

Temporary Registration of PROWL 480 Herbicide and PROWL 400 Herbicide (Pendimethalin) in Corn

The purpose of this Note to CAPCO is to announce Agriculture and Agri-Food Canada's regulatory decision, in consultation with the advisory departments of Health Canada and Environment Canada, to grant temporary registration to PROWL 480 (Registration Number 21994, *Pest Control Products Act*) for the control of certain annual grass and broadleaf weeds in field corn. This registration is accepted for the period ending December 31, 1994. An alternative pendimethalin formulation which does not contain the solvent monochlorobenzene, PROWL 400 (Registration Number 23439), has also been granted temporary registration for use in field corn until December 31, 1994.

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Publications Coordinator
Pest Management Regulatory Agency
Health Canada
2250 Riverside Drive
A.L. 6606D1
Ottawa, Ontario
K1A 0K9

Telephone: (613) 736-3592
Facsimile: (613) 736-3798
Information Service: 1-800-267-6315
(In Canada only)
Internet: pmra_publications@hc-sc.gc.ca
www.hc-sc.gc.ca



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Background

PROWL 480 is a formulated emulsifiable concentrate product containing 480 grams/litre of the active ingredient, pendimethalin. The technical active and end-use product are registered by Cyanamid Canada. PROWL 480 was initially granted temporary registration in 1991 for up to two early postemergence applications of 6.25 litres/ha each, in dry bulb onions grown on muck soils. The rationale for this decision is discussed in *Note to CAPCO C91-05*.

The applicant has proposed that the PROWL 480 label be amended to include preemergence or early postemergence applications for the control of certain annual and broadleaf weeds in field corn grown for grain or silage. The proposed use on corn involves a single application of 3.5 litres/ha.

In response to identified concerns regarding the solvent monochlorobenzene in the PROWL 480 formulated product, an alternative formulation, PROWL 400, was subsequently proposed for registration. PROWL 400 is an emulsifiable concentrate product which contains 400 grams/litre of pendimethalin, to be applied as a single preemergence or early postemergence application at a rate of 4.2 litres/ha in field corn.

Value to Agriculture

Pendimethalin was demonstrated by the applicant to provide effective control of certain annual grass and broadleaf weed species when applied alone as a preemergence treatment, or in tank-mixtures with atrazine, cyanazine or dicamba as a preemergence or early postemergence application.

Available options for controlling annual grasses in corn include butylate⁺ (applied preplant incorporated), EPTC⁺ (preplant incorporated), simazine (preplant incorporated or preemergence), cyanazine (preplant incorporated, preemergence, early postemergence), metolachlor or dimethenamid (preplant incorporated, preemergence or early postemergence), linuron (directed postemergence) and rimsulfuron, rimsulfuron/nicosulfuron (postemergence). Control of certain broadleaf weed species is indicated on the labels of these products.

Resistance of some populations of many species of annual grasses and broadleaf weeds to triazine herbicides such as cyanazine, atrazine and simazine has been reported widely in eastern Canada. Tank-mix treatments of pendimethalin with atrazine or cyanazine may be beneficial in improving control of certain weed species when triazine resistant populations are present. The registration of pendimethalin for use in corn represents an option for controlling annual grass weeds, with the additional benefit of controlling some broadleaf weeds species.

The competitive position of the Canadian corn producer will be enhanced by the registration of this product by providing access to an additional option for controlling annual grasses, certain broadleaf weeds, and triazine resistant weeds in field corn.

Human Health Assessment

Health Canada has determined that total residues of pendimethalin in treated corn at harvest are not likely to exceed 0.1 parts per million (ppm) when the product is used according to label directions. This residue level is not expected to pose a hazard to consumers. It is not considered necessary to establish a specific maximum residue limit for pendimethalin in Table II, Division 15 of the *Food and Drug Regulations*. Pendimethalin treated corn should not be grazed by livestock or cut for silage within 100 days after treatment.

With respect to occupational exposure, the margins of safety are considered adequate for the proposed use of pendimethalin on corn provided the precautionary statements on the product labels are followed. These precautions include the use of goggles or a face shield during mixing and loading, and the use of chemical resistant gloves and long sleeved coveralls during mixing, loading, cleanup and repair.

