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EEE BRANCH REVIEW

DATE: IN 12/10/75 OUT 1-12-76 IN _____ OUT _____ IN _____ OUT _____

FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO. _____

PETITION OR EXP. PERMIT NO. 100-EUP

DATE DIV. RECEIVED 11/25/75

DATE OF SUBMISSION 11/19/75

DATE SUBMISSION ACCEPTED _____

TYPE PRODUCT(S): I, D, H, F, N, R, S

PRODUCT MGR. NO. N/A

PRODUCT NAME(S) Dual 6EC Herbicide

COMPANY NAME Ciba-Geigy

SUBMISSION PURPOSE EUP

CHEMICAL & FORMULATION 2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide

Chemical classification: Chloroacetanilide

6EC

ENVIRONMENTAL SAFETY REVIEW
100-EUP

100.0 Pesticidal Use: Proposed EUP to evaluate the herbicide Dual 6EC - "a selective herbicide recommended as a preplant incorporated or preemergence surface-applied treatment for the control of most annual grasses and certain broadleaf weeds."

Crops

Soybeans

Major Geographical Use Areas

All major soybean states.

Details of Proposed Testing Program

Dual has been evaluated since 1973 as a herbicide in soybeans. The following treatments will be evaluated using commercial ground equipment:

1. Dual 6EC with water carrier preplant incorporated
2. Dual 6EC with water carrier preemergence
3. Dual 6EC with fluid fertilizer carrier preplant incorporated
4. Dual 6EC with fluid fertilizer carrier preemergence
5. Dual 6EC + Sencor 50% W.P. or Lexone with water carrier preplant incorporated
6. Dual 6EC + Sencor 50% W.P. or Lexone with water carrier preemergence
7. Dual 6EC + Lorox with water carrier preemergence

Treatments 1, 2, 5, 6 and 7 will be applied at a maximum of ten locations by air craft in a minimum of five gallons of water.

Proposed Use Pattern

Apply Dual 6EC preplant incorporated or preemergence at 2-4 pints per acre. Rate depends on soil texture, organic matter, and expected presence of yellow nutsedge.

Or, apply Dual 6EC tank mixed with either Sencor 50% W.P. or Lexone preplant incorporated or preemergence at rates of 1.67-3.33 pints of Dual 6EC plus 0.5-1.5 lbs. of Sencor 50% W.P. or Lexone per acre. Rates depend on soil texture, organic matter, and whether or not the application is being made in the Mississippi River Delts.

Or, apply Dual 6EC tank mixed with Lorox preemergence at rates of 1.67-3.33 pints of Dual 6EC plus 1-3 lbs. of Lorox per acre. Rates depend on soil texture and organic matter.

Sites of Test Locations

The actual sites of application will not be known with certainty until just before application. This information will be included in the periodic reports made during the permit period.

Plot Description

1. Number of Plots: maximum of 100 locations.

2. Number of Replications: one of each treatment applied at each location.

3. Dosages: minimum and/or maximum specified on label for particular soil; see label in Section B for specific rates.

4. Method of Application: commercial equipment as specified on the experimental label.

5. Season of Use: planting season (April 20-July 20).

6. 6. Timing of Application:

   Alone: preplant incorporated or preemergence. Tankmix with Sencor 50% W.P. or Lexone: preplant incorporated or preemergence. Tank-mix with Lorox: preemergence.

7. Plot Size: at least one acre for each treatment applied by ground equipment. Plot size for aerial treatments will not exceed five acres.

Objectives of Proposed Testing Program

The testing program is designed to compare the efficacy and crop safety of Dual 6EC and tank mixes of Dual 6EC plus Lorox, Sencor 50% W.P., or Lexone to standards applied with commercial equipment. The program will evaluate these treatments under many environmental conditions and will compare them with untreated plots.

Additionally, in order to support an aerial registration of Dual 6EC and tank mixtures of Dual 6EC plus Lorox, Sencor 50% W.P., or Lexone, residue samples will be collected.

Bioassay crops will be planted the fall and spring following treatment. The data generated will be used to support permanent registration of the Dual 6EC treatments tested.

100.1 Application Methods/Directions and Rates

The proposed labeling reads as follows:

Dual 6EC is a selective herbicide recommended as a preplant incorporated or preemergence surface-applied treatment for the control of most annual grasses and certain broadleaf weeds.

