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Proposed Registration Decision PRD2015-30

Acetic Acid

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Table of Contents

Overview ... 1
Proposed Registration Decision for Acetic Acid ... 1
What Does Health Canada Consider When Making a Registration Decision? ... 1
What Is Acetic Acid? ... 2
Health Considerations ... 2
Environmental Considerations ... 3
Value Considerations ... 4
Measures to Minimize Risk ... 4
Next Steps ... 4
Other Information ... 5
Science Evaluation ... 7
1.0 The Active Ingredient, Its Properties and Uses ... 7
1.1 Identity of the Active Ingredient ... 7
1.2 Physical and Chemical Properties of the Active Ingredients and End-Use Product ... 7
1.3 Directions for Use ... 8
1.4 Mode of Action ... 8
2.0 Methods of Analysis ... 8
2.1 Methods for Analysis of the Active Ingredient ... 8
2.2 Method for Formulation Analysis ... 9
3.0 Impact on Human and Animal Health ... 9
3.1 Toxicology Summary ... 9
3.1.1 Incident Reports ... 9
3.2 Food Residue Exposure Assessment ... 10
3.2.1 Food and Drinking Water ... 10
3.2.2 Maximum Residue Limits (MRLs) ... 10
3.3 Occupational Exposure and Risk Assessment ... 11
3.3.1 Use Description ... 11
3.3.2 Mixer, Loader and Applicator Exposure and Risk Assessment ... 11
3.3.3 Bystander Exposure ... 11
3.3.4 Postapplication Exposure ... 12
4.0 Impact on the Environment ... 12
5.0 Value ... 12
6.0 Pest Control Product Policy Considerations ... 13
6.1 Toxic Substances Management Policy Considerations ... 13
6.2 Formulants and Contaminants of Health or Environmental Concern ... 13
7.0 Summary ... 14
7.1 Human Health and Safety ... 14
7.2 Environmental Risk ... 14
7.3 Value ... 15
8.0 Proposed Regulatory Decision ... 15
List of Abbreviations ... 17

Appendix I Tables and Figures 19
Table 1 Supported Uses..... 19
References 21

Overview

Proposed Registration Decision for Acetic Acid

Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the *Pest Control Products Act* and Regulations, is proposing full registration for the sale and use of Horticultural Vinegar Technical and Vanish Herbicide, containing the technical grade active ingredient acetic acid, to control or suppress various annual and perennial weeds around apple trees, grape vines and cranberries.

An evaluation of available scientific information found that, under the approved conditions of use, the product has value and does not present an unacceptable risk to human health or the environment.

This Overview describes the key points of the evaluation, while the Science Evaluation provides detailed technical information on the human health, environmental and value assessments of acetic acid and Vanish Herbicide.

What Does Health Canada Consider When Making a Registration Decision?

The key objective of the *Pest Control Products Act* is to prevent unacceptable risks to people and the environment from the use of pest control products. Health or environmental risk is considered acceptable[1] if there is reasonable certainty that no harm to human health, future generations or the environment will result from use or exposure to the product under its proposed conditions of registration. The Act also requires that products have value[2] when used according to the label directions. Conditions of registration may include special precautionary measures on the product label to further reduce risk.

To reach its decisions, the PMRA applies modern, rigorous risk-assessment methods and policies. These methods consider the unique characteristics of sensitive subpopulations in humans (for example, children) as well as organisms in the environment. These methods and policies also consider the nature of the effects observed and the uncertainties when predicting the impact of pesticides. For more information on how the PMRA regulates pesticides, the assessment process and risk-reduction programs, please visit the Pesticides and Pest Management portion of Health Canada's website at healthcanada.gc.ca/pmra.

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1 "Acceptable risks" as defined by subsection 2(2) of the *Pest Control Products Act.*

2 "Value" as defined by subsection 2(1) of the *Pest Control Products Act*: "… the product's actual or potential contribution to pest management, taking into account its conditions or proposed conditions of registration, and includes the product's (*a*) efficacy; (*b*) effect on host organisms in connection with which it is intended to be used; and (*c*) health, safety and environmental benefits and social and economic impact."

