GRASSY WEED CONTROL WITH HOE 00736 IN DICOT CROPS

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The control of a mixed population of annual and perennial grasses in dicot crops is of great interest to Western Canadian farmers. Changes in farming practices have resulted in complex weed problems, both grassy and broadleaf weeds. Hoechst have developed a number of herbicides that provide control of grassy weeds. Hoe 00736 is the latest of these developments.

The potential market in Western Canada for a herbicide that selectively controls grassy weeds in dicot crops will vary from 6 to 10 million acres in any one year. This large variance is solely dependent upon the annual canola acreage. The acreage of the major oilseed and special crops in Western Canada in 1983 is shown in Table #1.

TABLE #1

(1) MAJOR CROPS	1983 ACREAGE
Canola (rapeseed)	5,700,000
Flax	1,100,000
Mustard	235,000
Sunflowers	170,000
Peas	155,000
Lentils	125,000
TOTAL	7,485,000

Other special crops such as beans and tame buckwheat, as well as forages would add a further one million acres to the above 7,485,000. Canola acreage could be as great as 7.5 to 8 million acreas in 1984 and well into the future. Flax acreage is usually in the range of 1.4 to 1.6 million acres. With this potential of 10 million acres, the need for a herbicide such as Hoe 00736 is great.

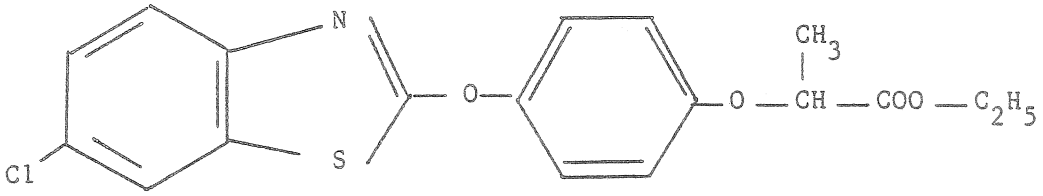
A number of grassy weeds infest the broadleaf crop acreage and require chemical control on an annual basis. Of all the grassy weeds, wild oats (Avena fatua) is the most severe and causes the greatest competition to the crops. Wild oats can reduce flax and other special crop yields by as much as 60-70%. Greater than 80% of all dicot crop acreage is treated for wild oat control. Second to wild oats, green foxtail (Seteria viridis) has become an increasingly severe weed problem to Western Canadian farmers. Green foxtail originated in southern Manitoba but during the past 10-15 years has spread throughout the remainder of Manitoba, nearly all of Saskatchewan, and many areas of Alberta including the Peace River Region. Recent weed surveys in Saskatchewan and Manitoba have shown that green foxtail is the most frequent weed and densities can be as great as 1200-1500 plants per square meter. Similar to wild oats, green foxtail is also very competitive and can reduce crop yields

by as great as 50%. Other annual grassy weeds that infest dicot crop acreage in Western Canada are Persian Darnel (Lolium persicun), barnyard grass (Echinchloa crusgalli), yellow foxtail (Seteria glauca), volunteer corn (Zea mays), Downy brome (Bromus tectorum) and others. Also, with the ever increasing trend towards continuous cropping, volunteer cereals are becoming a problem and require chemical control. Further to grassy weeds, broadleaf weeds infest all dicot crop acres and require control on an annual basis.

Hoe 00736 was developed by Hoechst AG in 1979 to provide selective post-emergent control of annual and perennial grassy weeds in broadleaf crops. A rate of application of 250 - 300 grams active ingredient per hectare has provided greater than 90% control of all major annual grasses and at the same time has provided good suppression of quackgrass (Cipropyron repens). Another feature of Hoe 00736 is that it is tank mixable with a number of broadleaf herbicides to provide a broad spectrum control of grassy and broadleaf weeds. The unique characteristic of Hoe 00736 is that it is not one single chemistry, but is the combination of two chemicals Hoe 35609 and Hoe 33171. Hoe 00736 is formulated with two parts Hoe 35609 and one part Hoe 33171. An application rate of 300 gr/ha would consist of 200 grams Hoe 35609 and 100 grams Hoe 33171.