Environmental Assessment

Information on pendimethalin pertaining to environmental fate was reviewed by the Commercial Chemicals Evaluation Branch (CCEB) of Environment Canada. This review concluded that pendimethalin is expected to be very persistent in both muck and mineral soils with the possibility of residue accumulation occurring as a result of repeated annual applications. Most of the pendimethalin residues remain in the 0-7.5 centimetre layer of soil with no further downward movement, indicating minimal potential for leaching.

This possibility of residue accumulation presents the potential for phytotoxicity in rotational crops following corn which was treated with pendimethalin. In common agronomic practice, however, this will not severely affect rotational cropping options following corn as soybeans can be safely planted in the year following pendimethalin application. The applicant has indicated that additional rotational cropping information will be developed and submitted for review.

Volatilization is expected to contribute to the disappearance of pendimethalin from moist soil surfaces. Pendimethalin may have the potential for long-range transport because of its high persistence. Phototransformation is also expected to be a significant means of transformation of the herbicide on soil surfaces and in water. Any pendimethalin entering aquatic systems due to runoff which is not already associated with soil particles is expected to partition into sediment where it has been observed to transform under anaerobic conditions.

The effects of pendimethalin on wildlife and wildlife habitat were reviewed by the CCEB and the Canadian Wildlife Service (CWS) of Environment Canada. Pendimethalin was found to be highly toxic to some species of fish and aquatic invertebrates. Most species of fish should not be at risk from spray drift of pendimethalin into aquatic environments due to label requirements for a buffer zone of 15 metres between the herbicide treated area and fish and wildlife habitats. Hazard to fish should further be reduced due to the expected adsorption of pendimethalin to soil particles which would reduce the bioavailability of any herbicide entering aquatic systems.

The high toxicity of pendimethalin to algae and several terrestrial species of plants may result in indirect impacts on wildlife through adverse effects on habitat. To protect wildlife and wildlife habitat, the registrant is required to implement an education program with the goal of increasing grower and dealer awareness of the importance of establishing buffer zones. This program consists of producing a buffer zone education brochure for distribution at a series of trade shows and grower/dealer meetings compiled by the applicant with input from CCEB and CWS. A discussion of buffer zones will also be incorporated into pendimethalin product presentations for growers and dealers.

To ensure that the required 15 metre buffer zone is sufficient to protect wetlands, waterbodies and terrestrial wildlife habitats, a spray drift study was conducted in 1992 by the registrant and was recently submitted to Environment Canada for review. Collectively, these steps have been taken to minimize the entry of pendimethalin into fish and wildlife habitats.

Health Canada indicated concern regarding the content of the solvent monochlorobenzene in the PROWL 480 formulation. Environment Canada reported that this solvent is highly volatile and is toxic to various non-target organisms. Replacement of this solvent in the formulated pendimethalin product was suggested.

Details of Regulatory Decision (Limitations and Use Pattern)

Based on the review of all available information, Agriculture and Agri-Food Canada has granted temporary registration for the use of PROWL 480 in corn for the period ending December 31, 1994. However, due to insufficient efficacy data submitted for coarse textured soils or soils low in organic matter, the application of PROWL 480 is limited to corn grown in medium and fine textured soils with greater than 3% organic matter.

PROWL 480 is accepted for use in corn applied alone as a preemergence treatment for the control of certain annual grass and broadleaf weeds. For broader spectrum weed control, PROWL 480 may be tank-mixed with atrazine, cyanazine or dicamba and applied as preemergence or early postemergence (before the 2-leaf stage of annual grasses) treatments. Serious corn injury will result if PROWL 480 Herbicide is incorporated into the soil prior to planting.

When applied alone as a preemergence treatment, pendimethalin will control the following weeds:

Green Foxtail (*Setaria viridis*);
Fall Panicum (*Panicum dichotomiflorum*);
Barnyardgrass (*Echinochloa crus-galli*);
Common Lamb's-quarters (*Chenopodium album*);
Redroot Pigweed (*Amaranthus retroflexus*).