Before making a final registration decision on acetic acid, the PMRA will consider any comments received from the public in response to this consultation document.[3] The PMRA will then publish a Registration Decision[4] on acetic acid, which will include the decision, the reasons for it, a summary of comments received on the proposed final registration decision and the PMRA's response to these comments.

For more details on the information presented in this Overview, please refer to the Science Evaluation of this consultation document.

What Is Acetic Acid?

Acetic acid is a non-selective contact herbicide. When it comes into contact with any parts of the plant, the acid quickly destroys the cell membrane, causing the leaves or root tissues to dry out.

Health Considerations

Can Approved Uses of Acetic Acid Affect Human Health?

Acetic Acid is unlikely to affect human health when used according to label directions.

Exposure to acetic acid may occur when handling and applying the end-use product, Vanish Herbicide, such as during mixing, loading or applying the product, or during clean up and maintenance activities. When assessing health risks, two key factors are considered: the levels where no health effects occur and the levels to which people may be exposed. The dose levels used to assess risks are established to protect the most sensitive human population (for example, children and nursing mothers). Only uses for which the exposure is well below levels that cause no effects in animal testing are considered acceptable for registration.

The technical grade active ingredient, acetic acid, is of low acute toxicity by the oral, dermal and inhalation routes of exposure and is not considered a dermal sensitizer. Based on the low pH of 2 to 3, acetic acid is considered corrosive to the eyes and mildly irritating to the skin and respiratory tract.

Exposure to humans from the commercial use of Vanish Herbicide is not expected to be of concern due to the precautionary statements present on the label that are aimed at mitigating exposure.

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3 "Consultation statement" as required by subsection 28(2) of the *Pest Control Products Act*.

4 "Decision statement" as required by subsection 28(5) of the *Pest Control Products Act*.

Residues in Water and Food

Dietary risks from food and water are not of concern.

The new uses for Vanish Herbicide are for directed applications to control labelled weed between apple trees and grape vines, and spot spraying or direct soil injection into weeds surrounding cranberry plants. Vanish Herbicide is not applied directly to food. Therefore, dietary exposure to acetic acid from the new uses is anticipated to be negligible. The PMRA has determined that a maximum residue limit is not required for acetic acid for use on these crops.

No risk due to exposure from drinking water is anticipated as acetic acid readily biodegrades into non-toxic substances and is, thus, unlikely to persist in the environment to the extent that it could be consumed in drinking water.

Occupational Risks From Handling Vanish Herbicide

Occupational risks are not of concern when Vanish Herbicide is used according to label directions, which include protective measures.

For the new uses in and around apple trees and grape vines, Vanish Herbicide is to be applied to weeds by foliar application using ground application equipment or by hand held backpack sprayers when the wind is minimal. For cranberries, the end-use product is applied as a soil injection to the base of target weeds or as a spot treatment directly to target weeds using a CO_2 pressurized backpack sprayer with an adjustable or specialized nozzle.

Occupational exposure to individuals mixing, loading or applying Vanish Herbicide is not expected to result in unacceptable risk when the product is used according to label directions.

Precautionary statements (for example, wearing of personal protective equipment) and hygiene statements on the label are considered adequate to protect individuals from any unnecessary risk due to occupational exposure.

Environmental Considerations

What Happens When Vanish Herbicide Is Introduced Into the Environment?

Vanish Herbicide is not expected to pose an unacceptable risk to the environment when used according to label instructions.

Vanish Herbicide controls weeds in apple orchards and grape vineyards through directed surface application around the base of the trees/vines, and in cranberry fields by spot spraying or injection into the soil at the root system level. Due to the directed methods of application of these uses and the known properties of acetic acid (i.e. does not persist in soil as it readily biodegrades into non-toxic substances), the potential for exposure of non-target terrestrial and aquatic organisms to acetic acid in Vanish Herbicide is expected to be low. Therefore, the risk associated with the use of this product at the new use patterns and application rates is expected to be negligible.