The individual chemical structure, chemical name and common name of Hoe 35609 and Hoe 33171 is as follows:

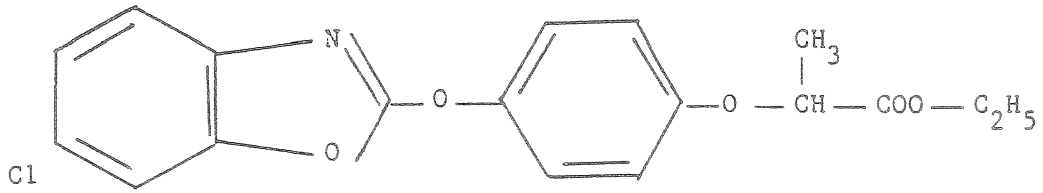
HOE 35609



CHEMICAL NAME: ETHYL 2-[4-(6-CHLORO-2-BENZOTHIAZOLYL)OXY] PHENOXY PROPANOATE

COMMON NAME: FENTHIAPROP ETHYL

HOE 33171



CHEMICAL NAME: ETHYL 2-[4-(6-CHLORO-2-BENZOXAZOLYL)OXY]

COMMON NAME: FENOXAPROP ETHYL

The chemical and physical properties of Hoe 00736 are as follows:

	HOE 35609	HOE 33171
Emperical Formula	$C_{18}H_{16}O_{4}NSCL$	$C_{18}H_{16}O_{5}NCL$
Molecular Weight	377.8 Grams	361.8 Grams
Melting Point	56-57.5°C	84-85°C
Vapour Pressure	$0.45 \times 10.^{-9}$ MBAR	0.19×10^{-7} MBAR
Solubility at 25°C		
Water	0.8 MG/L	0.9 MG/L
Hexane	> 1 G/100 ML	>0.5 G/100 ML
Ethanol	> 5 G/100 ML	> 1 G/100 ML
Acetone	>50 G/100 ML	> 50 G/100 ML

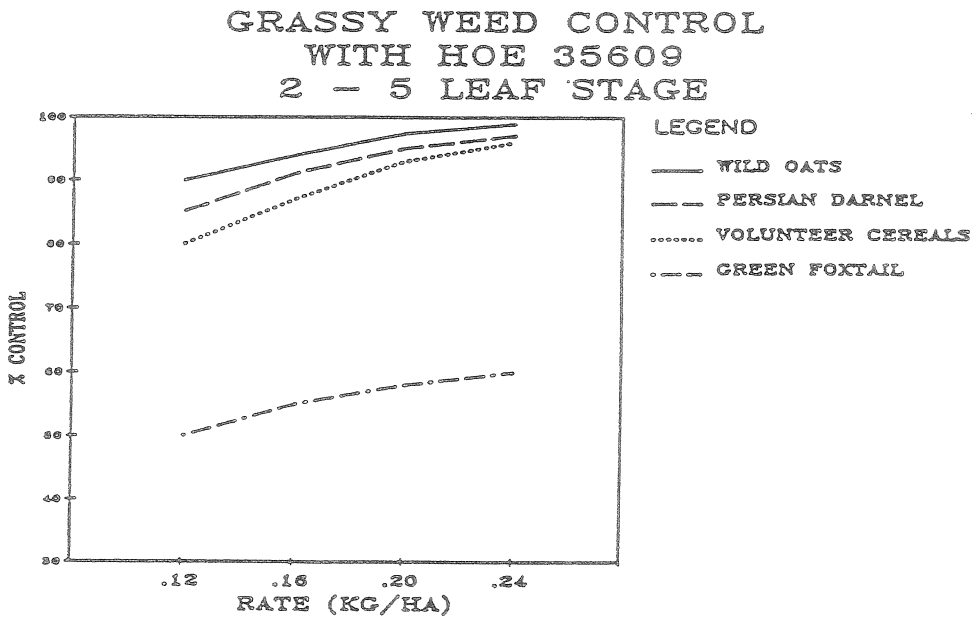
The toxicological properties of Hoe 00736 are as follows:

	HOE 35609	HOE 33171
Acute Oral LD_{50}		
Rat	948 MG/KG	2,429 MG/KG
Mouse	1,100 MG/KG	5,080 MG/KG
Acute Dermal LD_{50}		
Rat	>2,000 MG/KG	>2,000 MG/KG
Mutagencity	Non-Mutagenic	Mon-Mutagenic
Subchronic Toxicity		
Rat	50 PPM	80 PPM

Hoe 00736 is primarily absorbed through the plant foilage and then translocation is both basipetal and acropetal. The site of action is the meristematic tissue or the growing point of the plant. Visual symptoms of Hoe 00736 is that the plant stops growing within two days of application and no further leaves or secondary roots develop after this time. Chlorosis or yellowing begins on new young tissue as blotching at the leaf and sheath junction. Necrosis or plant death occurs within 7 to 10 days after application.

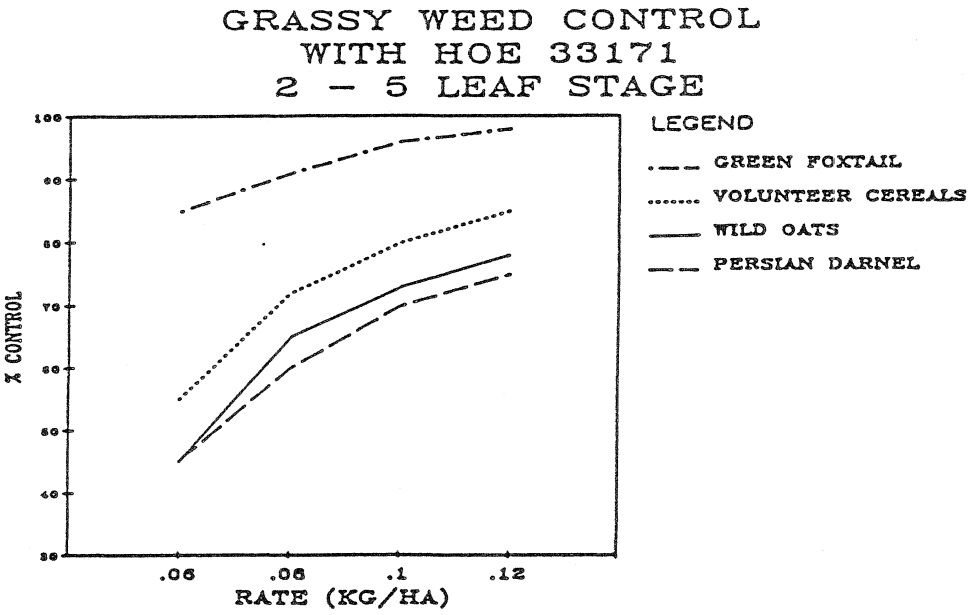
The reason for the mixture of Hoe 35609 and Hoe 33171 in that of two parts and one part respectively is explained in Graph #1, Graph #2 and Graph #3 as well as Table #2.

GRAPH #1



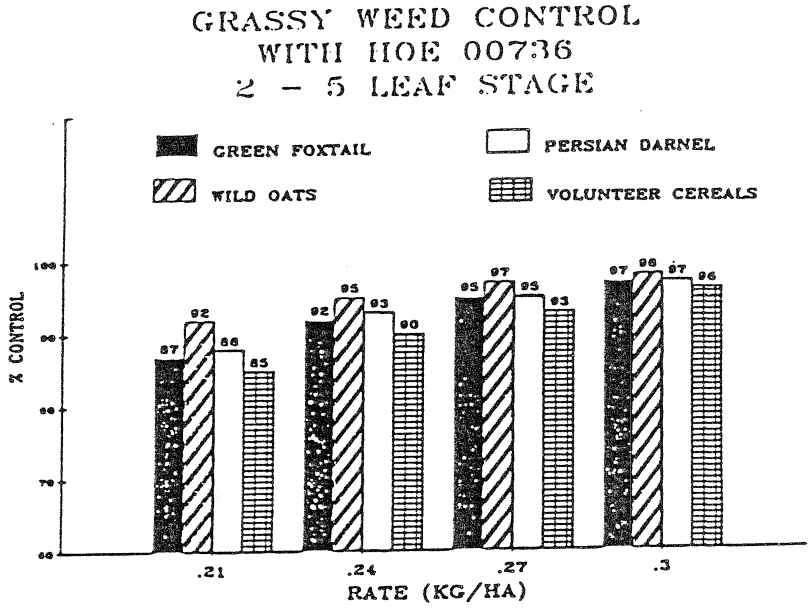
In graph #1, grassy weed control with Hoe 35609 is shown. With a rate of application of 0.2 kg/ha, wild oat, Persian darnel and volunteer cereal control is 90% or greater, however green foxtail control is only 55%.