PROWL 480 in tank-mixture with atrazine will control the following additional weeds when applied at early postemergence: Yellow Foxtail (*Setaria glauca*), Redroot Pigweed, Common Ragweed (*Ambrosia artemisiifolia*), Smartweed (*Polygonum persicaria*) and Velvetleaf (*Abutilon theophrasti*).

When tank-mixed with cyanazine and applied early postemergence, the control of Yellow Foxtail, Redroot Pigweed, Common Ragweed and Velvetleaf is added. Additionally, the PROWL 480 plus cyanazine tank-mixture will provide suppression of Proso Millet (*Panicum miliaceum*), a weed difficult to control in corn, when this tank-mixture is applied in conjunction with a weed management strategy that includes cultivation to control weeds escaping herbicide application.

Tank-mixture with dicamba as a preemergence or early postemergence treatment will control green foxtail, barnyardgrass, lamb's-quarters, redroot pigweed, common ragweed and velvetleaf.

The review of the environmental fate of pendimethalin indicates that residues in the soil may be persistent. Until sufficient data are reviewed to clearly define what rotational crops can be safely planted after the application of this herbicide on corn, the following statements will appear on the label:

1. PROWL treated land may be planted to corn or soybeans in the year following application. Refer to the labels of the tank-mix partner for rotational cropping restrictions.
2. DO NOT plant any crop other than corn in the year of application. Fall seeded crops (winter wheat, winter barley, winter rapeseed) should not be planted on PROWL treated land applied the previous spring.

After consultation with advisory departments and in consideration of all available information, Agriculture and Agri-Food Canada considers the use of PROWL 480 in corn to be acceptable. The requirement to maintain buffer zones and measures to increase grower awareness of the importance of buffer zones, will reduce the risk to wildlife and wildlife habitat. The effectiveness of the required buffer zone in minimizing pendimethalin entry into wildlife habitat will be assessed in the review of the recently submitted spray drift study.

In response to concerns expressed by Health Canada and Environment Canada regarding the content of the solvent monochlorobenzene in the PROWL 480 formulation of pendimethalin, the registrant submitted an application for registration of a formulation with alternative solvents. This formulation, PROWL 400, was determined to be equivalent in efficacy and phytotoxicity to the existing formulation when applied at 4.2 litres/ha, and temporary registration was accepted until December 31, 1994. All use patterns and tank-mixtures in field corn for PROWL 400 are identical to those outlined for PROWL 480. The registrant has indicated that the PROWL 480 formulation will be phased out of the market and replaced completely by PROWL 400 after inventories are depleted, probably by the end of the 1994 season.

Pendimethalin Treatments In Field Corn

Treatment	Application Rate	Application Timing
PROWL 480 Herbicide		
or		
PROWL 400 Herbicide	3.5 litres/hectare	
or		
PROWL 480	4.2 litres/hectare	preemergence
or		
PROWL 400	3.5 litres/hectare	
+ atrazine 90 W or 90 WP	3.5 litres/hectare	
or		
PROWL 480	4.2 litres/hectare	
+ 1.7 kilograms/hectare		preemergence or early postemergence, up to and including 4-leaf corn
or		
PROWL 480	3.5 litres/hectare	
or		
PROWL 400	3.5 litres/hectare	
+ cyanazine (Bladex 90 DF)	3.5 litres/hectare	
or		
PROWL 480	4.2 litres/hectare	
+ 2.5 kilograms/hectare		preemergence or early postemergence up to and including 3-leaf corn
or		
PROWL 480	3.5 litres/hectare	
or		
PROWL 400	3.5 litres/hectare	
+ dicamba (Banvel)	3.5 litres/hectare	
or		
PROWL 480	4.2 litres/hectare	
+ 1.25 L/ha (pre) or 600 mL- 1.25 L/ha (early post)		preemergence or early postemergence up to and including 4-leaf corn

Please direct inquiries regarding this Note to CAPCO to:

David Jones
Product Manager
Herbicides and Plant Growth Regulants Section
Pest Management Regulatory Agency
Health Canada
2250 Riverside Drive
A.L. 6606E1
Ottawa, Ontario
K1A 0K9

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