Value Considerations

What Is the Value of Vanish Herbicide

An application of Vanish Herbicide provides a non-conventional alternative for annual and perennial weed control in cranberry, apple and grape production.

Acetic acid is an active ingredient found in a number of domestic and commercial end-use herbicide products, including the 20% solution of Vanish Herbicide. Typically acetic acid based herbicides are used for non-selective vegetation control in and around established trees and shrubs, non-crop areas, rights-of-way and industrial land sites. The availability of Vanish Herbicide in the proposed crops could help to reduce the use of conventional herbicides in these crops.

Measures to Minimize Risk

Labels of registered pesticide products include specific instructions for use. Directions include risk-reduction measures to protect human and environmental health. These directions must be followed by law.

The key risk-reduction measures being proposed on the label of Vanish Herbicide to address the potential risks identified in this assessment are as follows.

Key Risk-Reduction Measures

Human Health

Precautionary statements and corresponding hazard identification and action statements are required on the technical product label to inform workers of the irritation potential of the active ingredient and to caution that it is corrosive to the eyes and that it causes irritation when absorbed through the skin.

The principal display panel has the signal words “CAUTION SKIN IRRITANT” and “DANGER CORROSIVE TO EYES”. Therefore, in the secondary display panel, the following statement in the PRECAUTIONS section is required: “CORROSIVE to the eye, DO NOT get in eyes. May irritate skin. Avoid contact with skin and clothing.”

Next Steps

Before making a final registration decision on acetic acid, the PMRA will consider any comments received from the public in response to this consultation document. The PMRA will accept written comments on this proposal up to 45 days from the date of publication of this document. Please forward all comments to Publications (contact information on the cover page of this document). The PMRA will then publish a Registration Decision, which will include its decision, the reasons for it, a summary of comments received on the proposed final decision and the Agency’s response to these comments.

Other Information

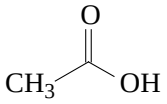
When the PMRA makes its registration decision, it will publish a Registration Decision on acetic acid (based on the Science Evaluation of this consultation document). In addition, the test data referenced in this consultation document will be available for public inspection, upon application, in the PMRA's Reading Room (located in Ottawa).

Science Evaluation

Acetic Acid

1.0 The Active Ingredient, Its Properties and Uses

1.1 Identity of the Active Ingredient

Active substance	Acetic Acid
Function	Herbicide
Chemical name	
1. International Union of Pure and Applied Chemistry (IUPAC)	Acetic Acid
2. Chemical Abstracts Service (CAS)	Ethanoic acid
CAS number	64-19-7
Molecular formula	$C_2H_4O_2$
Molecular weight	60.05
Structural formula	
Purity of the active ingredient	20%

1.2 Physical and Chemical Properties of the Active Ingredients and End-Use Product

Technical Product— Horticultural Vinegar Technical

Property	Result
Colour and physical state	Clear and colourless liquid
Odour	Vinegar odour
Melting range	N/A
Boiling point or range	117.9°C
Specific gravity	1.014 to 1.024
Vapour pressure at 20°C	15.7 mmHg
Ultraviolet (UV)-visible spectrum	Not expected to absorb at wavelengths > 300 nm
Solubility in water at 20°C	Miscible in all proportions
Solubility in organic solvents at 20°C	Complete solubility in ethanol and ether

n-Octanol-water partition coefficient (K_{ow})	log K_{ow} = -0.17
Dissociation constant (pK_a)	4.76 at 25°C
Stability (temperature, metal)	Stable

End-Use Product—Vanish Herbicide

Property	Result
Colour	Clear and colourless
Odour	Vinegar odour
Physical state	Liquid
Formulation type	Solution
Guarantee	20%
Container material and description	Plastic drums or glass lined tankers 250 mL to 4 litres
Specific gravity	1.022 – 1.032
pH of 1% dispersion in water	2 – 3
Oxidizing or reducing action	Corrosive to metals. Reacts with oxidants and bases.
Storage stability	The product is expected to be stable when stored in ambient temperatures in commercial packages.
Corrosion characteristics	The product is not expected to be corrosive to the packaging material.
Explodability	Product is not explosive.