GRAPH #2



In graph #2, the results are opposite. With a rate of application of 0.1 kg/ha, green foxtail control is greater than 90% while wild oat and Persian darnel control is only 65–70% and volunteer cereal control is 75%.

GRAPH #3



In graph #3, we see the combined effects of Hoe 35609 and Hoe 33171. With a rate of application of 0.25-0.30 kg/ha of Hoe 00736, grassy weed (wild oats, green foxtail, Persian darnel, volunteer cereal) control is greater than 90%. Table #2 indicates the sensitivity of grassy weeds to both Hoe 35609 and Hoe 33171.

TABLE #2

EFFICACY OF HOE 00736 AGAINST GRASSY SPECIES

	HOE 35609	HOE 33171
Very Sensitive	Wild Oats Downy Brome Volunteer Barley Volunteer Wheat Persian Darnel Giant Foxtail Volunteer Corn	Green Foxtail Yellow Foxtail Barnyard Grass Fall Panicum Proso Millet Johnson Grass
Less Sensitive	Quackgrass Barnyard Grass	Volunteer Wheat Volunteer Barley Wild Oats Persian Darnel
Least Sensitive	Green Foxtail Yellow Foxtail Johnson Grass	Quackgrass Downy Brome

From this table it is clear that the sensitivity of the weeds is almost opposite between Hoe 35609 and Hoe 33171. Knowing this Hoechst initiated development of Hoe 00736 which is the combination of the two chemistries. This combination fits ideally into the Western Canadian market.

Crop tolerance to Hoe 00736 is excellent. All major oilseed, lequme, and special crops (dicot crops) have shown no effects up to 3.0 kg/ha active ingredient (10 x rate).

Broadleaf herbicide tank mixtures have provided very promising results. Hoe 00736 plus Bromoxynil is compatible and excellent results were achieved with rates of application of 250-300 grams per hectare of Hoe 00736 and 280 grams per hectare of Bromoxynil. MCPA Amine has demonstrated some antagonism when mixed with Hoe 00736, but it is rate dependent and can be overcome by lowering the rate of MCPA from 560 gr/ha to 280 gr/ha or by increasing the rate of Hoe 00736 from 250 gr/ha to 300-350 gr/ha.

Buctril'M has revealed slight antagonism with Hoe 00736 when tank mixed, however this is only at lower rates (200-250 gr/ha) of Hoe 00736 and is overcome at a rate of application of 300 grams per hectare. Initial tank mixing has also been carried out with Lontrel in canola, Glean in flax, Cyanazine and Metribuzin in trizine tolerant canola, Bentonal/ Betamex in sugar beets, and Bentazon in beans. All these tank mixtures have provided very good results, however further testing will be required.

Hoe 00736 has also been tested extensively for quackgrass control. Results have indicated that excellent suppression can be achieved with a rate of application of 300 grams per hectare. The length (time) of suppression appears to be dependent on the crop competition. However, by increasing the rate to 500-600 gr/ha, suppression can be season long and some control is carried over to the next year.

In summary, Hoe 00736 provides excellent control of all major annual grasses at one rate of application. This rate will be approximately 0.3 kg/ha active ingredient. At this same rate of application quackgrass suppression is very good and may be season long depending on the degree of crop competition.

Control appears to be independent of leaf stage, however recommendation will likely be the 2-6 leaf stage (or combination of leaves and tillers not to exceed 6).

Tank mixture compatibility appears to be very good with Bromoxynil, Buctril'M, Lontrel, Glean, Metribuzin, Cyanazine, Bentenal/Betanex, and Bentazon and is rate dependent for MCPA Amine.

At the present time the toxicological package is near completion and submission for product registration will be made in the near future.