- Not plant the treated sites in the same year as treatment.

[1] Mitigation strategies have been categorized to avoid redundancy.

Sources

(1) Valent Professional Products. Pesticide Product Label [Envoy Plus]. Retrieved from: https://www.cdms.net/ldat/ld82U002.pdf
(2) Loveland Products. Pesticide Product Label [Intensity One®]. Retrieved from: https://s3-us-west-1.amazonaws.com/agrian-cg-fs1-production/pdfs/Intensity_One_Label9.pdf
(3) USDA/Forest Service. 2014. Scoping/Screening Level Risk assessment on Clethodim: Final Report. Prepared by Syracuse Environmental Research Associates, Inc. under USDA Forest Service Contract AG-3187-C-12-0009. Retrieved from: https://www.fs.fed.us/foresthealth/pesticide/pdfs/Clethodim_Report.pdf