1.3 Directions for Use

Vanish Herbicide is applied at different concentrations depending on the spectrum of weeds present and their size. Applications may be made using a variety of methods (shielded or hooded broadcast boom sprayer, single nozzle or hand-held gun applicator) in and around apple trees and grape vines, to control undesirable vegetation around the base of the trees and vines.

The application rate of Vanish Herbicide in cranberry bogs depends on the proximity of target weeds to cranberry plants and varies from 6-12%. Applications in cranberry bogs for suppression of sedges may be made by soil injection into the crowns of the weeds to kill the roots, or as foliar spot application directed at the weeds while minimizing contact with cranberry foliage.

1.4 Mode of Action

Acetic acid is an organic acid that is readily biodegradable into non-toxic substances such as carbon dioxide (CO_2) and water. Acetic acid acts as a non-selective contact herbicide. When it comes into contact with any parts of the plant, the acid quickly destroys the cell membrane, causing desiccation of the foliar or root tissues.

2.0 Methods of Analysis

2.1 Methods for Analysis of the Active Ingredient

The methods provided previously for the analysis of the active ingredient and impurities in the technical product have been assessed to be acceptable for the determinations.

2.2 Method for Formulation Analysis

The method provided previously for the analysis of the active ingredient in the technical product is suitable for this formulation and therefore, was assessed to be acceptable for use as an enforcement analytical method.

3.0 Impact on Human and Animal Health

3.1 Toxicology Summary

Based on publically available toxicological information, acetic acid is of low acute toxicity by the oral, dermal and inhalation routes of exposure and is not considered a dermal sensitizer. Based on the low pH of 2 to 3, acetic acid is considered corrosive to the eyes and mildly irritating to the skin and respiratory tract.

Information from the toxicity databases for acetic acid indicates that it is not a sensitizer, a mutagen or a developmental toxicant. Since acetic acid is a naturally occurring intermediary metabolite found in all plants and animals (including humans) and is not a mutagen, it is not likely to be a carcinogen.

3.1.1 Incident Reports

Since 26 April 2007, registrants have been required by law to report incidents, including adverse effects to health and the environment, to the PMRA. Information on the reporting of incidents can be found on the Pesticides and Pest Management portion of Health Canada's.

Incidents were searched and reviewed for the active ingredient acetic acid. As of 1 September 2015, there were 24 human and 23 domestic animal incident reports submitted to the PMRA involving the active ingredient acetic acid, alone or in combination with other active ingredients.

In the 24 human incidents, there was some degree of association between the reported symptoms and the suspected pesticide exposure. Most of these incidents were minor in severity and involved irritation of the skin, eye, or respiratory tract occurring during or shortly after product application. The labels for the products involved in these incidents all contain statements warning of the potential for irritation.

In the 23 domestic animal incidents, there was some degree of association between the reported symptoms and the suspected pesticide exposure. These animals experienced minor symptoms, including vomiting, diarrhea, lethargy, anorexia, retching, coughing, polydipsia and/or adipsia. Exposure of most of these animals occurred through contact with treated area.

The PMRA concluded that the information supported the current toxicity profile for this active; however, it did not change the original risk assessment outcome which included the appropriate precautionary label statements.

3.2 Food Residue Exposure Assessment

3.2.1 Food and Drinking Water

Vanish Herbicide is applied as a uniform band directed at weeds between trunks of apple trees or the vines of grape and is not applied directly to the crop. For cranberries, the end-use product is injected into the soil to the base of the target weeds where it is readily biodegradable or by spot treatment of the target weeds surrounding the cranberry plants. It is not applied directly to cranberry or its root systems.

Consequently, dietary exposure to acetic acid from the new uses of the end-use product is anticipated to be negligible. As such, a quantitative assessment of residues from dietary intake is unnecessary. In addition, no risk to exposure from drinking water is anticipated as acetic acid readily biodegrades into non-toxic substances and, thus, is unlikely to persist in the environment to the extent that it could be consumed in drinking water.