Weeds Controlled

annual bluegrass	johnsongrass (seedling)	carpetweed
annual ryegrass	junglerice	Florida purslane
barnyardgrass (watergrass)	signalgrass	lambsquarters
brachiaria	smooth crabgrass	prostrate pigweed
crabgrass	sorghum almum	purslane
fall panicum	Texas panicum	redroot pigweed
giant foxtail	witchgrass	smooth pigweed
goosegrass	yellow foxtail	
green foxtail	yellow nutsedge	
Japanese millet		

Mixing Instructions

Dual 6EC is an emulsifiable concentrate to be mixed with water or liquid fertilizer and applied as a spray. Fill the spray tank one-half to three-fourths full with water or liquid fertilizer, add the proper amount of Dual 6EC, then add the rest of the water or liquid fertilizer. Sufficient agitation should be provided during mixing and application to obtain and maintain a uniform emulsion.

Sprayer Equipment: Use conventional spray equipment with fan-type or flood jet nozzles. Wash sprayer thoroughly with clean water immediately after use.

Dual 6EC Applied Alone

Dual 6EC may be applied either preplant incorporated or preemergence. Preplant incorporated: Apply Dual 6EC to the soil and incorporate shallowly into the surface before planting. Preemergence: Apply Dual 6EC to the prepared seedbed during planting (behind the planter) or after planting but before the weeds and soybeans emerge.

Apply the appropriate rate from the following table. In a rate range, use the low rate on soil relatively coarse-textured or low in organic matter; use the high rate on soil relatively fine-textured or high in organic matter. Also use the high rate for best control of yellow nutsedge.

	Broadcast* rate per acre	
Soil texture	Less than 3% organic matter	3% organic matter or greater
COARSE:		
Sand, loamy sand, sandy loam	2-2 2/3 pts.	2-2 2/3 pts.
MEDIUM:		
Loam, silt loam, silt	2-3 1/3 pts.	2 2/3-3 1/3 pts.
FINE:		
Silty clay loam, sandy clay loam, silty clay, sandy clay, clay loam, clay	2 2/3-3 1/3 pts.	3 1/3-4 pts.

*The amount of Dual 6EC needed for band treatment may be calculated by the formula:

$$\frac{\text{band width in inches}}{\text{row width in inches}} \times \text{broadcast rate per acre} = \text{amount needed per acre}$$

Extremely dry weather following the preemergence application may reduce the effectiveness of Dual 6EC. If a 1/2-inch rain does not occur within 7 days after application, activate the herbicide by incorporating it with rotary hoe, rolling cultivator, etc. into the top inch of soil. If weeds develop, cultivation is recommended.

Rotational Crops: 1) If treated soybeans are lost due to poor germination, hail, flood, insects, etc., soybeans or corn may be replanted immediately. Do not make a second broadcast application of Dual 6EC. If the original application was banded and the second crop is replanted in the untreated row middles, a second band treatment may be applied. 2) Fall seeded small grains may be planted after soybean harvest. 3) Any rotational crop may be planted the following spring.

Tank Mixture of Dual 6EC Plus Sencor™ 50% W.P. and Lexone™

Use this tank mixture for control of these annual grasses and broadleaf weeds:

barnyardgrass	carpetweed	Poorjoe
crabgrass	cocklebur	prickly sida
fall panicum	coffeeweed	purslane
giant foxtail	evening primrose	ragweed
goosegrass	hemp sesbania	smartweed
green foxtail	jimsonweed	velvetleaf
johnsongrass (seedling)	lambsquarters	Venice mallow
stinkgrass	morningglory	wild mustard
witchgrass	pigweed	
yellow foxtail		
yellow nutsedge		

Mixing Instructions: Mix the proper amount of Sencor 50% W.P. or Lexone with water in a clean pail to form a slurry. Fill the spray tank one-half to three-fourths full with water, add the slurry and allow it to become dispersed, then add the Dual 6EC, and finally add the rest of the water. Sufficient agitation must be provided during mixing and application to obtain and maintain a uniform suspension.

Apply the tank mix in a minimum of 15 gals. of spray mixture per acre for applications applied with ground equipment or 5 gals. for applications applied by aircraft.

Sprayer Equipment: See General Information. Screens in nozzles and in suction and in-line strainers should be no finer than 50 mesh.

Application: Apply either preplant incorporated or preemergence. Preplant incorporated: Apply the tank mix to the soil and incorporate shallowly into the surface before planting. Preemergence: Apply the tank mix at planting (behind the planter) or after planting but before weeds and soybeans emerge. Refer to the Sencor or Lexone label for planting details and soybean variety restrictions. Apply the appropriate rates from the following table:

	Broadcast rates per acre			
	0.5-3% organic matter		Over 3% organic matter	
Soil texture*	Dual 6EC	Sencor 50% W.P. or Lexone	Dual 6EC	Sencor 50% W.P. or Lexone
COARSE: Loamy sand (over 2% organic matter), sandy loam	1.67 pts.	0.5 lb.	1.67 - 2 pts.	0.75 lb.
MEDIUM: Loam, silt loam, silt	2 pts.	0.75 lb.	2.67 pts.	1 lb.
FINE: Silty clay loam, sandy clay loam, silty clay, sandy clay, clay loam, clay	2.67 pts.	1 lb.	2.67 - 3.33 pts.	1 lb.
Mississippi Delta only Silty clay, clay	2.67 pts.	1.5 lbs.	2.67 - 3.33 pts.	1.5 lbs.