Therefore, the new uses of Vanish Herbicide are not expected to result in unacceptable dietary risk when the product is used according to label directions.

3.2.2 Maximum Residue Limits (MRLs)

As part of the assessment process prior to the registration of a pesticide, Health Canada must determine that the consumption of the maximum amount of residues that are expected to remain on food products when a pesticide is used according to label directions will not be a concern to human health. This maximum amount of residues expected is then legally established as an MRL under the *Pest Control Products Act* for the purposes of adulteration provision of the *Food and Drugs Act*. Health Canada sets science-based MRLs to ensure the food Canadians eat is safe.

There is reasonable certainty that no harmful effects will result from dietary exposure to residues of acetic acid (20% v/v) based on the low toxicity and long history of safe consumption of acetic acid. Furthermore, Vanish Herbicide is not applied directly to the crops and when the product is used according to label directions, the proposed uses of Vanish Herbicide is unlikely to result in residues in or on apples, grapes or cranberry fruit. Consequently, the PMRA has concluded that the setting of a specific MRL for acetic acid for use on these crops under the *Pest Control Products Act* is not necessary.

There are no CODEX MRLs established for acetic acid and the United States Environmental Protection Agency (USEPA) has established an exemption from the requirement of a tolerance for residues of acetic acid, (also known as vinegar) in or on all food crops resulting from unintentional spray and drift to non-target vegetation (including non-food, food and feed crops) when used as a non-selective contact herbicide spray.

3.3 Occupational Exposure and Risk Assessment

3.3.1 Use Description

Vanish Herbicide is a non-selective herbicide used for the control of various annual and perennial weeds. The amendment to the label is to add a new use for control of weeds in apple orchards, grape vineyards and cranberry fields. The new use pattern is for directed applications to control labelled weeds on the ground between the trunks of apple trees and the grape vines. It is also used as a soil injection to the base of target weeds or as a spot treatment of target weeds in cranberry fields.

For the new uses in and around apple trees and grape vines, Vanish Herbicide is to be applied to weeds by foliar application using ground application equipment, which is pulled behind an open or closed cab tractor equipped with charcoal filters to clean the air entering the cab, or by hand held backpack sprayers for spot treating weeds. The product is applied up to six times per year to actively growing weeds in the spring and early summer.

For cranberry fields, Vanish Herbicide is applied as a soil injection to the base of target weeds or as a spot treatment directly to target weeds up to a maximum of two applications in the spring and fall. The foliar treatments and soil injection treatments are applied with a CO_2 pressurized backpack sprayer using an adjustable or specialized nozzle. For soil treatment, the nozzle is inserted a few centimetres into the soil, deep enough to prevent release into the air, so that the openings release the end-use product into the soil around the weed roots.

3.3.2 Mixer, Loader and Applicator Exposure and Risk Assessment

The new uses of Vanish Herbicide may result in exposure to workers when handling, mixing, loading, and applying the product, as well as clean-up and maintenance activities. Worker exposure is likely to occur via the dermal and ocular routes from splashing, or by inhalation and is considered corrosive to the eye, and irritating to the skin and respiratory tract. Significant risks from such exposures are not anticipated due to the low toxicity of the end-use product and adequate exposure mitigation measures already on the label.

Occupational exposure to the end-use product will be minimal if workers follow label recommendations. The label has a number of exposure mitigation statements (for example, personal protective equipment, clothing, hygiene statement) to protect workers against any unnecessary risk from exposure. The current mitigative measures on the label include wearing a long-sleeved shirt and pants, chemical resistant gloves, safety goggles or face shield, shoes, and socks during loading and applying the end-use product, and during clean-up/maintenance activities. Workers are required to wash immediately after use and not to reuse contaminated clothing without washing. Therefore, with the addition of the new uses, there are adequate precautionary statements on the Vanish Herbicide label.

3.3.3 Bystander Exposure

Bystander exposure is expected to be minimal as applications are done by growers in agricultural settings (commercial apple orchards, grape vineyards and cranberry fields). In addition, the label already contains the following statement, “Avoid spraying on windy days. Apply only when the

potential for drift to areas of human habitation or areas of human activity such as houses, cottages, schools and recreational areas is minimal. Take into consideration wind speed, wind direction, temperature, application equipment and sprayer settings."

3.3.4 Postapplication Exposure

Postapplication exposure is not a concern as the end-use product label currently restricts entry for workers/individuals until the residues have dried.

4.0 Impact on the Environment

The fate characteristics of acetic acid are well documented in the open literature. Acetic acid is known to biotransform readily under aerobic and anaerobic conditions (HSDB, 2004) in soil (half-life in soil <14 days; HSDB, 2004) and will break down to water. It is, therefore, not expected to be persistent in the environment. Acetic acid is toxic to plants by contact and, therefore, may damage any plant parts that are contacted by the spray. The suggested mechanism of action is the rapid dissolution of cell membrane integrity which results in the dessication (drying out) of plant tissue.

Toxicity tests with acetic acid have shown that it is slightly toxic to aquatic organisms. However, due to the method of application of Vanish Herbicide as a directed and shielded spray or spot application on weeds immediately next to, and between, trunks and vines, and as a spot application and soil injection targeting the roots of the pest plant directly, the potential for exposure of terrestrial and aquatic non-target organisms is expected to be minimal. Therefore, a quantitative risk assessment was not performed.

5.0 Value

Weeds are always a problem in crop production including apple, grape and cranberry. Growers could benefit from a foliar application of a non-conventional product such as Vanish Herbicide in these crops.

Presently, the alternatives registered for weed control in apple and grape are conventional chemicals and include, but are not limited to: 2,4-D, glyphosate, glufosinate-ammonium, metribuzin and pendimethalin. There are few alternatives registered for weed control in cranberry. Some alternatives include diclobenil and mesotrione; clopyralid for spot applications; and 2,4-D and glyphosate for wick or wiper applications.

The grape and cranberry use patterns will satisfy grower priorities identified in the Canadian Grower Priority Database, and provide a new mode of action for weed management in grape and apple, and an additional option for spot spraying weeds in cranberry. In addition, it is a non-conventional product that may appeal to certain growers.

The value information was found to be supportive of the addition of apple, grape and cranberry to the Vanish Herbicide label. Value information provided for review included field trial data and a scientific rationale. Crop tolerance of apple and grape was demonstrated to be acceptable, and the control of labeled weeds can be extrapolated based on the existing label. The value information also demonstrated the efficacy of the soil injection of Vanish Herbicide and the label warns of potential crop injury to cranberry for both the soil injection and spot spray application methods.

6.0 Pest Control Product Policy Considerations

6.1 Toxic Substances Management Policy Considerations

The Toxic Substances Management Policy (TSMP) is a federal government policy developed to provide direction on the management of substances of concern that are released into the environment. The TSMP calls for the virtual elimination of Track 1 substances [those that meet all four criteria outlined in the policy, i.e. persistent (in air, soil, water and/or sediment), bioaccumulative, primarily a result of human activity and toxic as defined by the *Canadian Environmental Protection Act*].

During the review process, Horticultural Vinegar Technical and the related end-use product, Vanish Herbicide, were assessed in accordance with the PMRA Regulatory Directive DIR99-03[5] and evaluated against the Track 1criteria. It has been determined that the technical active substance does not meet TSMP Track-1 criteria:

- Horticultural Vinegar Technical does not meet the Track 1 criteria because it is not persistent, and is not considered a Track 1 substance.