*Do not use on any sand, on loamy sand with less than 2% organic matter, or on muck.

101.0 Chemical and Physical Properties

101.1 Chemical Name

1) 2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide

2) 2-chloro-6'-ethyl-N-(2-methoxy-1-methylethyl)-o-acetotoluidine

Other Names:

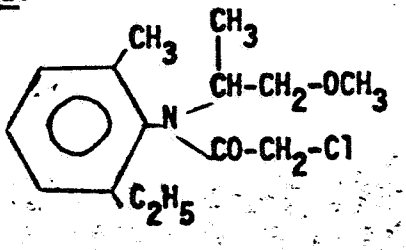
N-(2'-methoxy-1'-methylethyl)-2-ethyl-6-methyl-chloroacetanilide

101.2 Common Name: None assigned

Tradename: Dual™

Chemical Classification: chloroacetanilide

101.3 Structural formula:



empirical formula: $C_{15}H_{22}NO_2CL$

101.4 Molecular Weight: 283.80

101.5 Physical State, Color, Odor

Form: liquid
Color: white to tan
Odor: odorless
Boiling Point: 100°/0.001 mm Hg
Vapor Pressure: ca 10^{-5} mm Hg

101.6 Solubilities:

Water - 530 ppm @ 20°C
Organic solvents - miscible with xylene, toluene, dimethyl formamide, methyl cellusolve, butyl cellusolve, ethylene dichloride, and cyclohexanone
Insoluble in ethylene glycol and propylene glycol

101.7 Specific Gravity: 1.117

101.8 Stability:

a. Half-life of 0.25% solution at 100°C:

acid - 30 hours at pH 3
base - 1.5 hours at pH 10
neutral - 18 hours at pH 7

b. Shelf-life of the 6E formulation is estimated to be five year minimum based on no significant decomposition at 70°C for 7 weeks or at 50°C for 24 weeks.

102.0 Behavior in the Environment: No data available with submission for review.

103.0 Toxicological Properties

Toxicity data may be found in Pesticide Petition No. 5G1553 in 3 volumes entitled "Pesticide Petition For Temporary Residue Tolerances in Corn-CGA-24705-Section C". Additional toxicity data may be found in Pesticide Petition No. 5F1606 in a volume entitled "Pesticide Petition For Residue Tolerances in Corn-CGA-24705-Section C".

Toxicity studies with CGA-24705 have been conducted by Affiliated Medical Research, Inc., Ciba-Geigy Limited (Switzerland), IFFA CREDO Research Laboratories (France), and Truslow Farms, Inc.

Summaries are as follows:

103.1 Acute Toxicity

103.1.1 Mammal

Acute Oral Toxicity to Rats

Acute oral toxicity studies conducted on albino rats with CGA-24705 Technical and 6E (marketed emulsifiable concentrate) show that this product would be considered a Class II Economic Poison in accordance with Paragraph 162.116 of the Regulations under the Federal Insecticide, Fungicide and Rodenticide Act. The acute oral LD_{50} of Technical material to both sexes of albino rats is 2780 mg/kg (CG-I) whereas the acute oral LD_{50} of the 6E formulation is 4286 mg/kg to male rats and 2828 to female rats (AMR-I). No mortality was observed in either sex at 2000 mg/kg of the 6E formulation. Signs of intoxication observed at the higher dosage levels in these studies were severe salivation and diarrhea, exophthalmus, pilo-erection, and trismus. Gross necropsy of the animals that died during the study revealed hemorrhagic lungs while localized hemorrhagic areas were observed on the lungs of survivors sacrificed at the end of the observation period.

Acute Oral Toxicity to Dogs

Acute oral toxicity studies were attempted with CGA-24705 Technical (AMR-II) and 6E formulation (AMR-III) in Beagle dogs. In both studies emesis occurred prior to the onset of toxic symptoms. Emetic $Dose_{50}$ values of 19.0 and 24.5 mg/kg were established for CGA-24705 Technical and 6E, respectively. No deaths occurred in these studies and no abnormal behavioral reactions were noted during the 14-day post-dosing observation periods.

Acute Dermal Toxicity to Rabbits

The acute dermal LD_{50} of CGA-24705 Technical and 6E to albino rabbits were determined to be > 10,000 mg/kg for each material (AMR-IV and V). No mortality occurred as a result of the 24-hour exposure to dosage levels of 5,000 and 10,000 mg/kg of either test material. Gross autopsy of survivors at the end of the 14-day post-dosing observation period revealed slight dermal irritation at that time. No other indications of toxicity were noted.

Eye Irritation in Rabbits

Undiluted CGA-24705 Technical was shown to be non-irritating to the rabbit eye with an eye irritation score of 0.0/110. No irritation was observed under rinsed or unrinsed conditions in this study (CG-II). Undiluted CGA-24705 6E was shown to be an irritant to the rabbit eye with a maximum eye irritation group mean score of 29.5/110 occurring 48 hours after treatment (AMR-VI). This value decreased to 10.8/110 by the seven day evaluation. Minimal corneal involvement was observed in 3 of the 6 treated rabbits at the seven day evaluation period. The proposed label contains a caution statement reflecting this observation.

Primary Skin Irritation in Rabbits

In primary skin irritation studies, CGA-24705 Technical and 6E were both shown to be Not An Irritant to the skin of the albino rabbits. Primary skin irritation scores from these studies were calculated to be 0.1/8.0 for technical material (CG-III) and 1.62/8.0 for 6E formulation (AMR-VIII). The proposed label reflects this observation.

Skin Sensitization in Guinea Pigs

Ten guinea pigs of the Hartley strain were used to evaluate the skin sensitizing properties of CGA-24705 Technical (AMR-VIII). Treatment consisted of repeated closed patch applications of 0.5 ml of undiluted test material on alternate days for a total of ten insult applications. Each exposure was for a six hour period. Very mild dermal reactions resulted from most of these exposures. The mean erythema and edema scores for the insult period were 1.24 and 0.80, respectively. At challenge, 14 days after the last application, the mean reactions for erythema and edema were 0.70 and 0.60, respectively. Based on these data, CGA-24705 Technical was judged to be Not A Sensitizer.

Acute Aerosol Inhalation in Rats

Acute aerosol inhalation toxicity trials were conducted on albino rats with CGA-24705 Technical and 6E formulation. Both studies utilized exposure periods of four hours. The acute inhalation LC_{50} for technical material was shown to be > 1750 mg/m^3 based on a gravimetric determination of aerosol sampled

in the immediate vicinity of the test animals (CG-IV). No mortalities occurred at this exposure level and no treatment related gross organ changes were observed upon autopsy of survivors following the seven day post treatment observation period. The acute nominal inhalation LC_{50} for 6E was shown to be > 247 mg/L of air. No mortalities occurred at this exposure level, however, test animals exhibited hyperactivity, hypoactivity, salivation, and gasping during the exposure period (AMR-IX).

103.1.2 Acute Bird Toxicity

The acute toxicity of CGA-24705 Technical to Mallard Ducklings and Bobwhite Quail chicks was evaluated in 8-day LC_{50} studies conducted at Truslow Farms, Inc. Dietary LC_{50} values were determined to be > 10,000 ppm for each species (TF-I and III). Reduced food consumption and body weight gain were observed at this feeding level. Dieldrin, included in these studies as a positive control, gave LC_{50} values of 101 ppm in ducklings and 34 ppm in quail chicks. Based on these data, the statement "Toxic to Birds" would not be required on the CGA-24705 6E label.

103.1.3 Acute Fish Toxicity

The acute toxicity of CGA-24705 Technical to Rainbow trout, Crucian carp, Channel catfish, Bluegill sunfish and the Guppy was determined under static bioassay conditions (CG-V). The 96-hour LC_{50} values for these species were shown to be 2.0, 4.9, 4.9, 15.0, and 8.6 ppm, respectively. Based on these data, the statement "Toxic to Fish" would not be required on the CGA-24705 6E label.

103.1.4 Aquatic Invertebrate Toxicity: No data available.

103.2 Subacute Toxicity

21-Day Subacute Dermal Toxicity to Rabbits

A 21-day subacute dermal toxicity study was conducted with 37.5% and 75% aqueous solutions of CGA-24705 6E on albino rabbits to determine the effect of repeated doses of this product on the skin and on dermal toxicity (AMR-X). Treatment levels calculated to be 540 and 1080 mg/kg were exposed to abraded and intact skin of five rabbits of each sex, six hours a day, five days a week, for three weeks. One control animal died during the course of the study as a result of a handling

accident. Treated animals showed some redness of the skin at the site of application following the initial application. The intensity of this mild reaction did not increase as a result of subsequent application. No treatment related abnormalities were observed in blood or urine analyses or in organ/body weight ratios. Reduced body weight gain was observed in the high treatment groups.

No histopathological changes were observed which could be attributed to the repeated dermal exposures of test material, except in the skin. Minimal to slight acanthosis and hyperkeratosis were observed only in the high treatment level groups and no ulceration or abscessation was noted. The test material was considered to be a negligible to mild dermal irritant under the conditions of this study.

90-Day Subacute Oral Toxicity to Rats

Under the close supervision of Ciba-Geigy Limited toxicologists, a 90-day feeding study was initiated at IFFA CREDO research facilities in France to determine the oral toxicity of CGA-24705 Technical at subacute dietary levels of 100, 300, and 1,000 ppm (IFFA CREDO-I). The original French text of this study is included for reference purposes (IFFA CREDO-Ia). The 100 and 300 ppm groups consisted of 20 males and 20 females while the control and 1,000 ppm groups contained 30 rats of each sex. The extra animals in these groups were to serve as recovery animals and would receive no treatment for 30 days following the 90-day feeding period.

At the end of 9 weeks of treatment, no signs of toxicity were evident at any feeding level. In an effort to elicit a toxic response, the feeding levels for the 100 ppm group and for the 20 intended recovery animals in the 1,000 ppm group were elevated to 2,000 ppm for weeks 10 through 13.

No animals died during this study and no abnormal behavioral, digestive, or ocular disorders were observed. There were no significant differences in food consumption between test groups and deviations in the mean body weights of control and test groups never exceeded 3%. No significant differences were noted between test and control animals in blood and urine analyses. Likewise, no outstanding differences between test

and control animals were revealed in the gross pathological examination. Histopathological examination revealed no differences between control animals and group I animals which received 100 -pm of test material in the diet for 9 weeks and 2,000 ppm of test material for 4 weeks.

90-Day Subacute Oral Toxicity to Dogs

A 90-day feeding study was also initiated at IFFA CREDO in France with CGA-24705 Technical in Beagle dogs to determine the oral toxicity of this material at subacute dietary levels of 50, 150, and 500 ppm (IFFA CREDO-II). The original Feench text of this report is included for reference purposes (IFFA CREDO-IIa). The 50 and 150 ppm groups consisted of 4 males and 4 females while the control and 500 ppm group were elevated to 1,000 ppm for weeks 9 through 15.

No animals died during this study and no abnormal behavioral or digestive disorders were observed. From a clinical viewpoint, CGA-24705 was tolerated very well. Food consumption data presented in units of grams per day per animal showed that test dogs consumed somewhat less food per day than control dogs. T The decrease in food consumption was generally dose related. Test animals showed body weight gains comparable to control animals in the first eight weeks of the trial. These were somewhat reduced during the final seven weeks of the trial, and probably are a reflection of the slight reduction in food intake observed in treated dogs. No significant differences were noted between test and control animals in blood and urine analyses. Likewise, no outstanding differences between test and control animals were revealed in gross and histological examinations of body organs and tissues.

103.3 Chronic Toxicity: No data available.

103.4 Field Toxicity: No data available.

104.0 Hazard Assessment

104.1 Discussion: Toxicity studies have not given rise to any concerns regarding the hazard potential associated with the proposed uses. The environmental chemistry evaluation (70-15 data) is needed prior to completing a full and complete assessment.

104.1.1 Adequacy of Toxicity Data: satisfactory

104.1.2 Additional Data Required: Prior to consideration of full registration an acute aquatic invertebrate study, and an acute LD_{50} study on either mallard duck, or bobwhite quail is required by the Section III regulations.

104.1.3 Likelihood of Exposure to Non-Target Organisms:

Proposed uses include soybeans and corn.

105.0 Conclusions:

The environmental safety review staff finds no objections to the proposed EUP. Observations of effects upon fish, birds and other wildlife must be recorded and reported, preferably on a formal basis.

Delete the present precautionary statements under the "Environmental Hazard" section and add the following modified statements:

> Keep out of lakes, streams and ponds. Do not apply when weather conditions favor run-off or drift from treated areas. Do not contaminate water by cleaning of equipment or disposal of wastes.

Prior to consideration of full registration, an acute LD_{50} with either mallard ducks or bobwhite quail and an acute 48 hr. LC_{50} on an aquatic invertebrate (preferably daphnia) is required by the Section III regulations. Protocols are available upon request.

Scott Fredericks

Scott C. Fredericks 1-6-76
Environmental Safety
EEE Branch