6.2 Formulants and Contaminants of Health or Environmental Concern

During the review process, contaminants in the technical and formulants and contaminants in the end-use products are compared against the *List of Pest control Product Formulants and Contaminants of Health or Environmental Concern* maintained in the *Canada Gazette*.[6]

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5 DIR99-03, *The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy*

6 *Canada Gazette*, Part II, Volume 139, Number 24, SI/2005-114 (2005-11-30) pages 2641–2643: *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* and in the order amending this list in the *Canada Gazette*, Part II, Volume 142, Number 13, SI/2008-67 (2008-06-25) pages 1611-1613. *Part 1 Formulants of Health or Environmental Concern, Part 2 Formulants of Health or Environmental Concern that are Allergens Known to Cause Anaphylactic-Type Reactions and Part 3 Contaminants of Health or Environmental Concern.*

The list is used as described in the PMRA Notice of Intent NOI2005-01[7] and is based on existing policies and regulations including: DIR99-03; and DIR2006-02,[8] and taking into consideration the Ozone-depleting Substance Regulations, 1998, of the *Canadian Environmental Protection Act* (substances designated under the Montreal Protocol). The PMRA has reached the following conclusions:

- Horticultural Vinegar Technical and Vanish Herbicide, do not contain any formulants or contaminants of health or environmental concern identified in the *Canada Gazette.*

The use of formulants in registered pest control products is assessed on an ongoing basis through PMRA formulant initiatives and Regulatory Directive DIR2006-02.

7.0 Summary

7.1 Human Health and Safety

The available information for acetic acid is adequate to qualitatively identify the toxicological hazards that may result from human exposure to acetic acid. Acetic acid is of low acute toxicity by oral, dermal and inhalation routes of exposure and is not considered a dermal sensitizer. Based on its low pH, acetic acid is considered corrosive to the eyes and mildly irritating to the skin and respiratory tract. There is no evidence to indicate that acetic acid is carcinogenic, genotoxic or that it is a developmental or reproductive toxicant.

Dietary exposure to acetic acid from the new uses of Vanish Herbicide is anticipated to be negligible, and no risk to exposure from drinking water is anticipated as acetic acid readily biodegrades into non-toxic substances and, thus, is unlikely to persist in the environment to the extent that it could be consumed in drinking water. Therefore, the new uses of Vanish Herbicide are not expected to result in unacceptable dietary risk when the product is used according to label directions.

Occupational and residential exposure to the commercial end-use product are expected to be minimal if the precautionary statements and required personal protective equipment on the product label, which are intended to minimize worker exposure, are observed. Bystander exposure is likely to be negligible to nonexistent. Postapplication exposure can be minimized by restricted entry.

7.2 Environmental Risk

Acetic acid is known to biodegrade rapidly. It is, therefore, not expected to be persistent in the environment. Also, due to the nature of the use of Vanish Herbicide as a directed and shielded spray and as a soil injection, the potential for exposure of non-target organisms is not expected to occur. Therefore, the risk to non-target organisms in the environment following the use of Vanish Herbicide according to the label directions is expected to be negligible.

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7 NOI2005-01, *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* under the New Pest Control Products Act.

8 DIR2006-02, *Formulants Policy and Implementation Guidance Document.*

7.3 Value

The registration of a foliar application of Vanish Herbicide provides Canadian growers another non-conventional product for weed management in apple, grape and cranberry production, and can provide an alternative mode of action for weed control in these crops, and may contribute to resistance management.

8.0 Proposed Regulatory Decision

Health Canada's PMRA, under the authority of the *Pest Control Products Act* and Regulations, is proposing full registration for the sale and use of Horticultural Vinegar Technical and Vanish Herbicide, containing the technical grade active ingredient acetic acid, to control or suppress various annual and perennial weeds around apple trees, grape vines and cranberries.

An evaluation of available scientific information found that, under the approved conditions of use, the product has value and does not present an unacceptable risk to human health or the environment.

List of Abbreviations

>	greater than
<	less than
℃	degrees Celsius
CAS	Chemical Abstracts Service
CO_2	carbon dioxide
CODEX	Codex Alimentarius International Food Standards
DIR	Regulatory Directive
ha	hectare(s)
Hg	mercury
HSDB	US National Library of Medicine TOXNET Hazardous Substances Data Bank
IUPA C	International Union of Pure and Applied Chemistry
K_{ow}	*n*–octanol-water partition coefficient
mL	millilitre(s)
mm	millimetre(s)
MRL	maximum residue limit
MSHA	Mine Safety and Health Admistration
N/A	not applicable
NIOSH	National Institute for Occupational Safety and Health
nm	nanometre(s)
NOI	Notice of Intent
p*K*a	dissociation constant
PMRA	Pest Management Regulatory Agency
ppm	parts per million
PRD	Proposed Registration Decision
TSMP	Toxic Substances Management Policy
UV	ultraviolet
v/v	volume per volume dilution

Appendix I Tables and Figures

Table 1 Supported Uses

Crop	Pest	Rate	
Apple Grape	Annual Weeds: ragweed species, chickweed, lamb's-quarters, black medic and Canada fleabane Perennial Weeds: dandelion, plantain species, clover species, wild carrot, toadflax, quack grass, tufted vetch, hawkweed species, curled dock, Canada thistle, Kentucky bluegrass	Full Strength	717.5 litres/ha
		1:2.25 Dilution	219.5 litres/ha
		1:3.0 Dilution	179 litres/ha
Cranberry	Sedges (suppression only)	For soil injection to the base of target weeds, apply Vanish Herbicide to soil by injection at 6-12% (v/v) of active ingredient. Where cranberry plants are in close proximity, use no more than 6% (v/v) to limit localized injury to cranberry. Use up to 12% (v/v) only where target weeds predominate, as there is a higher risk of injury to neighbouring cranberry vines. Do NOT apply directly to cranberry or cranberry root systems.	
		For spot treatment of target weeds, apply Vanish Herbicide directly to weeds at 2-6% (v/v) of active ingredient. Where cranberry plants are in close proximity, use 2% (v/v) directed only to target weeds to limit the amount of localized injury to cranberry. Do NOT apply directly to cranberry. Cranberry vines will be injured when contacted directly by Vanish Herbicide. Do NOT apply when there is a potential for drift onto cranberry.	

References

A. List of Studies/Information Submitted by Registrant

1.0 Human and Animal Health

PMRA Document Number	Reference
2438017	2014, Use Description/Scenario (Mixer/Loader/Applicator and Post Application) for Vanish Herbicide, DACO: 5.2
2438019	2014, Use Description Scenario (Application and Postapplication) for Munger Horticultural Vinegar Plus (MHVP), DACO: 5.2

2.0 Value

PMRA Document Number	Reference
2438020	2014, Value Summary for Vanish Herbicide, DACO: 10.1, 10.2.1, 10.2.2, 10.2.3.1, 10.2.3.2, 10.2.3.3, 10.2.3.4, 10.3.1, 10.3.2, 10.3.3, 10.4, 10.5, 10.5.1, 10.5.2, 10.5.3, 10.5.4
2438023	2014, Efficacy of Munger Horticultural Vinegar Plus (MHVP) for the Suppression of Sedges (Carex canescens) in Cranberry, DACO: 10.1, 10.2, 10.2.1, 10.2.2, 10.3, 10.5, 10.5.1, 10.5.2, 10.5.3
2438024	2014, Table 1 Summary of Efficacy Data - Mungers Horticultural Vinegar Plus (Cranberry Use), DACO: 10.1
2438025	2014, Evaluation of Munger Horticultural Vinegar Plus for the Control of Weeds in Cranberry, DACO: 10.1
2438026	2014, Evaluation of Munger Horticultural Vinegar Plus for the Control of Weeds in Cranberry, DACO: 10.1
2438027	2014, Evaluation of Munger Horticultural Vinegar Plus for the Control of Weeds in Cranberry - Appendix 2, DACO: 10.1
2438029	2007, Crop Profile for Cranberry in Canada, DACO: 10.1

B. Additional Information Considered

i) Published Information

1.0 Environment

HSDB (Hazardous Substances Data Bank), 2004, Toxnet, National Library of Medicine, Specialized Information Services, Acetic Acid CAS registry Number:64-19-7. Retreived from the World Wide Web. http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB