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(54) Title: HERBICIDAL ACYLATED AMINO-(PHENYL- OR PYRIDINYL- OR THIENYL-)-PHENYL DERIVATIVES (57) Abstract The invention comprises certain substituted phenylamine compounds, agriculturally suitable compositions thereof and a method for controlling undesired vegetation by applying compounds or compositions comprising certain substituted phenylamine compounds.		

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TITLE

Herbicidal Acylated amino-(phenyl- or pyridinyl- or thienyl-)-phenyl derivatives

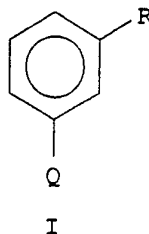
This invention relates to certain substituted

5 phenylamine compounds which are useful as herbicides and their agriculturally suitable compositions as well as methods for their use as general or selective preemergent or postemergent herbicides or as plant growth regulants.

New compounds effective for controlling the growth of
10 undesired vegetation are in constant demand. In the most common situation, such compounds are sought to selectively control the growth of weeds in useful crops such as cotton, rice, corn, wheat and soybeans, to name a few. Unchecked weed growth in such crops can cause
15 significant losses, reducing profit to the farmer and increasing costs to the consumer. In other situations, herbicides are desired which will control all plant growth. Examples of areas in which complete control of all vegetation is desired are areas around railroad
20 tracks, storage tanks and industrial storage areas. There are many products commercially available for these purposes, but the search continues for products which are more effective, less costly and environmentally safe.

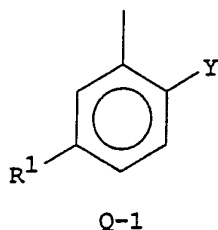
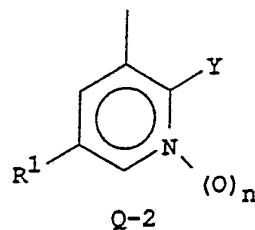
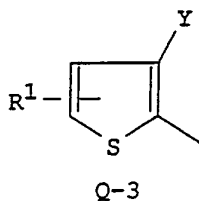
SUMMARY OF THE INVENTION

25 The invention comprises a method for controlling the growth of undesired vegetation by the preemergent and/or postemergent application to the locus to be protected of an effective amount of compounds of Formula I:

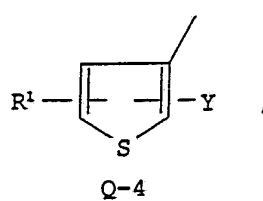


wherein

Q is



or



10 R is H, C₁-C₂ alkyl, C₁-C₂ haloalkyl, C₁-C₂ alkoxy, C₁-C₂ haloalkoxy, C₁-C₂ haloalkylthio, halogen, CN or NO₂;

Y is NR⁷C(O)XR³;

X is a single bond, O, S or NR⁴;

15 R¹ is H, C₁-C₃ alkyl, C₁-C₃ alkoxy, C₁-C₃ haloalkoxy, C₁-C₃ alkylthio, C₂-C₃ alkynyl, C₂-C₃ alkoxyalkyl, C₂-C₃ alkylthioalkyl, halogen, NO₂, CN, NHR⁵ or NR⁵R⁶;

20 R³ is C₁-C₅ alkyl optionally substituted with C₁-C₂ alkoxy, OH, 1-3 halogens, OC(O)(C₁-C₂ alkyl) or C₁-C₂ alkylthio; CH₂(C₃-C₄ cycloalkyl); C₃-C₄ cycloalkyl optionally substituted with 1-3 CH₃'s, 1-2 F's or 1-2 Cl's; C₂-C₄ alkenyl; C₂-C₄ haloalkenyl; C₃-C₄ alkynyl; C(O)(C₁-C₂ alkyl); benzyl; or a 5- or 6-membered heterocyclic ring
25 containing one heteroatom selected from O, N and S, each ring optionally substituted with halogen or CH₃;

R⁴ is H, C₁-C₂ alkyl or OCH₃;

R⁵ and R⁶ are independently C₁-C₂ alkyl;

R⁷ is H, C₁-C₂ alkyl or C(O)R⁸;

5 R⁸ is C₁-C₅ alkyl optionally substituted with C₁-C₂ alkoxy, OH, 1-3 halogens, OC(O)(C₁-C₂ alkyl) or C₁-C₂ alkylthio; CH₂(C₃-C₄ cycloalkyl); C₃-C₄ cycloalkyl optionally substituted with 1-3 CH₃'s, 1-2 F's or 1-2 Cl's; C₂-C₄ alkenyl; C₂-C₄ haloalkenyl; C₃-C₄ alkynyl; C(O)(C₁-C₂ alkyl); benzyl; or a 5- or 6-membered heterocyclic ring
10 containing one heteroatom selected from O, N and S, each ring optionally substituted with halogen or CH₃; and

n is 0 or 1;

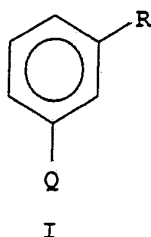
provided that when R³ is C₂ alkenyl, C₂ haloalkenyl or
15 a heterocyclic ring then X is a single bond.

In the above definitions, the term "alkyl", used either alone or in compound words such as "alkylthio" or "haloalkyl", includes straight chain or branched alkyl, e.g., methyl, ethyl, *n*-propyl, isopropyl or the different
20 butyl isomers. Alkoxy includes methoxy, ethoxy, *n*-propyloxy, isopropyloxy and the different butoxy isomers. Alkenyl includes straight chain or branched alkenes, e.g., 1-propenyl, 2-propenyl, 3-propenyl and the different butenyl isomers. Cycloalkyl includes
25 cyclopropyl, cyclobutyl, cyclopentyl and cyclohexyl. The term "halogen", either alone or in compound words such as "haloalkyl", means fluorine, chlorine, bromine or iodine. Further, when used in compound words such as "haloalkyl" said alkyl may be partially or fully substituted with
30 halogen atoms, which may be the same or different. Examples of haloalkyl include CH₂CH₂F, CF₂CF₃ and CH₂CHFCl. Representative exemplification of heterocyclic rings includes but is not limited to pyrrole, furan, thiophene and pyridine.

The preferred methods of use of the invention for reasons including ease of synthesis and/or greater herbicidal efficacy involve:

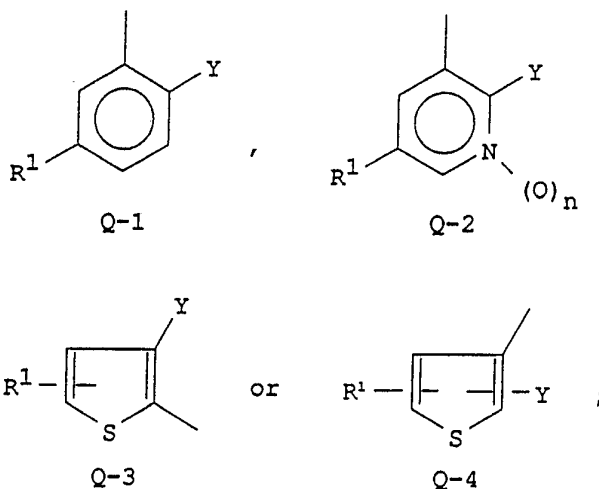
1. Compounds of Formula I wherein R is C₁-C₂ haloalkyl, C₁-C₂ haloalkoxy, C₁-C₂ haloalkylthio, halogen or CN;
 2. Compounds of Preferred 1 wherein R¹ is C₁-C₂ alkyl, C₁-C₂ alkoxy, C₁-C₂ alkylthio, C₂-C₃ alkoxyalkyl, C₂-C₃ alkylthioalkyl, Cl, Br, CN, NHR⁵ or NR⁵R⁶; and R⁷ is H;
 3. Compounds of Preferred 2 wherein Q is Q-1 or Q-2; and R³ is C₁-C₄ alkyl optionally substituted with C₁-C₂ alkoxy; CH₂ (C₃-C₄ cycloalkyl); C₃-C₄ cycloalkyl optionally substituted with 1-3 CH₃'s; or C₂-C₄ alkenyl;
 4. Compounds of Preferred 3 wherein R is C₁-C₂ fluoroalkyl, C₁-C₂ fluoroalkoxy, C₁-C₂ fluoroalkylthio, Cl, Br or CN;
- Specifically preferred methods for reasons of greatest ease of synthesis and/or greatest herbicidal efficacy are the method of Preferred 4 involving 1-methylethyl [5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl]carbamate and 3-methyl-N-[5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl]butanamide.

The invention also comprises novel compounds of Formula I and agriculturally suitable compositions containing them.



wherein

Q is



R is H, C₁-C₂ alkyl, C₁-C₂ haloalkyl, C₁-C₂ alkoxy, C₁-C₂ haloalkoxy, C₁-C₂ haloalkylthio, halogen, CN or NO₂;

Y is NR⁷C(O)XR³;

X is a single bond, O, S or NR⁴;

R¹ is H, C₁-C₃ alkyl, C₁-C₃ alkoxy, C₁-C₃ haloalkoxy, C₁-C₃ alkylthio, C₂-C₃ alkoxyalkyl, C₂-C₃ alkylthioalkyl, halogen, NO₂, CN, NHR⁵ or NR⁵R⁶;

R³ is C₁-C₅ alkyl optionally substituted with C₁-C₂ alkoxy, OH, 1-3 halogens, OC(O)(C₁-C₂ alkyl) or C₁-C₂ alkylthio; CH₂(C₃-C₄ cycloalkyl); C₃-C₄ cycloalkyl optionally substituted with 1-3 CH₃'s, 1-2 F's or 1-2 Cl's; C₂-C₄ alkenyl; C₂-C₄ haloalkenyl; C₃-C₄ alkynyl; C(O)(C₁-C₂ alkyl); benzyl; or a 5- or 6-membered heterocyclic ring containing one heteroatom selected from O, N and S, each ring optionally substituted with halogen or CH₃;

R⁴ is H, C₁-C₂ alkyl or OCH₃;

R⁵ and R⁶ are independently C₁-C₂ alkyl; and

R^7 is H, C_1 - C_2 alkyl or $C(O)R^8$;

R^8 is C_1 - C_5 alkyl optionally substituted with C_1 - C_2 alkoxy, OH, 1-3 halogens, $OC(O)(C_1$ - C_2 alkyl) or C_1 - C_2 alkylthio; $CH_2(C_3$ - C_4 cycloalkyl); C_3 - C_4 cycloalkyl optionally substituted with 1-3 CH_3 's, 1-2 F's or 1-2 Cl's; C_2 - C_4 alkenyl; C_2 - C_4 haloalkenyl; C_3 - C_4 alkynyl; $C(O)(C_1$ - C_2 alkyl); benzyl; or a 5- or 6-membered heterocyclic ring containing one heteroatom selected from O, N and S, each ring optionally substituted with halogen or CH_3 ;

n is 0 or 1;

provided that

- (a) when R^3 is C_2 alkenyl, C_2 haloalkenyl or a heterocyclic ring then X is a single bond and
- (b) when Q is Q-1, R^1 is H and Y is $NHC(O)CH_3$ then R is other than Br or F.

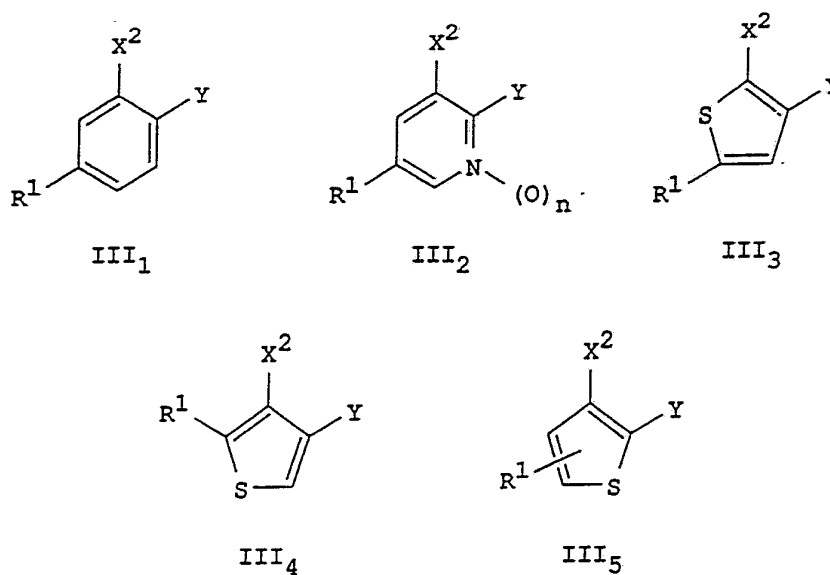
The preferred compounds and compositions of the invention are the compounds and compositions involving the compounds set forth above in the preferred methods of use.

DETAILED DESCRIPTION OF THE INVENTION

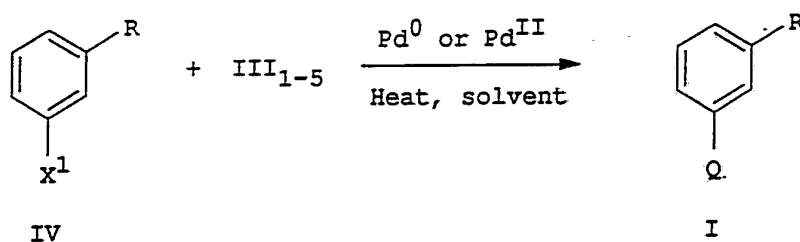
Compounds of General Formula I can be readily prepared by one skilled in the art by using the reactions and techniques described in Schemes 1-10 of this section as well as by following the specific procedures given in Examples 1-22.

Scheme 1 illustrates the preparation of compounds of General Formula I (where R, R^1 and Y are defined as above) whereby aromatic compounds of General Formula IV where X^1 is bromine, iodine or trifluoromethylsulfonyloxy (OTf) can be coupled with substituted aryl compounds of Formula III₁₋₅ where X^2 is a trialkyltin (e.g., Me_3Sn), trialkylsilyl (e.g., Me_3Si), or boronic acid (e.g.,

- B(OH)₂ moiety. The coupling is carried out by methods known in the art: for example, see Tsuji, J., *Organic Synthesis with Palladium Compounds*, Springer-Verlag, Berlin **1980**; Negishi, E., *Acc. Chem. Res.* **1982**, 15, 340;
- 5 Stille, J. K., *Angew. Chem.* **1986**, 98, 504; Yamamoto, A. and Yamagi, A., *Chem. Pharm. Bull.* **1982**, 30, 1731 and 2003; Dondoni et al., *Synthesis* **1987**, 185; Dondoni et al., *Synthesis* **1987**, 693; Hoshino et al., *Bull. Chem. Soc. Jpn.* **1988**, 61, 3008; Sato, M. et al., *Chem. Lett.*
- 10 **1989**, 1405; Miyaura et al., *Synthetic Commun.* **1981**, 11, 513; Siddiqui and Sniekus, *Tetrahedron Lett.* **1988**, 29, 5463; Sharp et al., *Tetrahedron Lett.* **1987**, 28, 5093; Hatanaka et al., *Chem. Lett.* **1989**, 1711; Bailey, T. R., *Tetrahedron Lett.* **1986**, 27, 4407 and Echavarren, A. M.
- 15 and Stille, J. K., *J. Am. Chem. Soc.* **1987**, 109, 5478.
- The coupling of IV and III₁₋₅ is carried out by heating in the presence of a transition metal catalyst such as tetrakis(triphenylphosphine) palladium(0) or bis(triphenylphosphine) palladium(II) dichloride in a
- 20 solvent such as toluene, acetonitrile, glyme, or tetrahydrofuran. As shown in Scheme 1, compounds of General Formula I can also be prepared by coupling aromatic compounds of General Formula IV where X¹ is a trialkyltin (e.g., Me₃Sn), trialkylsilyl (e.g., Me₃Si) or
- 25 boronic acid (e.g., B(OH)₂) moiety with substituted aryl compounds of Formula III₁₋₅ where X² is bromine, iodine, or OTf using the same conditions as described above.

Scheme 1

5



Substituted aryl compounds of General Formula IV and
 10 III_{1-5} where X^1 and X^2 are bromine, iodine or OTf are
 either known or readily prepared by procedures and
 techniques well known in the art, for example:
 Houben-Weil, *Methoden der Organische Chemie*, IV Edition,
 Eugen Muller, ed., Georg Thieme Verlag. By methods also
 15 reported in the above cited literature, treatment of
 compounds of General Formula IV and III_{1-5} where X^1 is
 bromine or iodine with a base such as n-butyllithium
 followed by quench with a trialkyltin halide,
 trialkylsilyl halide, boron trichloride, or trialkyl
 20 borate gives compounds of General Formula IV and III_{1-5}
 where X^1 and X^2 respectively are a trialkyltin (e.g.,
 Me_3Sn), trialkylsilyl (e.g., Me_3Si), or boronic acid

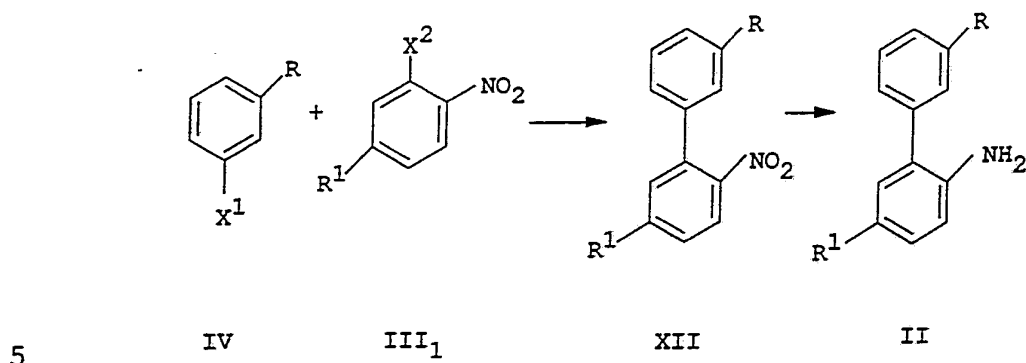
(e.g., $B(OH)_2$) moiety. Compounds of General Formula III_{1-5} where X^2 is a trialkyltin (e.g., Me_3Sn), trialkylsilyl (e.g., Me_3Si), or boronic acid (e.g., $B(OH)_2$) moiety can also be prepared from compounds of General Formula III_{1-5} where X^2 is hydrogen by treatment with a base such as n-butyllithium followed by quench with a trialkyltin halide, trialkylsilyl halide, or trialkyl borate as reported in the same literature references, providing that Y is an ortho-directing group known in the art (e.g., trimethylacetamido): for example, Fuhrer, W., *J. Org. Chem.*, **1979**, 44, 1133.

The remaining schemes and examples illustrate the preparation of compounds of General Formula I wherein Q is Q-1, but can also be applied to Q-2 through Q-5.

Compounds of General Formula I can be readily prepared by one skilled in the art from intermediate compounds of General Formula I where Y is NH_2 or NHR^7 by reaction with appropriate acyl chlorides, acid anhydrides, chloroformates, carbamyl chlorides, or isocyanates under conditions well known in the literature, for example: Sandler, R. S. and Karo, W., *Organic Functional Group Preparations*, 2nd Edition, Vol. I, 274; Vol. II, 152, 260, Academic Press. Schemes 2 and 3 and Examples 5-7 and 13 of this section illustrate examples of the preparation and reactions of intermediates of Formula II. Such intermediates are readily prepared by coupling of aromatic compounds of Formula IV where X^1 is bromine or iodine with substituted aryl compounds of Formula III_{1-5} where Y is NHR^7 and X^2 is a trialkyltin (e.g., Me_3Sn), trialkylsilyl (e.g., Me_3Si), or boronic acid (e.g., $B(OH)_2$) moiety, or of aromatic compounds of Formula IV where X^1 is a trialkyltin (e.g., Me_3Sn), trialkylsilyl (e.g., Me_3Si), or boronic acid (e.g., $B(OH)_2$) moiety with substituted aryl compounds of

Formula III₁₋₅ where Y is NHR⁴ and X² is bromine or iodine under the same conditions as described above.

Scheme 2

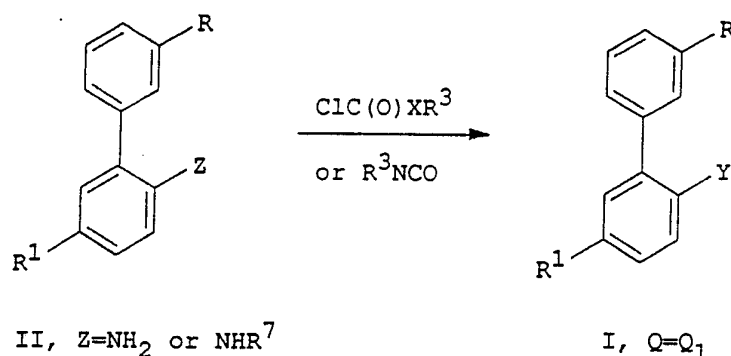


Intermediate compounds of General Formula II can also be prepared, as illustrated in Scheme 2 and Examples 16 and 17 of this section, by palladium catalyzed coupling of aromatic compounds of General Formula IV where X¹ is a trialkyltin (e.g., Me₃Sn), trialkylsilyl (e.g., Me₃Si), or boronic acid (e.g., B(OH)₂) moiety with substituted aryl compounds of Formula III₁₋₅ where X² is bromine, iodine or OTf and Y is nitro, using the same conditions as described above, and then catalytically or chemically reducing the nitro group in the intermediate compounds of General Formula XII. Such reduction of nitro to amino groups is well documented in the chemical literature. See for example, Ohme, R. and Zubek, A. R. and Zubek, A. in *Preparative Organic Chemistry*, 557, Hilgetag, G. and Martini, A., Eds., John Wiley & Sons, New York, 1972.

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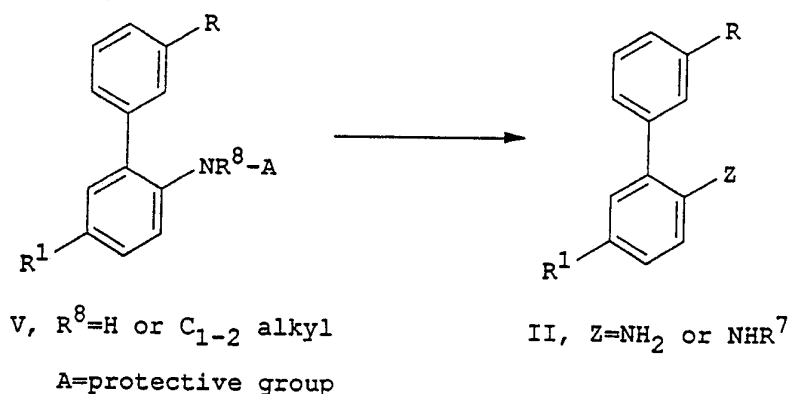
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Scheme 3

5 Alternatively, intermediate compounds of General
 Formula II where Z is NHR^7 can be prepared from compounds
 of General Formula V, which contain an appropriately
 protected primary or secondary amino group, by
 hydrolysis, hydrogenolysis, or other adequate
 10 deprotection procedures, as shown in Scheme 4.
 Appropriate conditions for such reactions are extensively
 described in the literature, for example: Theodora W.
 Green, *Protective Groups in Organic Synthesis*, Chap. 7,
 John Wiley & Sons, New York, 1981.

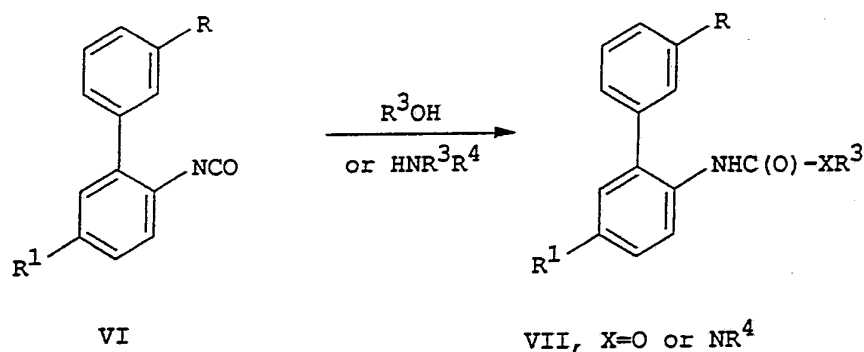
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Scheme 4

20 Compounds of General Formula VII containing a
 urethane or urea moiety can be prepared by one skilled in
 the art from intermediate compounds of General Formula VI

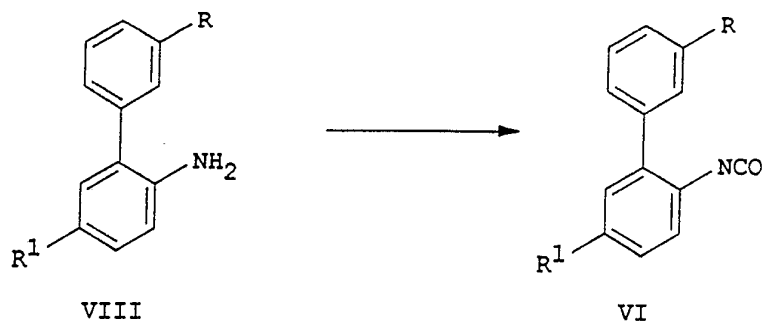
containing an isocyanate moiety by reaction with appropriate alcohols or amines, respectively, as shown in Scheme 5 and well documented in the literature: for example, Sandler, R. S. and Karo, W., *Organic Functional Group Preparations*, 2nd Edition, Vol. II, 152, 260, Academic Press.

Scheme 5



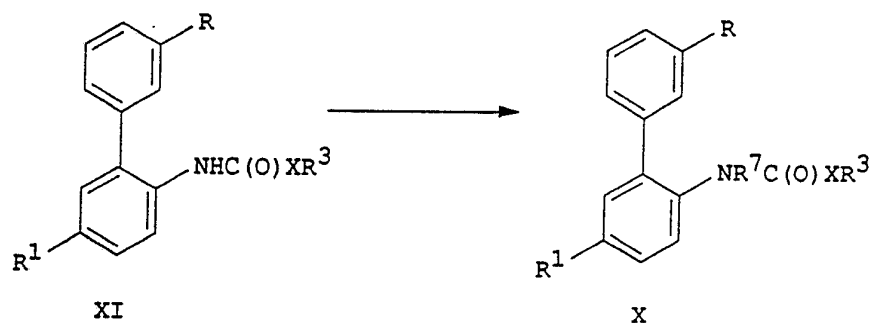
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Such isocyanate intermediates of Formula VI can be prepared from intermediate compounds of General Formula VIII by reaction with phosgene or a safer phosgene replacement (e.g., diphosgene or triphosgene) as illustrated in Scheme 6 and Example 4 of this section, using procedures and techniques known in the literature: for example, Lehman, G. and Teichman, H. in *Preparative Organic Chemistry*, 472, Hilgetag, G. and Martini, A., Eds., John Wiley & Sons, New York, 1972; Eckert, H. and Forster, B., *Angew. Chem. Int. Ed.*, 1987, 26, 894; Babad, H. and Zeiler, A. G., *Chem.Rev.*, 1973, 73, 75.

Scheme 6

5 Compounds of General Formula X can be prepared from
 compounds of General Formula XI by reaction with the
 appropriate C₁ to C₂ alkyl halide, sulfate, or other
 adequate equivalent as described and illustrated in
 Scheme 7 and Example 15, using published procedures and
 10 techniques: for example, Lehman, G. and Teichman, H. in
Preparative Organic Chemistry, 455-6, Hilgetag, G. and
 Martini, A., Eds., John Wiley & Sons, New York, 1972;
 Pachter, I. J. and Kloetzel, M. C., *J. Amer. Chem. Soc.*,
 1952, 74, 1321.

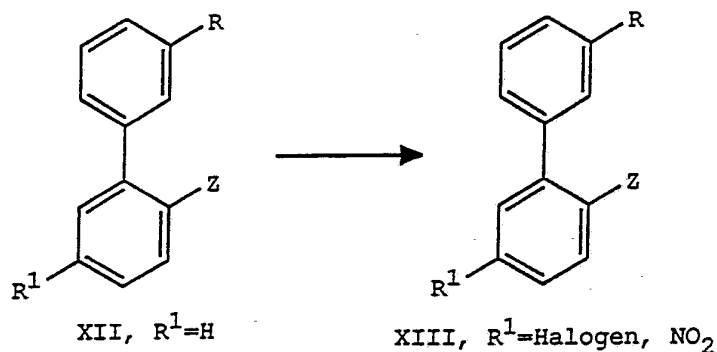
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Scheme 7

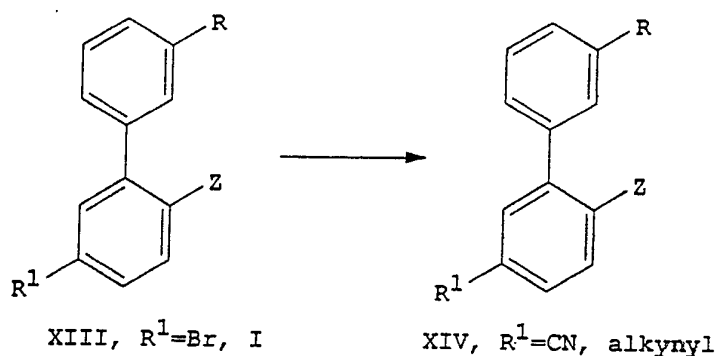
20 Compounds of General Formula XIII can be prepared
 from compounds of General Formula XII, where Z is a
 primary or secondary amine, amide, urethane, or urea by
 reaction with a halogen, nitric acid or nitric oxide
 under the appropriate conditions, as illustrated in
 Scheme 8 and Example 20 and thoroughly described in the

chemical literature; for example see, Dorn, H. in *Preparative Organic Chemistry*, Hilgetag, G. and Martini, A., Eds., John Wiley & Sons: New York, 1972, p. 150.

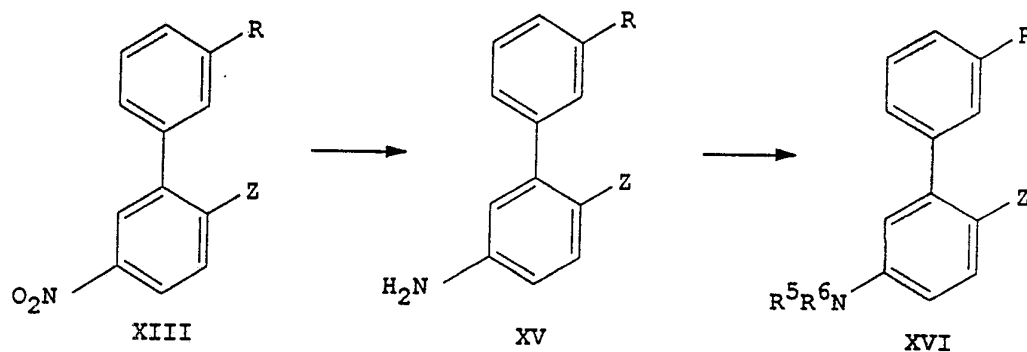
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Scheme 8

Compounds of General Formula XIII where R^1 is bromine
10 or iodine, can be further elaborated into Compounds of
General Formula XIV, as illustrated in Scheme 9 and
Examples 20 and 21, under reaction conditions described
in the chemical literature; for example see, Gross, H.,
Bischoff, Ch., Höft, E., and Gründemann, E. in
15 *Preparative Organic Chemistry*, Hilgetag, G. and
Martini, A., Eds., John Wiley & Sons: New York, 1972,
p. 923; Takahashi, S., Kuroyama, Y., Sonogashira, K.,
and Hagihara, N., *Synthesis*, 1980, 627; De la Rosa,
Martha A., Velarde, Esperanza, and Guzman, A.: *Synthetic*
20 *Communications*, 1990, 20, 2059.

Scheme 9

5 Compounds of General Formula XIII where R^1 is nitro can be also used to prepare Compounds of General Formula XV and Compounds of General Formula XVI, as illustrated in Scheme 10 using procedures and techniques known in the literature, for example, Lehmann, G. and Teichmann, H. in
 10 *Preparative Organic Chemistry*, Hilgetag, G. and Martini, A., Eds., John Wiley & Sons: New York, **1972**, p. 419.

Scheme 10EXAMPLE 1Preparation of 3-(trifluoromethyl)phenylboronic acid

20 A solution of 50 g (0.222 mol) *meta*-bromobenzotri-fluoride in 175 ml dry ether was cooled at -10°C under nitrogen and 155 ml (0.24 mol) 1.6N *n*-butyllithium solution in hexanes was added dropwise during 1.5 hrs

while maintaining the temperature below 0°C. After complete addition, the lithium salt solution was slowly transferred through a cannula during 30 min, under slight nitrogen pressure, into a solution of 170 g (0.888 mol) triisopropylborate in 150 ml anhydrous tetrahydrofuran at -70 to -60°C. Stirring was continued overnight while allowing the cold bath to melt. The reaction mixture was poured over 200 ml ice-cold 10% hydrochloric acid and stirred for 20 min. Phases were separated, organic phase washed twice with brine, dried and evaporated. The crude product was purified by triturating with hot hexane, to yield 35 g of pure product as white crystals, m.p. 155-6°C.

EXAMPLE 2

Preparation of 2,2-dimethyl-N-[5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl]-propanamide
22.8 g (0.1 mol) 2-bromo-4-methyl-N-acetylaniline was dissolved under nitrogen in 30 ml glyme, 0.3 g palladium bis(triphenylphosphine) dichloride was added, and the mixture was stirred at the room temperature for 10 min., after which 20.9 g (0.11 mol) meta-trifluoromethylphenylboronic acid was added, followed by a solution of 25.2 g (0.3 mol) sodium bicarbonate in 300 ml water. The mixture was refluxed under nitrogen with good stirring for 2 hrs. After cooling to about 60°C, the reaction mixture was poured over 300 ml 1N sodium hydroxide solution and stirred at the room temperature for 20 min, then extracted with 250 ml ethyl acetate. Organic extracts were washed with brine, dried, and evaporated to dryness. The crude product was purified by chromatography on silica using 20:1 chlorobutane/ethyl acetate mixture as eluent to yield 26.5 g pure product as a white powder, m.p. 110-3°C.

¹H NMR (CDCl₃): δ 1.98 (s, 3: COCH₃), 2.40 (s, 3: CH₃), 7.02-7.8 (7 aromatic protons, NH).

EXAMPLE 3Preparation of 5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl-amine

8 g 2,2-Dimethyl-N-[5-methyl-3'-(trifluoro-
5 methyl)[1,1'-biphenyl]-2-yl]-propanamide was dissolved in
30 ml glacial acetic acid and the mixture warmed up to
about 70°C and then 20 ml 15% hydrochloric acid solution
was gradually added. After complete addition the
reaction mixture was kept at reflux for 4 hrs. After
10 cooling, volatiles were removed in vacuo, the residue was
taken in 50 ml water, ice was added, the mixture was
neutralized to pH 10 with 5% sodium hydroxide solution
and extracted with ether. Organic extracts were washed
with brine, dried, and evaporated to dryness. The crude
15 product was purified by chromatography on silica using
chlorobutane as eluent to yield 6.2 g pure product as a
tan oil.

¹H NMR (CDCl₃): δ 2.24(s, 3: Me) 3.58(s, 2: NH₂)
6.6-7.8 (7 aromatic protons).

20

EXAMPLE 4Preparation of 5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl-isocyanate

To a solution of 0.8 g triphosgene in 25 ml dry
chloroform 2 g of 5-methyl-3'-(trifluoromethyl)[1,1'-
25 biphenyl]-2-yl-amine was added under nitrogen, followed
by dropwise addition of 0.7 ml triethylamine. A mildly
exothermal reaction occurred. After stirring overnight
at the room temperature, aliquots of this reaction
mixture were used for further reactions.

30

EXAMPLE 5Preparation of 3-methyl-N-[5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl]butanamide

To a solution of 2.51 g (0.01 mol) 5-methyl-3'-(
(trifluoromethyl)[1,1'-biphenyl]-2-yl)-amine in 20 ml dry
35 chloroform 1.2 g (0.012 mol) triethylamine was added

under nitrogen, followed by dropwise addition of 1.33 g (0.011 mol) 3-methylbutyryl chloride dissolved in 5 ml dry chloroform. After stirring for 5 hrs at the room temperature, 5 ml water was added and stirring was continued for 20 min. The reaction mixture was diluted with 50 ml methylene chloride, washed with water, then saturated sodium bicarbonate solution and brine, dried, and evaporated to dryness. The crude product was purified by chromatography on silica using 20:1 chlorobutane/ethyl acetate mixture as eluent to yield 3.1 g pure product as a light tan powder, m.p. 89-91°C.

^1H NMR (CDCl_3): δ 0.95 (d, 6: $2\times\text{CH}_3$), 2.00 (m, 3: CH_2 , CH), 2.40 (s, 3: CH_3), 6.8 (s, 1: NH), 7.05-7.65 (7 aromatic protons).

15

EXAMPLE 6

Preparation of 1-methylethyl-N-[5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl] carbamate

To a solution of 2.51 g (0.01 mol) 5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl-amine in 20 ml dry chloroform 1.2 g (0.012 mol) triethylamine was added under nitrogen, followed by dropwise addition of 1.35 g (0.011 mol) isopropyl chloroformate dissolved in 5 ml dry chloroform. After stirring for 2 hrs at the room temperature the reaction mixture was refluxed for 5 min, allowed to cool at the room temperature, 5 ml water was added and stirring continued for 20 min. The reaction mixture was diluted with 50 ml methylene chloride, washed with water, then saturated sodium bicarbonate solution and brine, dried, and evaporated to dryness. The crude product was purified by chromatography on silica using 20:1 chlorobutane/ethyl acetate mixture as eluent to yield 3.1 g pure product as white crystals, m.p. 83-85°C.

^1H NMR (CDCl_3): δ 1.22 (d, 6: $2\times\text{CH}_3$), 2.38 (s, 3: CH_3), 4.96 (m, 1: CH), 6.2 (s, 1: NH), 7.02-7.90 (7 aromatic protons).

35

EXAMPLE 7Preparation of N,N-diethyl-N'-[5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl] urea

To a solution of 2.51 g (0.01 mol) 5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl-amine in 20 ml dry chloroform 2 g (0.015 mol) diethylcarbonyl chloride was added under nitrogen and the reaction mixture was refluxed for 5 hrs. After cooling to room temperature, 5 ml water was added and stirring continued for 20 min. The reaction mixture was diluted with 50 ml methylene chloride, washed with saturated sodium bicarbonate solution and brine, dried, and evaporated to dryness. The crude product was purified by chromatography on silica using 10:1 chlorobutane/ethyl acetate mixture as eluent to yield 2.1 g pure product as white crystals, m.p. 87-87°C.

^1H NMR (CDCl_3): δ 1.00 (t, 6: $2 \times \text{CH}_3$), 2.35 (s, 3: CH_3), 3.15 (q, 4: $2 \times \text{NCH}_2$), 6.1 (s, 1: NH), 7.02-8.00 (7 aromatic protons).

20

EXAMPLE 8Preparation of N-(2-methylpropyl)-N'-[5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl] urea

To 5 ml solution of 5-methyl-3'-(trifluoromethyl)-[1,1'-biphenyl]-2-yl-isocyanate prepared as described under Example 4 was added under nitrogen 0.17 g (1.2 equiv) isobutylamine and the reaction mixture stirred overnight at the room temperature, then diluted with 25 ml methylene chloride, washed with saturated sodium bicarbonate solution and brine, dried, and evaporated to dryness. The crude product was purified by chromatography on silica using 5:1 chlorobutane/ethyl acetate mixture as eluent to yield 0.52 g pure product as white crystals, m.p. 165-7°C.

¹H NMR (CDCl₃): δ 0.91 (d, 6: 2xCH₃), 1.63 (m, 1: CH), 2.40 (s, 3: CH₃), 2.96 (t, 2: NCH₂), 4.6 (t, 1: NH), 5.8 (s, 1: NH), 7.05-7.65 (7 aromatic protons).

EXAMPLE 9

5 Preparation of cyclopentyl-[5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl] carbamate

To 5 ml solution of 5-methyl-3'-(trifluoromethyl)-[1,1'-biphenyl]-2-yl-isocyanate prepared as described under Example 4 was added under nitrogen 0.21 g (1.5 equiv) cyclopentyl alcohol and the reaction mixture stirred overnight at the room temperature, then diluted with 25 ml methylene chloride, washed with saturated sodium bicarbonate solution and brine, dried, and evaporated to dryness. The crude product was purified by chromatography on silica using 5:1 chlorobutane/ethyl acetate mixture as eluent to yield 0.21 g pure product.

EXAMPLE 10

Preparation of 4-methyl-2-(trimethyltin)trimethylacetylanilide

20 19.1 g (0.1 mol) 4-methyl-N-(trimethylacetyl)aniline was dissolved under nitrogen in 250 ml anhydrous tetrahydrofuran and the solution was cooled to -10°C, after which 156 ml (0.25 mol) 1.6N solution of n-butyllithium in hexanes was added dropwise during 1.5 hrs, while maintaining the temperature below 0°C. After complete addition stirring was continued for 0.5 hrs on the cold bath, then overnight at the room temperature. The reaction mixture was cooled to -5°C and a solution of 40 g (0.2 mol) trimethyltin chloride in 100 ml anhydrous tetrahydrofuran was added dropwise during 20 min., while maintaining the temperature below 0°C. After complete addition stirring was continued at 0°C for 4 hrs, then the reaction mixture was poured under nitrogen blanket over 300 ml saturated solution of sodium bicarbonate and stirred for 1 hr. 300 ml Ethyl acetate was added, phases

separated, the organic phase washed with brine, dried and evaporated to dryness. The residue was chromatographed on silica using chlorobutane as eluent. 21.3 g of trimethyltin derivative and 6.1 g of starting material
5 were obtained.

^1H NMR (CDCl_3): δ 0.38 (s, 9: SnMe_3), 1.30 (s, 9: $\text{C}(\text{CH}_3)_3$), 2.32 (s, 3: CH_3), 7.10-7.7 (3 aromatic protons, NH).

EXAMPLE 11

10 Preparation of 2,2-dimethyl-N-[5-methyl-3'-cyano[1,1'-biphenyl]-2-yl]-propanamide

7.1 g (0.02 mol) 4-methyl-2-(trimethyltin)trimethylacetylanilide was dissolved under nitrogen in 30 ml anhydrous tetrahydrofuran, 0.05 g palladium tetrakis-
15 (triphenylphosphine) was added, and the mixture was stirred at the room temperature for 10 min., after which 4 g (0.022 mol) meta-bromobenzonitrile was added. The mixture was refluxed under nitrogen with good stirring for 7 hrs. After cooling, the reaction mixture was
20 poured over 100 ml saturated sodium bicarbonate solution and stirred at the room temperature for 20 min, then extracted with 100 ml ethyl acetate. Organic extracts were washed with brine, dried, and evaporated to dryness. The crude product was purified by chromatography on
25 silica using chlorobutane as eluent to yield 4.55 g pure product as white crystals, m.p. 78-80°C.

^1H NMR (CDCl_3): δ 1.16 (s, 9: $\text{C}(\text{CH}_3)_3$), 2.38 (s, 3: CH_3), 7.04-7.9 (7S aromatic protons, NH).

EXAMPLE 12

30 Preparation of 5-methyl-3-[(trifluoromethyl)-phenyl]-2-pyridinamine

4.7 g (0.025 mol) 2-amino-3-bromo-5-methylpyridine was dissolved under nitrogen in 50 ml anhydrous tetrahydrofuran, 0.05 g palladium bis(triphenylphosphine)
35 dichloride was added, and the mixture was stirred at the

room temperature for 10 min., after which 5.5 g (0.029 mol) *meta*-trifluoromethylphenylboronic acid was added, followed by a solution of 7.2 g (0.075 mol) sodium carbonate in 70 ml water. The mixture was refluxed under
5 nitrogen with good stirring for 2 hrs. After cooling, the reaction mixture was poured over 100 ml 1N sodium hydroxide solution and stirred at the room temperature for 20 min, then extracted with 150 ml ethyl acetate. Organic extracts were washed with brine, dried, and
10 evaporated to dryness. The crude product was purified by chromatography on silica using 20:1 chlorobutane/ethyl acetate mixture as eluent to yield 5.35 g pure product as a light tan solid, m.p. 73-5°C.

^1H NMR (CDCl_3): δ 2.12 (s, 3: CH_3), 4.40 (s, 2: NH_2), 7.10-8.0 (6 aromatic protons).

EXAMPLE 13

Preparation of N-[5-methyl-3-[3-(trifluoromethyl)phenyl]-2-pyridinyl] cyclopropaneamide

To a solution of 0.50 g (0.002 mol) 5-methyl-3-
20 [(trifluoromethyl)phenyl]-2-pyridinamine in 10 ml dry chloroform 0.26 g (0.0026 mol) triethylamine was added under nitrogen, followed by dropwise addition of 0.23 g (0.0022 mol) cyclopropanecarbonyl chloride dissolved in 2 ml dry chloroform. After stirring for 5 hrs at the
25 room temperature, 5 ml water was added and stirring continued for 20 min. The reaction mixture was diluted with 20 ml methylene chloride, washed with water, then saturated sodium bicarbonate solution and brine, dried, and evaporated to dryness. The crude product was
30 purified by chromatography on silica using 3:1 chlorobutane/ethyl acetate mixture as eluent to yield 0.54 g pure product as a white solid, m.p. 129-31°C.

^1H NMR (CDCl_3): δ 0.65-0.90 (m, 4: $2\times\text{CH}_2$), 1.85 (m, 1: CH), 2.40 (s, 3: CH_3), 7.44-8.50: (6 aromatic
35 protons).

EXAMPLE 14Preparation of N-[5-methyl-3-[3-(trifluoromethyl)phenyl]-2-pyridinyl] cyclopropaneamide N-oxide

0.3 g (1 mmol) N-[5-methyl-3-[3-(trifluoromethyl)phenyl]-2-pyridinyl] cyclopropaneamide was dissolved in 5 ml methylene chloride and 0.42 g (cca. 1.2 mmol) 50-60% meta-chloroperbenzoic acid was added in two portions at 1 hr interval. The mixture was stirred overnight, diluted with 25 ml methylene chloride and washed with 1N sodium thiosulfate, then saturated sodium bicarbonate solution until no meta-chlorobenzoic acid was present. The solution was dried over magnesium sulfate and evaporated to dryness. The crude product was purified by chromatography on silica using 1:1 chlorobutane/ethyl acetate mixture as eluent to yield 0.22 g pure product as white crystals, m.p. 125-7°C.

^1H NMR (CDCl_3): δ 0.60-0.85 (m, 4: $2\times\text{CH}_2$), 1.83 (m, 1: CH), 2.40 (s, 3: CH_3), 7.20-8.20: (6 aromatic protons), 9.45 (s, 1: NH).

20

EXAMPLE 15Preparation of N,2,2-trimethyl-N-[5-methyl-3'-(trifluoromethyl) [1,1'-biphenyl]-2-yl]-propanamide

0.8 g 2,2-dimethyl-N-[5-methyl-3'-(trifluoromethyl)-[1,1'-biphenyl]-2-yl]-propanamide was dissolved in 15 ml acetone, 0.8 g powdered potassium hydroxide added, and the mixture was energetically stirred while adding 1 g iodomethane after which it was kept at reflux for 5 min. After cooling, the mixture was filtered, the filtrate concentrated in vacuo, 30 ml water added and the mixture extracted with ethyl acetate. The organic extracts were washed three times with brine, dried over magnesium sulfate and evaporated to dryness. The crude product was purified by chromatography on silica using 1:1 chlorobutane/ethyl acetate mixture as eluent to yield 0.6 g pure product as a light tan oil.

^1H NMR (CDCl_3): δ 1.06 (s, 9: $\text{C}(\text{CH}_3)_3$), 2.40 (s, 3: CH_3), 3.00 (s, 3: NCH_3), 7.05-7.65 (7 aromatic protons).

EXAMPLE 16

Preparation of 2-nitro-3'-(trifluoromethyl)-1,1'-biphenyl

5 A solution of 5 g (0.02 mol) *meta*-iodonitrobenzene, 6.8 g (0.022 mol) trimethyl [3-(trifluoromethyl)phenyl]-stannane, and 0.2 g palladium bis(triphenylphosphine) dichloride in 50 ml dry tetrahydrofuran was refluxed under nitrogen for 6 hrs. After cooling to room
10 temperature, the reaction mixture was poured over 200 ml saturated sodium bicarbonate solution, stirred for 20 min, then extracted with ethyl acetate. The extracts were washed with brine, dried over magnesium sulfate, filtered, and evaporated to dryness. The residue was
15 chromatographed on silica using 1:3 chlorobutane/hexane mixture as eluent to yield 5.6 g pure product as a light tan oil.

EXAMPLE 17

Preparation of 3'-(trifluoromethyl)-

[1,1'-biphenyl]-2-amine

20 5.4 g (0.02 mol) of 2-nitro-3'-(trifluoromethyl)-1,1'-biphenyl was dissolved in 80 ml ethyl acetate, 5 ml acetic acid and 0.2 g 10% palladium on charcoal were added, and the mixture was hydrogenated at balloon
25 pressure overnight. The catalyst was removed by filtration and the solution evaporated to dryness. The residue was dissolved in hexane, washed with 0.5 M sodium hydroxide solution, then brine, dried over magnesium sulfate, filtered, treated with charcoal, filtered, and
30 evaporated to dryness. The residue was dried in a vacuum oven under nitrogen at 40°C to afford 4.5 g pure product as a light tan oil.

EXAMPLE 18Preparation of N-(2-boronophenyl)-
2,2-dimethylpropanamide

A solution of 25.5 (0.1 mol) N-(2-bromophenyl)-2,2-dimethylpropanamide in 300 ml dry ether and 60 ml dry tetrahydrofuran was cooled at -10°C under nitrogen and 137 ml (0.22 mol) 1.6M butyllithium in hexanes was added dropwise during 1 hr while maintaining the temperature below 0°C. After complete addition stirring was continued for 3 hrs on the cold bath after which the reaction mixture was transferred via cannula, under light nitrogen pressure, into a solution of 40 g (0.4 mol) trimethyl borate in 100 ml dry tetrahydrofuran, cooled at -10°C. The rate of addition was adjusted in such a way as to maintain the temperature below 0°C. After complete addition stirring was continued over night, allowing the cold bath to melt. The reaction mixture was evaporated to dryness, 300 ml 10% hydrochloric acid and 100 ml tetrahydrofuran added, and the mixture stirred at the room temperature for 3 hrs. Solvents were removed in vacuo and the residue was recrystallized from hot water. After drying in a vacuum oven overnight, 17.7 g (80%) of N-(2-boronophenyl)-2,2-dimethylpropanamide was obtained.

EXAMPLE 19

25 Preparation of N-(3'-cyano[1,1'-biphenyl])-
2-yl)-2,2-dimethylpropanamide

A mixture of 9.1 g (0.05 mol) meta-bromobenzonitrile, 0.300 g palladium bis(triphenylphosphine) dichloride, and 15 ml glyme was stirred under nitrogen for 15 min., after which 13.3 g (0.06 mol) N-(2-boronophenyl)-2,2-dimethylpropanamide was added, followed by a solution of 12.7 g (0.12 mol) sodium carbonate in 150 ml water. The reaction mixture was kept at reflux under nitrogen for 6 hrs. After cooling, 150 ml 1N sodium hydroxide solution was added and the mixture was extracted with ethyl

acetate. The organic extracts were washed twice with brine, dried over magnesium sulfate, and evaporated to dryness. The crude product was purified by chromatography on silica using chlorobutane/ethyl acetate 40:1 as eluent, to yield 10.6 g (76%) N-(3'-cyano[1,1'-biphenyl]-2-yl)-2,2-dimethylpropanamide, m.p. 178-181°C.

EXAMPLE 20

Preparation of N-(5-bromo-3'-cyano[1,1'-biphenyl]-2-yl)-2,2-dimethylpropanamide

10 A solution of 6.7 g (0.042 mol) bromine in 15 ml glacial acetic acid was added dropwise, during 1 hr, to a solution of 8.4 g (0.3 mol) N-(3'-cyano[1,1'-biphenyl]-2-yl)-2,2-dimethylpropanamide and 10.6 g (0.1 mol) sodium acetate in 50 ml glacial acetic acid. After 15 complete addition stirring was continued for 6 hrs. The acetic acid was removed *in vacuo*, ice was added and the suspension was made basic with 10% sodium hydroxide and was extracted with ethyl acetate. The organic extracts 20 were washed twice with brine, dried, and evaporated to dryness. The crude product was purified by chromatography on silica using chlorobutane/ethyl acetate 20:1 as eluent, to afford 9.85 g (92%) N-(5-bromo-3'-cyano[1,1'-biphenyl]-2-yl)-2,2-dimethylpropanamide as a viscous oil.

25 ^1H NMR (CDCl_3): δ 1.05 (s, 9: $\text{C}(\text{CH}_3)_3$), 7.15 (s, 1: NH), 7.4-8.1 (7H aromatic).

EXAMPLE 21

Preparation of N-(3',5-dicyano[1,1'-biphenyl]-2-yl)-2,2-dimethylpropanamide

30 A mixture containing 3.6 g (0.01 mol) N-(5-bromo-3'-cyano[1,1'-biphenyl]-2-yl)-2,2-dimethylpropanamide, 1.1 g (0.012 mol) copper cyanide, 0.04 g copper sulfate, and 30 ml dry pyridine was kept at reflux, under nitrogen, for 72 hrs. After cooling, the reaction mixture was 35 treated with 100 ml 10% ammonium hydroxide and extracted

with ethyl acetate. The organic extracts were washed twice with 100 ml 10% ammonium hydroxide, then with 10% hydrochloric acid and brine, dried over magnesium sulfate, and evaporated to dryness. The residue was
5 purified by chromatography on silica using chlorobutane/ethyl acetate 20:1 as eluent to afford 1.97 g (656%) N-(3',5-dicyano[1,1'-biphenyl]-2-yl)-2,2-dimethylpropanamide, m.p. 54-59°C.

EXAMPLE 22

10 Preparation of N-[5-ethynyl-3'-(trifluoromethyl)-
[1,1'-biphenyl]-2-yl]-2-methylpropanamide

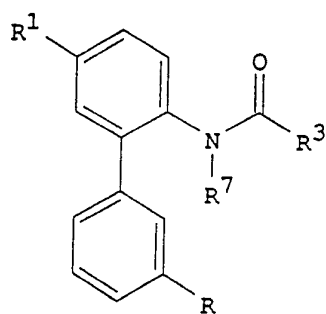
0.385 g (0.001 mol) N-[5-bromo-3'-(trifluoromethyl)-[1,1'-biphenyl]-2-yl]-2-methylpropanamide was added under
nitrogen to a mixture of 15 ml triethylamine and 5 ml
15 anhydrous acetonitrile, after which 0.2 g trimethylsilylacetylene, 0.4 g triphenylphosphine, 0.2 g 10% palladium on charcoal, and 0.02 g copper iodide were added and the reaction mixture was refluxed for 18 hrs. After cooling, the catalyst was removed by filtration and
20 the filtrates were diluted to 50 ml with ethyl acetate, washed with 50 ml 10% hydrochloric acid, then brine, dried over magnesium sulfate, and evaporated to dryness. The residue was purified by chromatography on silica using chlorobutane/ethyl acetate 40:1 as eluent. 0.350 g
25 (90%) 2-methyl-N-[3'-(trifluoromethyl)-5-[trimethylsilyl]ethynyl][1,1'-biphenyl]-2-yl]-propanamide was obtained, m.p. = 145-149°C.

0.300 g 2-methyl-N-[3'-(trifluoromethyl)-5-[trimethylsilyl]ethynyl][1,1'-biphenyl]-2-yl]-propanamide was
30 dissolved in 5 ml absolute methanol, a solution of 0.04 g KOH in 2 ml water was added, and the mixture stirred at the room temperature for 4 hrs. The solvent was removed *in vacuo*, the residue taken in ethyl acetate and washed twice with brine, then dried over magnesium sulfate and
35 evaporated to dryness. The residue was dissolved in

ether, treated with activated carbon, filtered, and evaporated, to afford 0.285 g (92%) N-[5-ethynyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-yl]-2-methylpropanamide, m.p. = 108-111°C.

- 5 Using the procedures outlined in Schemes 1-10 and Examples 1-22 of this section, the compounds of this invention including those listed in Tables 1-11 can be readily prepared by one skilled in the art.

TABLE 1



R	R ¹	R ³	R ⁷
CF ₃	Me	C(CH ₃) ₂ OCH ₃	H
CF ₃	Me	CH(CH ₃)SCH ₃	H
CF ₃	Me	C(CH ₃) ₂ SCH ₃	H
CF ₃	Me	CH ₂ F	H
CF ₃	Me	CH ₂ CHCl ₂	H
CF ₃	Me	CH ₂ CH ₂ CF ₃	H
CF ₃	Me	CH(CH ₃)CH ₂ Cl	H
CF ₃	Me	CHBrCH(CH ₃) ₂	H
CF ₃	Me	CH ₂ -cyclopropyl	H
CF ₃	Me	C(CH ₃)=CHBr	H
CF ₃	Me	CH=C(CH ₂ Cl) ₂	H
CF ₃	Me	cyclopropyl	Me
CF ₃	Et	CH(CH ₃)OCH ₃	H
CF ₃	Et	CH(CH ₃)SCH ₃	H
CF ₃	Et	CHFCH ₃	H
CF ₃	Et	CCl ₂ CH ₃	H
CF ₃	Et	cyclopentyl	H
CF ₃	Et	CH ₂ -cyclobutyl	H
CF ₃	Et	2,2-difluorocyclopropyl	H
CF ₃	Et	C(CH ₃)=CHCH ₃	H
CF ₃	Et	C(CH ₃)=CHBr	H
CF ₃	Et	2-pyrranyl	H

R	R ¹	R ³	R ⁷
CF ₃	Et	CH(CH ₃) ₂	Me
CF ₃	Et	CH ₂ CH(CH ₃) ₂	Me
Cl	Me	CH(CH ₃)CH ₂ CH ₃	H
Cl	Me	C(CH ₃)OCH ₃	H
Cl	Me	C(CH ₃) ₂ OCOCH ₃	H
Cl	Me	CH(CH ₃)SCH ₃	H
Cl	Me	CH ₂ CHCl ₂	H
Cl	Me	CCl ₂ CH ₃	H
Cl	Me	CH ₂ -cyclobutyl	H
Cl	Me	CH ₂ CH=CHBr	H
Cl	Me	CH=C(CH ₂ Cl) ₂	H
Cl	Me	CH ₂ C ₆ H ₅	H
Cl	Me	cyclopropyl	Me
Cl	Et	CH ₂ OCH ₂ CH ₃	H
Cl	Et	C(CH ₃) ₂ OCH ₃	H
Cl	Et	CH ₂ CH(CH ₃)OCH ₃	H
Cl	Et	C(CH ₃) ₂ OCOCH ₃	H
Cl	Et	CH ₂ SCH ₂ CH ₃	H
Cl	Et	CHF ₂	H
Cl	Et	CF ₂ Cl	H
Cl	Et	CH ₂ CHClCH ₃	H
Cl	Et	CH(CH ₃)CHBr ₂	H
Cl	Et	cyclopentyl	H
Cl	Et	CH ₂ -cyclopropyl	H
Cl	Et	1-Br-cyclobutyl	H
Cl	Et	CH=CH ₂	H
Cl	Et	C(CH ₃)=CH ₂	H
Cl	Et	CH=CHCl	H
Cl	Et	C(CH ₃)=CHBr	H
Cl	Et	2-pyrranyl	H
Cl	Et	CH ₂ CH(CH ₃) ₂	Me
CN	Me	C ₄ H ₉	H

R	R ¹	R ³	R ⁷
CN	Me	CH(CH ₃)OC ₂ H ₅	H
CN	Me	C(CH ₃) ₂ CH ₂ OCH ₃	H
CN	Me	C(CH ₃) ₂ OCOCH ₃	H
CN	Me	CH(CH ₃)SCH ₂ CH ₃	H
CN	Me	CH(SCH ₃)CH ₂ CH ₃	H
CN	Me	CBr ₃	H
CN	Me	CHBrCH ₂ Br	H
CN	Me	C(CH ₃)(CH ₂ Cl) ₂	H
CN	Me	CHBrCH ₂ CH ₂ CH ₃	H
CN	Me	cyclohexyl	H
CN	Me	CH ₂ -cyclopentyl	H
CN	Me	1-Me-2,2-dichlorocyclopropyl	H
CN	Me	C(CH ₃)CH=CH ₂	H
CN	Me	C(CH ₃)=CHCH ₃	H
CN	Me	C(CH ₃)=CClC ₂ H ₅	H
CN	Me	CH ₂ C ₆ H ₅	H
CN	Me	2-thiophenyl	H
CN	Et	C ₃ H ₇	H
CN	Et	C(CH ₃)CH ₂ OCH ₃	H
CN	Et	CH ₂ CH ₂ CH ₂ OCH ₃	H
CN	Et	C(CH ₃) ₂ OCOCH ₃	H
CN	Et	CH ₂ CH ₂ SCH ₃	H
CN	Et	C(CH ₃) ₂ SCH ₃	H
CN	Et	CCl ₃	H
CN	Et	CHBrCH ₂ CH ₃	H
CN	Et	C(CH ₃)(CH ₂ Cl) ₂	H
CN	Et	cyclopentyl	H
CN	Et	CH ₂ -cyclobutyl	H
CN	Et	2,2-difluorocyclopropyl	H
CN	Et	CH=C(CH ₂ Cl) ₂	H
CF ₃	Pr	CH ₂ OCH ₃	H
CF ₃	Pr	CH ₂ CH ₂ OCH ₃	H

R	R ¹	R ³	R ⁷
CF ₃	Pr	C(CH ₃) ₂ OCOCH ₃	H
CF ₃	Pr	CH ₂ SCH ₃	H
CF ₃	Pr	CH ₂ Cl	H
CF ₃	Pr	CH ₂ F	H
CF ₃	Pr	CHClCH ₂ Cl	H
CF ₃	Pr	1-Me-cyclopropyl	H
CF ₃	Pr	CH=CH ₂	H
CF ₃	Pr	CH=CHCl	H
Cl	Pr	C ₂ H ₅	H
Cl	Pr	CH(CH ₃) ₂	H
Cl	Pr	CH(CH ₃)OCH ₃	H
Cl	Pr	C(CH ₃) ₂ OCOCH ₃	H
Cl	Pr	CH ₂ CH ₂ SCH ₃	H
Cl	Pr	CHCl ₂	H
Cl	Pr	CHF ₂	H
Cl	Pr	CF ₃	H
Cl	Pr	CH ₂ CH ₂ Cl	H
Cl	Pr	cyclopropyl	H
Cl	Pr	CH ₂ -cyclobutyl	H
Cl	Pr	CH=CH ₂	H
Cl	Pr	C(CH ₃)=CH ₂	H
Cl	Pr	CH=C(CH ₃) ₂	H
Cl	Pr	C(CH ₃)CH=CH ₂	H
Cl	Pr	C(CH ₃)=CHCH ₃	H
Cl	Pr	C(CH ₃)=CHC ₂ H ₅	H
Cl	Pr	CH ₂ CH=CHBr	H
Cl	Pr	2-pyrrolyl	H
CN	Pr	CH(CH ₃) ₂	H
CN	Pr	CH ₂ CH(CH ₃) ₂	H
CN	Pr	CH(OCH ₃)CH ₂ CH ₃	H
CN	Pr	CH ₂ CH(CH ₃)OCH ₃	H
CN	Pr	C(CH ₃) ₂ OCOCH ₃	H

R	R ¹	R ³	R ⁷
CN	Pr	CH(CH ₃)SCH ₂ CH ₃	H
CN	Pr	CHClCH ₃	H
CN	Pr	CHClCH ₂ CH ₃	H
CN	Pr	CH ₂ CH ₂ CH ₂ Br	H
CN	Pr	CHBrCH ₂ CH ₂ Br	H
CN	Pr	CCl(CH ₃)CH ₂ Cl	H
CN	Pr	cyclopropyl	H
CN	Pr	C(CH ₃)=CHC ₂ H ₅	H
CN	Pr	1-Br-cyclobutyl	H
OCF ₃	Me	CH(CH ₃)CH ₂ CH ₃	H
OCF ₃	Me	C(CH ₃)OCH ₃	H
OCF ₃	Me	C(CH ₃)OC ₂ H ₅	H
OCF ₃	Me	C(CH ₃) ₂ OCOCH ₃	H
OCF ₃	Me	C(CH ₃) ₂ SCH ₃	H
OCF ₃	Me	CCl ₂ CH ₃	H
OCF ₃	Me	CH ₂ CH ₂ CF ₃	H
OCF ₃	Me	C(CH ₃) ₂ CHCl ₂	H
OCF ₃	Me	cyclopentyl	H
OCF ₃	Me	cyclohexyl	H
OCF ₃	Me	CH ₂ -cyclopropyl	H
OCF ₃	Me	CH ₂ -cyclobutyl	H
OCF ₃	Me	2-Me-cyclopropyl	H
OCF ₃	Me	2,2-difluorocyclopropyl	H
OCF ₃	Me	C(CH ₃)=CH ₂	H
OCF ₃	Me	CH=C(CH ₃) ₂	H
OCF ₃	Me	C(CH ₃)=CHBr	H
OCF ₃	Me	CHBrCH(CH ₃) ₂	H
OCF ₃	Me	CH ₂ C ₆ H ₅	H
OCF ₃	Me	2-pyrranyl	H
OCF ₃	Me	2-pyrrolyl	H
OCF ₃	Et	CH(CH ₃) ₂	H
OCF ₃	Et	CH ₂ CH(CH ₃) ₂	H

R	R ¹	R ³	R ⁷
OCF ₃	Et	CH(CH ₃)OCH ₃	H
OCF ₃	Et	C(CH ₃) ₂ OCOCH ₃	H
OCF ₃	Et	CH(CH ₃)SCH ₃	H
OCF ₃	Et	CH ₂ Cl	H
OCF ₃	Et	CHF ₂	H
OCF ₃	Et	CHFCH ₃	H
OCF ₃	Et	CCl ₂ CH ₃	H
OCF ₃	Et	cyclopropyl	H
OCF ₃	Et	cyclobutyl	H
OCF ₃	Et	CH ₂ -cyclopropyl	H
OCF ₃	Et	1-Me-cyclopropyl	H
OCF ₃	Et	2,2-difluorocyclopropyl	H
OCF ₃	Et	C(CH ₃)=CHCH ₃	H
OCF ₃	Et	C(CH ₃)=CHBr	H
OCF ₃	Et	CBr(CH ₃) ₂	H
OCF ₃	Et	CH ₂ C ₆ H ₄ Cl-p	H
OCF ₃	Et	2-pyrrolyl	H
OCF ₃	Pr	CH ₃	H
OCF ₃	Pr	CH(CH ₃) ₂	H
OCF ₃	Pr	CH ₂ OCH ₂ CH ₃	H
OCF ₃	Pr	CH(CH ₃)OCH ₃	H
OCF ₃	Pr	C(CH ₃) ₂ OCOCH ₃	H
OCF ₃	Pr	CH ₂ SCH ₃	H
OCF ₃	Pr	CH ₂ F	H
OCF ₃	Pr	CF ₂ Cl	H
OCF ₃	Pr	CH(CH ₃)CH ₂ Br	H
OCF ₃	Pr	cyclopropyl	H
OCF ₃	Pr	CH=CH ₂	H
OCF ₃	Pr	2-pyrrolyl	H
OCHF ₂	Et	CH ₂ CH(CH ₃) ₂	H
OCHF ₂	Et	C(CH ₃) ₃	H
OCHF ₂	Et	C(CH ₃) ₂ CH ₂ OCH ₃	H

R	R ¹	R ³	R ⁷
OCHF ₂	Et	C(CH ₃) ₂ OCOCH ₃	H
OCHF ₂	Et	CH ₂ SCH ₂ CH ₃	H
OCHF ₂	Et	CHBr ₂	H
OCHF ₂	Et	CCl ₃	H
OCHF ₂	Et	C(CH ₃) ₂ Br	H
OCHF ₂	Et	cyclopropyl	H
OCHF ₂	Et	CH ₂ -cyclopropyl	H
OCHF ₂	Et	1-Me-cyclopropyl	H
OCHF ₂	Et	C(CH ₃)CH=CH ₂	H
OCHF ₂	Et	C(CH ₃)=CClC ₂ H ₅	H
OCHF ₂	Et	2-pyrranyl	H
SCF ₃	Me	C(CH ₃) ₂ OCH ₃	H
SCF ₃	Me	C(CH ₃) ₂ OCOCH ₃	H
SCF ₃	Me	CH(CH ₃)SCH ₃	H
SCF ₃	Me	CF ₂ Cl	H
SCF ₃	Me	CHBrCH ₃	H
SCF ₃	Me	CH ₂ CHCl ₂	H
SCF ₃	Me	CH ₂ CH ₂ CF ₃	H
SCF ₃	Me	CH=CHCl	H
SCF ₃	Et	CH(CH ₃) ₂	H
SCF ₃	Et	CH(CH ₃)OCH ₃	H
SCF ₃	Et	cyclopropyl	H
SCHF ₂	Et	CH(CH ₃) ₂	H
SCHF ₂	Me	C(CH ₃) ₂ OCOCH ₃	H
NO ₂	Me	C(CH ₃) ₂ OCOCH ₃	H
NO ₂	Me	2-thienyl	H
OMe	Me	CH(CH ₃)CH ₂ Br	H
OMe	Me	cyclopropyl	H
Br	Me	CH ₂ CH(CH ₃) ₂	H
Br	Me	CH(CH ₃)CH ₂ CH ₃	H
Br	Me	CH ₂ OCH ₃	H
Br	Me	C(CH ₃) ₂ OCH ₃	H

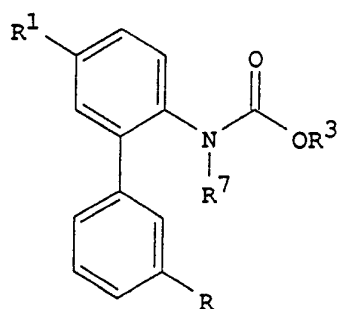
R	R ¹	R ³	R ⁷
Br	Me	C(CH ₃) ₂ OCOCH ₃	H
Br	Me	C(CH ₃) ₂ SCH ₃	H
Br	Me	CHF ₂	H
Br	Me	CH(CH ₃)CH ₂ Cl	H
Br	Me	C(CH ₃)(CH ₂ Cl) ₂	H
Br	Me	CH ₂ -cyclopropyl	H
Br	Me	C(CH ₃)=CH ₂	H
Br	Me	CH=C(CH ₃) ₂	H
Br	Me	CH(CH ₃)CH=CH ₂	H
Br	Me	C(CH ₃)=CHBr	H
Br	Me	CH ₂ C ₆ H ₅	H
Br	Me	2-pyrrolyl	H
Br	Me	2-thiophenyl	H
Br	Et	C ₂ H ₅	Me
Br	Et	C(CH ₃) ₃	H
Br	Et	CH ₂ CH(CH ₃) ₂	H
Br	Et	CH ₂ OCH ₂ CH ₃	H
Br	Et	CH(CH ₃)CH ₂ OCH ₃	H
Br	Et	C(CH ₃) ₂ OCOCH ₃	H
Br	Et	CH(CH ₃)SCH ₃	H
Br	Et	CF ₂ Cl	H
Br	Et	CH ₂ CHClCH ₃	H
Br	Et	CH ₂ COOCH ₃	H
Br	Et	cyclopropyl	H
Br	Et	CH ₂ -cyclopentyl	H
Br	Et	2-Me-cyclopropyl	H
Br	Et	CH=C(CH ₃) ₂	H
Br	Et	2-pyrrolyl	H
CF ₃	NHCH ₃	cyclopropyl	H
CF ₃	N(CH ₃) ₂	CH(CH ₃) ₂	H
CF ₃	Cl	CH(CH ₃) ₂	H
CF ₃	F	2-Me-cyclopropyl	H

R	R ¹	R ³	R ⁷
CF ₃	OCH ₃	CH ₂ CH(CH ₃) ₂	H
CF ₃	SCH ₃	cyclopropyl	H
CF ₃	OCF ₃	CH(CH ₃) ₂	H
CF ₃	CH ₂ OCH ₃	1-Me-cyclopropyl	H
CF ₃	CH ₂ SCH ₃	cyclopropyl	H
Cl	NHCH ₃	cyclopropyl	H
Cl	N(CH ₃) ₂	CH(CH ₃) ₂	H
Cl	Cl	CH(CH ₃) ₂	H
Cl	F	2-Me-cyclopropyl	H
Cl	OCH ₃	CH ₂ CH(CH ₃) ₂	H
Cl	SCH ₃	cyclopropyl	H
Cl	OCF ₃	CH(CH ₃) ₂	H
Cl	CH ₂ OCH ₃	1-Me-cyclopropyl	H
Cl	CH ₂ SCH ₃	cyclopropyl	H
Cl	NO ₂	CH ₂ CH(CH ₃) ₂	H
Cl	Br	CH(CH ₃) ₂	H
Br	NHCH ₃	cyclopropyl	H
Br	N(CH ₃) ₂	CH(CH ₃) ₂	H
Br	Cl	CH(CH ₃) ₂	H
Br	F	2-Me-cyclopropyl	H
Br	OCH ₃	CH ₂ CH(CH ₃) ₂	H
Br	SCH ₃	cyclopropyl	H
Br	OCF ₃	CH(CH ₃) ₂	H
Br	CH ₂ OCH ₃	1-Me-cyclopropyl	H
Br	CH ₂ SCH ₃	cyclopropyl	H
Br	NO ₂	CH ₂ CH(CH ₃) ₂	H
Br	CN	cyclopropyl	H
Br	Br	CH(CH ₃) ₂	H
CN	NHCH ₃	cyclopropyl	H
CN	N(CH ₃) ₂	CH(CH ₃) ₂	H
CN	Cl	CH(CH ₃) ₂	H
CN	F	2-Me-cyclopropyl	H

R	R ¹	R ³	R ⁷
CN	OCH ₃	CH ₂ CH(CH ₃) ₂	H
CN	SCH ₃	cyclopropyl	H
CN	OCF ₃	CH(CH ₃) ₂	H
CN	CH ₂ OCH ₃	1-Me-cyclopropyl	H
CN	CH ₂ SCH ₃	cyclopropyl	H
CN	NO ₂	CH ₂ CH(CH ₃) ₂	H
NO ₂	NHCH ₃	cyclopropyl	H
NO ₂	N(CH ₃) ₂	CH(CH ₃) ₂	H
NO ₂	Cl	CH(CH ₃) ₂	H
NO ₂	F	2-Me-cyclopropyl	H
NO ₂	OCH ₃	CH ₂ CH(CH ₃) ₂	H
NO ₂	SCH ₃	cyclopropyl	H
NO ₂	OCF ₃	CH(CH ₃) ₂	H
NO ₂	CH ₂ OCH ₃	1-Me-cyclopropyl	H
NO ₂	CH ₂ SCH ₃	cyclopropyl	H
NO ₂	NO ₂	CH ₂ CH(CH ₃) ₂	H
NO ₂	Br	cyclopropyl	H
NO ₂	C≡CH	CH(CH ₃) ₂	H
OCF ₃	NHCH ₃	cyclopropyl	H
OCF ₃	N(CH ₃) ₂	CH(CH ₃) ₂	H
OCF ₃	Cl	CH(CH ₃) ₂	H
OCF ₃	F	2-Me-cyclopropyl	H
OCF ₃	OCH ₃	CH ₂ CH(CH ₃) ₂	H
OCF ₃	SCH ₃	cyclopropyl	H
OCF ₃	OCF ₃	CH(CH ₃) ₂	H
OCF ₃	CH ₂ OCH ₃	1-Me-cyclopropyl	H
OCF ₃	CH ₂ SCH ₃	cyclopropyl	H
OCF ₃	NO ₂	CH ₂ CH(CH ₃) ₂	H
OCF ₃	CN	cyclopropyl	H
OCF ₃	Br	CH(CH ₃) ₂	H
OCF ₃	C≡CH	CH ₂ CH(CH ₃) ₂	H
SCF ₃	NHCH ₃	cyclopropyl	H

R	R ¹	R ³	R ⁷
SCF ₃	N(CH ₃) ₂	CH(CH ₃) ₂	H
SCF ₃	Cl	CH(CH ₃) ₂	H
SCF ₃	F	2-Me-cyclopropyl	H
SCF ₃	OCH ₃	CH ₂ CH(CH ₃) ₂	H
SCF ₃	SCH ₃	cyclopropyl	H
SCF ₃	OCF ₃	CH(CH ₃) ₂	H
SCF ₃	CH ₂ OCH ₃	1-Me-cyclopropyl	H
SCF ₃	CH ₂ SCH ₃	cyclopropyl	H
SCF ₃	NO ₂	CH ₂ CH(CH ₃) ₂	H
SCF ₃	CN	cyclopropyl	H
SCF ₃	Br	CH(CH ₃) ₂	H
SCF ₃	C≡CH	CH ₂ CH(CH ₃) ₂	H

TABLE 2



R	R ¹	R ³	R ⁷
CF ₃	Me	CH ₂ CH(C ₂ H ₅)OCH ₃	H
CF ₃	Me	CH(C ₂ H ₅)CH ₂ OCH ₃	H
CF ₃	Me	CH ₂ CH ₂ SCH ₂ CH ₃	H
CF ₃	Me	CH ₂ CH ₂ F	H
CF ₃	Me	CH(CH ₂ F) ₂	H
CF ₃	Me	cyclobutyl	H
CF ₃	Me	2-Cl-cyclopentyl	H

R	R ¹	R ³	R ⁷
CF ₃	Me	CH(CH ₃)-cyclopropyl	H
CF ₃	Me	CH(CH ₃)CH=CH ₂	H
CF ₃	Me	CH ₂ CCl=CH ₂	H
CF ₃	Me	CH ₂ C ₆ H ₅	H
CF ₃	Me	2-pyrrolyl	H
CF ₃	Me	CH ₂ CH(CH ₃) ₂	Me
CF ₃	Et	C ₄ H ₉	H
CF ₃	Et	CH ₂ CH ₂ OCH ₃	H
CF ₃	Et	CH ₂ CH(CH ₃)OCH ₃	H
CF ₃	Et	CH ₂ CH ₂ SCH ₃	H
CF ₃	Et	CH ₂ CH ₂ Cl	H
CF ₃	Et	CH(CH ₃)CF ₃	H
CF ₃	Et	cyclopropyl	H
CF ₃	Et	CH ₂ -1-Me-cyclopropyl	H
CF ₃	Et	CH ₂ CH=CHCH ₃	H
CF ₃	Et	CH ₂ CBr=CH ₂	H
CF ₃	Et	CH ₂ C ₆ H ₅	H
CF ₃	Et	2-thiophenyl	H
CF ₃	Et	CH(CH ₃) ₂	Me
Cl	Me	C ₄ H ₉	H
Cl	Me	CH(CH ₃)CH ₂ CH ₂ OCH ₃	H
Cl	Me	CH(CH ₃)CH(CH ₃)OCH ₃	H
Cl	Me	CH(CH ₃)CH(CH ₃)SCH ₃	H
Cl	Me	CH(CH ₃)CH ₂ Cl	H
Cl	Me	CH(CH ₃)CF ₂ CHF ₂	H
Cl	Me	cyclopentyl	H
Cl	Me	CH ₂ -cyclobutyl	H
Cl	Me	CH ₂ (2-Me-cyclopropyl)	H
Cl	Me	C(CH ₃) ₂ -cyclobutyl	H
Cl	Me	CH ₂ C(CH ₃)=CH ₂	H
Cl	Me	CH(CH ₂ Br)CH=CH ₂	H

B	B ¹	B ³	B ⁷
Cl	Me	2-pyrranyl	H
Cl	Me	CH ₂ CH ₃	Me
Cl	Et	CH ₃	H
Cl	Et	CH ₂ CH ₂ OCH ₂ CH ₃	H
Cl	Et	CH ₂ CH(CH ₃)OCH ₃	H
Cl	Et	CH ₂ CH(C ₂ H ₅)OCH ₃	H
Cl	Et	CH ₂ CH ₂ CH ₂ SCH ₃	H
Cl	Et	CH ₂ CH ₂ Br	H
Cl	Et	CH ₂ CCl ₃	H
Cl	Et	CH(CH ₂ Cl) ₂	H
Cl	Et	CH(CH ₃)CF ₃	H
Cl	Et	cyclobutyl	H
Cl	Et	cyclohexyl	H
Cl	Et	CH(CH ₃)-cyclobutyl	H
Cl	Et	CH ₂ CH=CH ₂	H
Cl	Et	CH ₂ CCl=CH ₂	H
Cl	Et	CH ₂ C ₆ H ₅	H
Cl	Et	CH ₃	Me
Cl	Et	2-thiophenyl	H
CN	Me	C(CH ₃) ₃	H
CN	Me	CH ₂ CH ₂ CH(CH ₃)OCH ₃	H
CN	Me	CH(CH ₃)CH(CH ₃)OCH ₃	H
CN	Me	CH(CH ₃)CH ₂ Cl	H
CN	Me	CH(CH ₂ Br)CH ₂ CH ₂ Br	H
CN	Me	CH(CH ₃)(C ₂ H ₅)COOCH ₃	H
CN	Me	cyclohexyl	H
CN	Me	2-Cl-cyclopentyl	H
CN	Me	CH ₂ -cyclopentyl	H
CN	Me	C(CH ₃) ₂ -cyclobutyl	H
CN	Me	CH ₂ CH ₂ CH=CH ₂	H
CN	Me	CH ₂ C(CH ₃)=CH ₂	H

R	R ¹	R ³	R ⁷
CN	Me	CH(CH ₂ Br)CH=CH ₂	H
CN	Me	CH ₂ C ₆ H ₅	H
CN	Et	CH ₂ CH ₂ OCH ₂ CH ₃	H
CN	Et	CH(CH ₃)CH ₂ CH ₂ OCH ₃	H
CN	Et	CH ₂ CH ₂ SCH ₃	H
CN	Et	CH ₂ CHF ₂	H
CN	Et	CH(CH ₃)CCl ₃	H
CN	Et	cyclopropyl	H
CN	Et	CH ₂ -cyclobutyl	H
CN	Et	CH(CH ₃)-cyclobutyl	H
CN	Et	C(CH ₃) ₂ -cyclobutyl	H
CN	Et	CH ₂ CH ₂ CH=CH ₂	H
CN	Et	CH ₂ C(Cl)=CH ₂	H
CN	Et	2-pyrranyl	H
CF ₃	Pr	CH ₂ CH ₂ OCH ₃	H
CF ₃	Pr	CH ₂ CH ₂ Cl	H
CF ₃	Pr	CH ₂ CBr ₃	H
CF ₃	Pr	cyclopropyl	H
CF ₃	Pr	CH ₂ (1-Me-cyclopropyl)	H
CF ₃	Pr	CH ₂ CH=CH ₂	H
CF ₃	Pr	2-pyrrolyl	H
CN	Pr	CH(CH ₃) ₂	H
CN	Pr	CH ₂ CH ₂ CH ₂ OCH ₃	H
CN	Pr	CH(CH ₃)CCl ₃	H
CN	Pr	cyclopentyl	H
CN	Pr	CH(CH ₃)-cyclopropyl	H
CN	Pr	CH ₂ C(CH ₃)=CH ₂	H
CN	Pr	2-thiophenyl	H
OCF ₃	Me	CH(CH ₃)CH ₂ OCH ₃	H
OCF ₃	Me	CH ₂ CH ₂ SCH ₃	H
OCF ₃	Me	CH ₂ CH ₂ SCH ₂ CH ₃	H

R	R ¹	R ³	R ⁷
OCF ₃	Me	CH ₂ CH ₂ CH ₂ SCH ₃	H
OCF ₃	Me	CH ₂ CF ₃	H
OCF ₃	Me	cyclopropyl	H
OCF ₃	Me	CH ₂ -cyclobutyl	H
OCF ₃	Me	CH(CH ₃)-cyclopropyl	H
OCF ₃	Me	C(CH ₃) ₂ -cyclopropyl	H
OCF ₃	Me	CH ₂ CH=CH ₂	H
OCF ₃	Me	CH ₂ CBr=CH ₂	H
OCF ₃	Me	CH ₂ C ₆ H ₅	H
OCF ₃	Me	2-thiophenyl	H
OCF ₃	Et	CH ₃	H
OCF ₃	Et	CH(CH ₃) ₂	H
OCF ₃	Et	CH ₂ CH ₂ CH ₂ OCH ₃	H
OCF ₃	Et	CH ₂ CH ₂ Cl	H
OCF ₃	Et	CH(CH ₃)CF ₃	H
OCF ₃	Et	cyclopropyl	H
OCF ₃	Et	CH ₂ -cyclobutyl	H
OCF ₃	Et	CH ₂ (2-Me-cyclopropyl)	H
OCF ₃	Et	CH ₂ CH=CH ₂	H
OCF ₃	Et	CH ₂ C(Cl)=CH ₂	H
OCF ₃	Et	CH ₂ C ₆ H ₅	H
OCF ₃	Et	2-thiophenyl	H
OCF ₃	Pr	CH(CH ₃) ₂	H
OCF ₃	Pr	CH ₂ CH ₂ SCH ₃	H
OCF ₃	Pr	CH ₂ CH ₂ Br	H
OCF ₃	Pr	CH(CH ₃)CF ₃	H
OCF ₃	Pr	cyclobutyl	H
OCF ₃	Pr	CH(CH ₃)-cyclobutyl	H
OCF ₃	Pr	2-pyrrolyl	H
OCHF ₂	Et	CH(CH ₃) ₂	H
OCHF ₂	Et	CH ₂ CH ₂ SCH ₃	H

R	R ¹	R ³	R ⁷
OCHF ₂	Et	CH(CH ₂ F) ₂	H
OCHF ₂	Et	cyclopropyl	H
SCF ₃	Me	C ₃ H ₇	H
SCF ₃	Me	CH ₂ CH ₂ F	H
SCF ₃	Me	2-Cl-cyclopentyl	H
SCF ₃	Et	C ₂ H ₅	H
SCF ₃	Et	CH ₂ CHF ₂	H
SCF ₃	Et	2-pyrrolyl	H
SCHF ₂	Me	CH ₂ CH(CH ₃) ₂	H
SCHF ₂	Me	CH ₂ CH ₂ CH ₂ OCH ₃	H
SCHF ₂	Me	CH ₂ (1-Me-cyclopropyl)	H
OMe	Pr	C ₃ H ₇	H
OMe	Me	CH(CH ₃) ₂	H
OMe	Me	CH(CH ₃)CH ₂ Cl	H
OMe	Et	CH ₂ COOCH ₃	H
OMe	Me	cyclopropyl	H
OMe	Et	CH ₂ CH=CH ₂	H
OMe	Me	2-thiophenyl	H
NO ₂	Me	C(CH ₃) ₃	H
NO ₂	Me	CH ₂ CH ₂ OCH ₃	H
NO ₂	Me	CH ₂ CH ₂ SCH ₃	H
NO ₂	Et	cyclopentyl	H
NO ₂	Pr	2-pyrrolyl	H
Br	Me	CH(CH ₃) ₂	H
Br	Me	CH ₂ CH(CH ₃) ₂	H
Br	Me	CH(CH ₃)CH ₂ OCH ₃	H
Br	Me	CH(CH ₃)CH(CH ₃)OCH ₃	H
Br	Me	CH ₂ CH ₂ SCH ₂ CH ₃	H
Br	Me	CH ₂ CHF ₂	H
Br	Me	CH(CH ₃)CF ₃	H
Br	Me	cyclopropyl	H

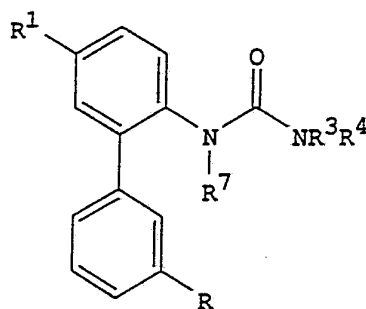
R	R ¹	R ³	R ⁷
Br	Me	CH ₂ -cyclopropyl	H
Br	Me	CH(CH ₃)-cyclopropyl	H
Br	Me	CH(CH ₃)CH=CH ₂	H
Br	Me	CH ₂ CBr=CH ₂	H
Br	Me	CH ₂ C ₆ H ₅	H
Br	Me	2-pyrranyl	H
Br	Pr	C ₂ H ₅	H
Br	Et	CH(CH ₃) ₂	H
Br	Et	CH ₂ CH ₂ OCH ₃	H
Br	Et	CH ₂ CH ₂ SCH ₂ CH ₃	H
Br	Et	CH(CH ₃)CH ₂ Cl	H
Br	Pr	cyclopentyl	H
Br	Et	CH ₂ (2-Me-cyclopropyl)	H
Br	Et	CH ₂ C(CH ₃)=CH ₂	H
Br	Pr	2-thiophenyl	H
H	Me	CH ₂ CH(CH ₃) ₂	
CF ₃	NHCH ₃	CH ₂ -cyclopropyl	H
CF ₃	N(CH ₃) ₂	CH(CH ₃) ₂	H
CF ₃	Cl	CH(CH ₃) ₂	H
CF ₃	F	2-thiophenyl	H
CF ₃	OCH ₃	CH ₂ CH(CH ₃) ₂	H
CF ₃	SCH ₃	CH ₂ -cyclopropyl	H
CF ₃	OCF ₃	CH(CH ₃) ₂	H
CF ₃	CH ₂ OCH ₃	benzyl	H
CF ₃	CH ₂ SCH ₃	cyclopropyl	H
Cl	NHCH ₃	CH ₂ -cyclobutyl	H
Cl	N(CH ₃) ₂	CH(CH ₃) ₂	H
Cl	Cl	CH(CH ₃) ₂	H
Cl	F	CH ₂ -cyclopropyl	H
Cl	OCH ₃	CH ₂ CH(CH ₃) ₂	H
Cl	SCH ₃	CH ₂ -cyclopropyl	H

R	R ¹	R ³	R ⁷
Cl	OCF ₃	CH(CH ₃) ₂	H
Cl	CH ₂ OCH ₃	benzyl	H
Cl	CH ₂ SCH ₃	CH ₂ -cyclopropyl	H
Cl	NO ₂	CH ₂ CH(CH ₃) ₂	H
Cl	Br	CH(CH ₃) ₂	H
Br	NHCH ₃	benzyl	H
Br	N(CH ₃) ₂	CH(CH ₃) ₂	H
Br	Cl	CH(CH ₃) ₂	H
Br	F	CH ₂ -cyclopropyl	H
Br	OCH ₃	CH ₂ CH(CH ₃) ₂	H
Br	SCH ₃	benzyl	H
Br	OCF ₃	CH(CH ₃) ₂	H
Br	CH ₂ OCH ₃	2-thiophenyl	H
Br	CH ₂ SCH ₃	CH ₃	H
Br	NO ₂	CH ₂ CH(CH ₃) ₂	H
Br	CN	CH ₂ CH ₃	H
Br	Br	CH(CH ₃) ₂	H
CN	NHCH ₃	benzyl	H
CN	N(CH ₃) ₂	CH(CH ₃) ₂	H
CN	Cl	CH(CH ₃) ₂	H
CN	F	CH ₂ CH ₃	H
CN	OCH ₃	CH ₂ CH(CH ₃) ₂	H
CN	SCH ₃	CH ₃	H
CN	OCF ₃	CH(CH ₃) ₂	H
CN	CH ₂ OCH ₃	CH(CH ₃) ₂	H
CN	CH ₂ SCH ₃	CH ₂ -cyclopropyl	H
CN	NO ₂	CH ₂ CH(CH ₃) ₂	H
NO ₂	NHCH ₃	benzyl	H
NO ₂	N(CH ₃) ₂	CH(CH ₃) ₂	H
NO ₂	Cl	CH(CH ₃) ₂	H
NO ₂	F	CH ₂ -cyclopropyl	H

R	R ¹	R ³	R ⁷
NO ₂	OCH ₃	CH ₂ CH(CH ₃) ₂	H
NO ₂	SCH ₃	CH ₃	H
NO ₂	OCF ₃	CH(CH ₃) ₂	H
NO ₂	CH ₂ OCH ₃	CH ₂ CH ₃	H
NO ₂	CH ₂ SCH ₃	CH ₂ -cyclopropyl	H
NO ₂	NO ₂	CH ₂ CH(CH ₃) ₂	H
NO ₂	Br	benzyl	H
NO ₂	C≡CH	CH(CH ₃) ₂	H
OCF ₃	NHCH ₃	CH ₂ CH ₃	H
OCF ₃	N(CH ₃) ₂	CH(CH ₃) ₂	H
OCF ₃	Cl	CH(CH ₃) ₂	H
OCF ₃	F	CH ₂ CH ₃	H
OCF ₃	OCH ₃	CH ₂ CH(CH ₃) ₂	H
OCF ₃	SCH ₃	CH ₃	H
OCF ₃	OCF ₃	CH(CH ₃) ₂	H
OCF ₃	CH ₂ OCH ₃	CH ₂ -cyclopropyl	H
OCF ₃	CH ₂ SCH ₃	benzyl	H
OCF ₃	NO ₂	CH ₂ CH(CH ₃) ₂	H
OCF ₃	CN	CH ₂ CH ₂ CH ₃	H
OCF ₃	Br	CH(CH ₃) ₂	H
OCF ₃	C≡CH	CH ₂ CH(CH ₃) ₂	H
SCF ₃	NHCH ₃	CH ₂ CH ₃	H
SCF ₃	N(CH ₃) ₂	CH(CH ₃) ₂	H
SCF ₃	Cl	CH(CH ₃) ₂	H
SCF ₃	F	CH ₃	H
SCF ₃	OCH ₃	CH ₂ CH(CH ₃) ₂	H
SCF ₃	SCH ₃	CH ₂ CH ₂ CH ₃	H
SCF ₃	OCF ₃	CH(CH ₃) ₂	H
SCF ₃	CH ₂ OCH ₃	CH ₂ CH ₃	H
SCF ₃	CH ₂ SCH ₃	CH ₂ -cyclopropyl	H
SCF ₃	NO ₂	CH ₂ CH(CH ₃) ₂	H

R	R ¹	R ³	R ⁷
SCF ₃	CN	CH ₂ CH ₃	H
SCF ₃	Br	CH(CH ₃) ₂	H
SCF ₃	C≡CH	CH ₂ CH(CH ₃) ₂	H

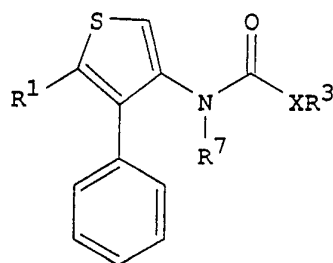
TABLE 3



R	R ¹	R ³	R ⁴	R ⁷
Br	Me	CH ₃	Me	Me
Cl	Et	C ₂ H ₅	Me	H
Cl	Me	C ₃ H ₇	H	H
Cl	Me	C(CH ₃) ₃	H	H
Br	Me	cyclopropyl	H	H
Cl	Me	cyclobutyl	Me	Me
OCF ₃	Me	cyclopentyl	H	H
Cl	Me	cyclohexyl	H	H
Cl	Me	CH ₂ -cyclopropyl	Me	H
CF ₃	Me	C(CH ₃)CH:CH ₂	H	H
Cl	Me	CH ₂ C ₆ H ₅	H	Me
CF ₃	Et	CH ₂ CH(CH ₃) ₂	Me	Me
CF ₃	Et	CH ₃	Me	H
Cl	Me	CH(CH ₃) ₂	H	H
CF ₃	NHCH ₃	CH ₂ -cyclopropyl	H	Me
CF ₃	N(CH ₃) ₂	CH(CH ₃) ₂	Me	H

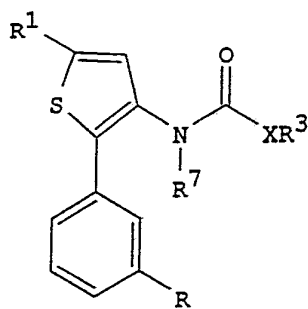
R	R ¹	R ³	R ⁴	R ⁷
CF ₃	Cl	CH(CH ₃) ₂	Me	H
CF ₃	F	2-thiophenyl	H	Me
CF ₃	OCH ₃	CH ₂ CH(CH ₃) ₂	H	Me
CF ₃	SCH ₃	CH ₂ -cyclopropyl	Me	Me
CF ₃	OCF ₃	CH(CH ₃) ₂	H	Me
CF ₃	CH ₂ OCH ₃	benzyl	Me	H
CF ₃	CH ₂ SCH ₃	cyclopropyl	Me	Me

TABLE 4



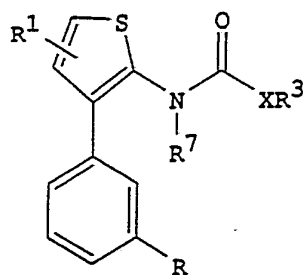
R	R ¹	X	R ³	R ⁷
CF ₃	Me	-	cyclopropyl	H
CF ₃	Et	-	CH(CH ₃) ₂	H
Cl	Me	-	CH(CH ₃)CH:CH ₂	H
Br	Me	-	CH ₂ CH(CH ₃) ₂	Me
CF ₃	Me	O	C ₃ H ₇	H
Cl	Me	O	CH(CH ₃) ₂	H
CF ₃	Me	NH	CH ₂ CH ₃	H
CF ₃	Me	NCH ₃	CH ₃	H
CF ₃	Me	NCH ₃	CH ₃	Me

TABLE 5



R	R ¹	X	R ³	R ⁷
CF ₃	Me	-	CH ₂ CH(CH ₃) ₂	H
CF ₃	Et	-	CH(CH ₃) ₂	H
Cl	Me	-	CH ₂ CH:CH ₂	H
Br	Me	-	cyclopropyl	Me
CF ₃	Me	O	C ₃ H ₇	H
Cl	Me	O	CH ₂ -cyclopropyl	H
CF ₃	Me	NH	CH ₂ CH(CH ₃) ₂	H
CF ₃	Et	NCH ₃	CH ₃	H

TABLE 6



R	R ¹	X	R ³	R ⁷
CF ₃	4-Me	-	CH(CH ₃) ₂	H
CF ₃	4-Et	-	C(CH ₃) ₃	Me
CF ₃	5-Et	-	C(CH ₃) ₂ Br	H

R	R ¹	X	R ³	R ⁷
Cl	5-Me	-	CH=C(CH ₃) ₂	H
OCF ₃	Me	-	C(CH ₃) ₂ OCOCH ₃	H
Br	5-Me	-	CH ₂ CH ₃	H
CF ₃	4-Me	O	C ₃ H ₇	H
CN	4-Me	O	CH ₂ CF ₃	H
Cl	5-Me	O	CH ₂ -cyclopropyl	H
CF ₃	5-Me	NH	CH ₂ CH(CH ₃) ₂	H
Br	4-Me	NCH ₃	CH(CH ₃) ₂	Me

Formulation

Compounds of this invention will generally be used in formulation with an agriculturally suitable carrier comprising a liquid or solid diluent or an organic solvent. Use formulations include dusts, granules, pellets, solutions, suspensions, emulsions, wettable powders, emulsifiable concentrates, dry flowables and the like, consistent with the physical properties of the active ingredient, mode of application and environmental factors such as soil type, moisture and temperature. Sprayable formulations can be extended in suitable media and used at spray volumes from about one to several hundred liters per hectare. High strength compositions are primarily used as intermediates for further formulation. The formulations will typically contain effective amounts of active ingredient, diluent and surfactant within the following approximate ranges which add up 100 weight percent.

	Weight Percent		
	<u>Active Ingredient</u>	<u>Diluent</u>	<u>Surfactant</u>
Wettable Powders	25-90	0-74	1-10
Oil Suspensions, Emulsions, Solutions, (including Emulsifiable Concentrates)	5-50	40-95	0-15
Dusts	1-25	70-99	0-5
Granules and Pellets	0.01-99	5-99.99	0-15
High Strength Compositions	90-99	0-10	0-2

Typical solid diluents are described in Watkins, et al., *Handbook of Insecticide Dust Diluents and Carriers*, 2nd Ed., Dorland Books, Caldwell, New Jersey.

Typical liquid diluents and solvents are described in Marsden, *Solvents Guide*, 2nd Ed., Interscience, New York, 1950. *McCutcheon's Detergents and Emulsifiers Annual*, Allured Publ. Corp., Ridgewood, New Jersey, as well as
5 Sisely and Wood, *Encyclopedia of Surface Active Agents*, Chemical Publ. Co., Inc., New York, 1964, list surfactants and recommended uses. All formulations can contain minor amounts of additives to reduce foam, caking, corrosion, microbiological growth, etc.

10 Solutions are prepared by simply mixing the ingredients. Fine solid compositions are made by blending and, usually, grinding as in a hammer mill or fluid energy mill. Water-dispersible granules can be produced by agglomerating a fine powder composition; see
15 for example, Cross et al., *Pesticide Formulations*, Washington, D.C., 1988, pp 251-259. Suspensions are prepared by wet-milling; see, for example, U.S. 3,060,084. Granules and pellets can be made by spraying the active material upon preformed granular carriers or
20 by agglomeration techniques. See Browning, "Agglomeration", *Chemical Engineering*, December 4, 1967, pp 147-48, *Perry's Chemical Engineer's Handbook*, 4th Ed., McGraw-Hill, New York, 1963, pages 8-57 and following, and WO 91/13546. Pellets can be prepared as described in
25 U.S. 4,172,714. Water-dispersible and water-soluble granules can also be prepared as taught in DE 3,246,493.

For further information regarding the art of formulation, see U.S. 3,235,361, Col. 6, line 16 through Col. 7, line 19 and Examples 10-41; U.S. 3,309,192, Col.
30 5, line 43 through Col. 7, line 62 and Examples 8, 12, 15, 39, 41, 52, 53, 58, 132, 138-140, 162-164, 166, 167 and 169-182; U.S. 2,891,855, Col. 3, line 66 through Col. 5, line 17 and Examples 1-4; Klingman, *Weed Control as a Science*, John Wiley and Sons, Inc., New York, 1961,

pp 81-96; and Hance et al., *Weed Control Handbook*, 8th Ed., Blackwell Scientific Publications, Oxford, 1989.

In the following Examples, all percentages are by weight and all formulations are worked up in conventional ways. Compound numbers refer to compounds in Table 7.

Example A

High Strength Concentrate

	Compound 1	98.5%
	silica aerogel	0.5%
10	synthetic amorphous fine silica	1.0%

Example B

Wettable Powder

	Compound 1	65.0%
	dodecylphenol polyethylene glycol ether	2.0%
15	sodium ligninsulfonate	4.0%
	sodium silicoaluminate	6.0%
	montmorillonite (calcined)	23.0%

Example C

Granule

20	Compound 1	10.0%
	attapulgate granules (low volative matter, 0.71/0.30 mm; U.S.S. No. 25-50 sieves)	90.0%

Example D

25 Extruded Pellet

	Compound 1	25.0%
	anhydrous sodium sulfate	10.0%
	crude calcium ligninsulfonate	5.0%
	sodium alkyl naphthalenesulfonate	1.0%
30	calcium/magnesium bentonite	59.0%

UTILITY

Test results indicate compounds of this invention are active postemergence and preemergence herbicides. Many compounds in this invention are useful for the control of selected grass and broadleaf weeds with tolerance to important agronomic crops such as barley (Hordeum vulgare), corn (Zea mays), cotton (Gossypium hirsutum), rice (Oryza sativa), sorghum (Sorghum bicolor), soybean (Glycine max) and wheat (Triticum aestivum). Grass and broadleaf weed species controlled include, but are not limited to, barnyardgrass (Echinochloa crusgalli), bedstraw (Galium aparine), blackgrass (Alopecurus myosuroides), chickweed (Stellaria media), crabgrass (Digitaria spp.), foxtail (Setaria spp.), lambsquarters (Chenopodium spp.), velvetleaf (Abutilon theophrasti), wild buckwheat (Polygonum convolvulus) and wild oats (Avena fatua).

These compounds also have utility for weed control of selected vegetation in specified areas such as around storage tanks, parking lots, highways, and railways; in fallow crop areas; and in citrus and plantation crops such as banana, coffee, oil palm, and rubber. Alternatively, these compounds are useful to modify plant growth.

Effective amounts of the compounds of this invention are determined by a number of factors. These factors include: formulation selected, method of application, amount and type of vegetation present, growing conditions, etc. In general, effective amounts of compounds are applied at rates from 0.01 to 20 kg/ha with a preferred rate range of 0.02 to 4 kg/ha. Although a small number of compounds show slight herbicidal activity at the rates tested, it is anticipated these compounds are herbicidally active at higher application rates. One skilled in the art can easily determine effective

application rates necessary for desired level of weed control.

Compounds of this invention can be used alone or in combination with other commercial herbicides, insecticides or fungicides. A mixture of one or more of the following herbicides with a compound of this invention may be particularly useful for weed control. Examples of other herbicides with which compounds of this invention can be formulated are: acetochlor,

10 acifluorfen, acrolein, 2-propenal, alachlor, ametryn, amidosulfuron, ammonium sulfamate, amitrole, anilofos, asulam, atrazine, barban, benefin, bensulfuron methyl, bensulide, bentazon, benzooflur, benzoylprop, bifenox, bromacil, bromoxynil, bromoxynil heptanoate, bromoxynil

15 octanoate, butachlor, buthidazole, butralin, butylate, cacodylic acid, 2-chloro-*N,N*-di-2-propenylacetamide, 2-chloroallyl diethyldithiocarbamate, chloramben, chlorbromuron, chloridazon, chlorimuron ethyl, chlormethoxynil, chlornitrofen, chloroxuron,

20 chlorpropham, chlorsulfuron, chlortoluron, cinmethylin, cinosulfuron, clethodim, clomazone, cloproxydim, clopyralid, calcium salt of methylarsonic acid, cyanazine, cycloate, cycluron, cyperquat, cyprazine, cyprazole, cypromid, dalapon, dazomet, dimethyl 2,3,5,6-

25 tetrachloro-1,4-benzenedicarboxylate, desmedipham, desmetryn, dicamba, dichlobenil, dichlorprop, diclofop, diethatyl, difenzoquat, diflufenican, dimepiperate, dinitramine, dinoseb, diphenamid, dipropetryn, diquat, diuron, 2-methyl-4,6-dinitrophenol, disodium salt of

30 methylarsonic acid, dymron, endothall, S-ethyl dipropylcarbamoethioate, esprocarb, ethalfluralin, ethametsulfuron methyl, ethofumesate, fenac, fenoxaprop, fenuron, salt of fenuron and trichloroacetic acid, flamprop, fluazifop, fluazifop-P, fluchloralin,

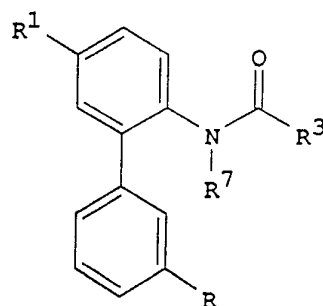
35 flumesulam, flumipropyn, fluometuron, fluorchloridone,

fluorodifen, fluoroglycofen, flupoxam, fluridone,
fluroxypyr, fluzasulfuron, fomesafen, fosamine,
glyphosate, haloxyfop, hexaflurate, hexazinone,
imazamethabenz, imazapyr, imazaquin, imazamethabenz
5 methyl, imazethapyr, imazosulfuron, ioxynil, isopropalin,
isoproturon, isouron, isoxaben, karbutilate, lactofen,
lenacil, linuron, metobenzuron, metsulfuron methyl,
methylarsonic acid, monoammonium salt of methylarsonic
acid, (4-chloro-2-methylphenoxy)acetic acid, *S,S'*-
10 dimethyl-2-(difluoromethyl)-4-(2-methylpropyl)-6-
(trifluoromethyl)-3,5-pyridinedicarbothioate, mecoprop,
mefenacet, mefluidide, methalpropalin, methabenz-
thiazuron, metham, methazole, methoxuron, metolachlor,
metribuzin, 1,2-dihydropyridazine-3,6-dione, molinate,
15 monolinuron, monuron, monuron salt and trichloroacetic
acid, monosodium salt of methylarsonic acid, napropamide,
naptalam, neburon, nicosulfuron, nitralin, nitrofen,
nitrofluorfen, norea, norflurazon, oryzalin, oxadiazon,
oxyfluorfen, paraquat, pebulate, pendimethalin,
20 perfluidone, phenmedipham, picloram, 5-[2-chloro-4-
(trifluoromethyl)phenoxy]-2-nitroacetophenone oxime-*O*-
acetic acid methyl ester, pretilachlor, primisulfuron,
procyazine, profluralin, prometon, prometryn, pronamide,
propachlor, propanil, propazine, propham, prosulfalin,
25 prynachlor, pyrazolate, pyrazon, pyrazosulfuron ethyl,
quinchlorac, quizalofop ethyl, rimsulfuron, secbumeton,
sethoxydim, siduron, simazine, 1-(*a,a*-dimethylbenzyl)-3-
(4-methylphenyl)urea, sulfometuron methyl, trichloro-
acetic acid, tebuthiuron, terbacil, terbuchlor,
30 terbuthylazine, terbutol, terbutryn, thifensulfuron
methyl, thiobencarb, tri-allate, trialkoxydim,
triasulfuron, tribenuron methyl, triclopyr, tridiphan,
trifluralin, trimeturon, (2,4-dichlorophenoxy)acetic
acid, 4-(2,4-dichlorophenoxy)butanoic acid, vernolate,
35 and xylachlor.

Herbicidal properties of the subject compounds were discovered in a number of greenhouse tests. Test procedures and results follow.

Selective herbicidal properties of the subject
5 compounds were discovered in greenhouse tests as
described below.

TABLE 7



No.	R	R¹	R³	R⁷	m.p. (°C)
1	CF₃	Me	C(CH₃)₃	H	97-100
2	CF₃	Me	CH₃	H	110-113
3	H	Me	C(CH₃)₃	H	72-77
4	NO₂	Me	C(CH₃)₃	H	142-145
5	CF₃	Me	cyclopropyl	H	151-154
6	CF₃	i-Pr	C(CH₃)₃	H	108-110
7	CF₃	Me	CF₃	H	71-76
8	CF₃	Me	C₄H₉	H	103-106
9	OCH₃	Me	C(CH₃)₃	H	¹H NMR (CDCl₃): δ 1.05 (s, 9: C(CH₃)₃), 2.40 (s, 3: CH₃), 7.05- 7.65 (7H aromatic)
10	CF₃	H	C(CH₃)₃	H	112-114
11	CF₃	Et	C(CH₃)₃	H	95-97
12	CN	Me	C(CH₃)₃	H	78-80
13	CN	i-Pr	C(CH₃)₃	H	145-147
14	CF₃	Me	C(CH₃)₂OCOCH₃	H	81-84
15	CF₃	H	cyclohexyl	H	111-114
16	CF₃	H	CH₂CH(CH₃)₂	H	106-108
17	CF₃	Me	cyclohexyl	H	139-141
18	CF₃	Me	CH₂CH(CH₃)₂	H	89-91
19	CF₃	Me	C(CH₃)=CH₂	H	85-87
20	CF₃	H	cyclopropyl	H	128-130

No.	R	R ¹	R ³	R ⁷	m.p. (°C)
21	CF ₃	Me	CH(CH ₃) ₂	H	111-113
22	CF ₃	Me	CH ₂ CH ₃	H	97-99
23	CF ₃	Me	cyclobutyl	H	113-114
24	CF ₃	H	cyclobutyl	H	80-82
29	CF ₃	Me	2-furyl	H	98-100
30	CF ₃	Me	CH=C(CH ₃) ₂	H	103-105
31	Cl	Me	C(CH ₃) ₃	H	95-97
32	Cl	Me	cyclopropyl	H	155-156
33	CF ₃	Me	1-Me-2,2-diCl-cyclopropyl	H	110-112
34	CF ₃	Me	C(CH ₃) ₃	CH ₃	¹ H NMR (CDCl ₃): δ 1.06 (s, 9: C(CH ₃) ₃), 2.40 (s, 3: CH ₃), 3.00 (s, 3: NCH ₃), 7.05-7.65 (7 aromatic H)
39	CF ₃	Me	1-Me-cyclopropyl	H	70-72
40	CF ₃	Me	CH ₂ OCH ₃	H	105-107
41	CF ₃	Me	CH ₂ Br	H	103-105
46	NO ₂	Et	C(CH ₃) ₃	H	125-127
47	CF ₃	Me	CHClCH ₃	H	66-68
48	CF ₃	Me	CH ₂ SCH ₃	H	79-81
50	CF ₃	Me	2-thienyl	H	215-217
53	Cl	Me	C(CH ₃) ₂ CH ₂ Cl	H	82-84
54	Cl	Me	cyclopropyl	CO-cyclo-propyl	¹ H NMR (CDCl ₃): δ 0.8 (m, 4: CH ₂ x2), 0.95 (m, 4: CH ₂ x2), 2.0 (m, 2: CHx2), 2.40 (s, 3: CH ₃), 7.05-7.4 (7H aromatic)
57	Cl	Me	C(CH ₃) ₂ Br	H	64-66
58	CF ₃	Et	CH ₃	H	105-107
59	Cl	Me	CH ₂ CH(CH ₃) ₂	H	129-131
60	Cl	Me	CHBrCH ₃	H	101-103

No.	R	R ¹	R ³	R ⁷	m.p. (°C)
61	CF ₃	Me	CHCl ₂	H	115-117
62	CF ₃	Et	CH ₂ CH ₂ Cl	H	79-81
63	CF ₃	Et	C(CH ₃) ₂ CH ₂ Cl	H	101-103
64	Cl	Me	CHCl ₂	H	132-134
65	CF ₃	Me	CH=CHBr	H	106-108
66	CF ₃	Et	CHCl ₂	H	115-117
67	CF ₃	Et	CHClCH ₂ Cl	H	99-101
69	CF ₃	Et	CH ₃	CH ₃	71-73
71	CF ₃	Et	cyclopropyl	CH ₃	¹ H NMR (CDCl ₃): δ 0.6 (m, 2: CH ₂), 0.75 (m, 1: CH), 1.0 (m, 1: CH), 1.3 (t, 3: CH ₃), 1.45 (m, 1: CH), 2.75 (q, 2: CH ₂), 2.95 (s, 3: CH ₃), 7.25- 7.6 (7H aromatic)
72	CF ₃	Me	C(CH ₃) ₂ CH ₂ Cl	H	75-77
73	NO ₂	Et	CH ₃	H	136-138
74	NO ₂	Et	cyclopropyl	H	162-163
75	CF ₃	Et	C(CH ₃) ₂ OCOCH ₃	H	76-78
76	NO ₂	Et	CH ₂ CH(CH ₃) ₂	H	122-124
77	CF ₃	Me	CH=CH ₂	H	119-121
78	Cl	Et	CH ₃	H	76-78
83	Cl	Et	cyclopropyl	H	100-102
89	Cl	Me	CH ₂ CH ₂ Br	H	112-114
91	CF ₃	Pr	CH ₃	H	74-76
92	CF ₃	Pr	cyclopropyl	H	114-116
93	CF ₃	Pr	CH(CH ₃) ₂	H	98-100
94	CF ₃	Pr	CH ₂ CH(CH ₃) ₂	H	95-97

No.	R	R ¹	R ³	R ⁷	m.p. (°C)
97	CF ₃	Pr	CH=C(CH ₃) ₂	H	78-80
98	CF ₃	Et	CH=C(CH ₃) ₂	CH ₃	¹ H NMR (CDCl ₃): δ 1.3 (t, 3: CH ₃), 1.6 (s, 3: CH ₃), 1.8 (s, 3: CH ₃), 2.75 (q, 2: CH ₂), 3.1 (s, 3: CH ₃), 7.2-7.6 (7H aromatic)
102	Br	Et	CH ₃	H	84-86
103	CF ₃	Me	CHF ₂	H	¹ H NMR (CDCl ₃): δ 2.4 (s, 3: CH ₃), 5.9 (t, 1: CHF ₂), 2.75 (q, 2: CH ₂), 3.1 (s, 3: CH ₃), 7.1-8.1 (7H aromatic & NH)
107	CF ₃	NO ₂	CH ₃	H	154-156
108	CF ₃	NO ₂	CH(CH ₃) ₂	H	117-119
109	NO ₂	Me	cyclopropyl	H	165-166
110	NO ₂	Me	CH(CH ₃) ₂	COCH(CH ₃) ₂	59-61
111	NO ₂	Me	CH(CH ₃) ₂	H	148-150
112	NO ₂	Me	CH=C(CH ₃) ₂	H	143-145
113	NO ₂	Me	CH ₂ CH(CH ₃) ₂	H	141-143
118	CF ₃	Et	C(CH ₃) ₂ OCOCH ₃	CH ₃	91-93
122	NO ₂	Me	CH ₂ C(=CH ₂)CH ₃	H	116-118
124	CN	Me	CH(CH ₃) ₂	H	146-148
125	CN	Me	cyclopropyl	H	196-198
126	CN	Me	1-Me-cyclopropyl	H	120-122
127	CN	Me	CH ₂ CH(CH ₃) ₂	H	105-107
128	SCHF ₂	Me	C(CH ₃) ₃	H	¹ H NMR (CDCl ₃): δ 1.1 (s, 8: t-Bu), 2.4 (s, 3: CH ₃), 6.9 (t, 1: CHF ₂), 3.1 (s, 3: CH ₃), 7.0-8.1 (7H aromatic & NH)
130	Cl	Me	1-Me-cyclopropyl	H	75-77

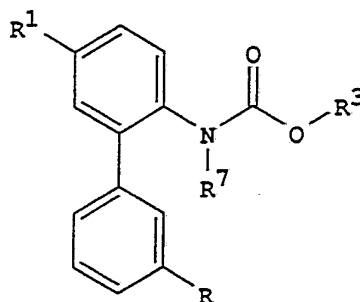
No.	R	R ¹	R ³	R ⁷	m.p. (°C)
131	Br	Me	CH(CH ₃) ₂	H	138-140
132	Br	Me	cyclopropyl	H	153-155
133	Br	Me	1-Me-cyclopropyl	H	¹ H NMR (CDCl ₃): δ 0.6 (t, 2: CH ₂), 1.1 (s, 3: CH ₃), 1.2 (t, 2: CH ₂), 2.4 (s, 3: CH ₃), 7.0-8.1 (7H aromatic & NH)
134	Cl	Me	CH(CH ₃) ₂	H	145-147
135	OCF ₃	Me	C(CH ₃) ₃	H	74-76
136	Cl	Me	CH=C(CH ₃) ₂	H	115-117
137	Cl	Et	CH(CH ₃) ₂	H	116-118
138	Cl	Et	1-Me-cyclopropyl	H	74-76
139	Cl	i-Pr	CH(CH ₃) ₂	H	122-124
140	Cl	i-Pr	cyclopropyl	H	104-106
144	OCF ₃	Me	CH ₂ CH(CH ₃) ₂	H	111-112
145	OCF ₃	Me	CH ₂ CH ₂ CH ₃	H	112-113
147	Cl	Me	CH ₂ CH ₃	H	115-116
148	OCF ₃	Me	cyclopropyl	H	152-153
149	OCF ₃	Me	CH(CH ₃) ₂	H	107-108
151	Cl	Et	CH ₂ CH(CH ₃) ₂	H	83-85
152	Cl	Et	CH=C(CH ₃) ₂	H	102-104
153	Cl	CN	CH ₃	H	148-150
154	Cl	CN	CH(CH ₃) ₂	H	102-104
155	Cl	CN	cyclopropyl	H	155-157
156	Cl	CN	1-Me-cyclopropyl	H	107-109
158	Cl	CN	CH ₂ CH(CH ₃) ₂	H	128-130
160	SCHF ₂	Me	CH(CH ₃) ₂	H	89-90
161	SCHF ₂	Me	cyclopropyl	H	123-124
162	CF ₃	CN	CH(CH ₃) ₂	H	130-132
163	CF ₃	CN	cyclopropyl	H	130-131
165	CF ₃	CN	CH ₂ CH(CH ₃) ₂	H	116-117
168	CN	Et	CH(CH ₃) ₂	H	163-165

No.	R	R ¹	R ³	R ⁷	m.p. (°C)
170	CN	Et	CH ₂ CH(CH ₃) ₂	H	114-115
171	CN	Et	CH=C(CH ₃) ₂	H	113-114
174	CN	Et	1-Me-cyclopropyl	H	89-90
175	OCH ₃	Me	CH(CH ₃) ₂	H	91-93
176	CH ₃	Me	CH(CH ₃) ₂	H	100-102
179	SCF ₃	Me	CH(CH ₃) ₂	H	127-128
180	CH ₃	Me	cyclopropyl	H	126-127
181	SCF ₃	Me	cyclopropyl	H	137-138
182	Cl	Me	cyclobutyl	H	234-239
183	CF ₃	Me	2-Me-cyclopropyl	H	226-228
184	Cl	Me	2-Me-cyclopropyl	H	157-158
185	Br	Me	2-Me-cyclopropyl	H	145-147
186	CN	Me	2-Me-cyclopropyl	H	136-138
187	CF ₃	CN	2-Me-cyclopropyl	H	152-153
188	NO ₂	Me	CH ₃	H	132-134
189	CF ₃	H	CH ₃	H	124-125
190	CF ₃	Br	CH ₃	H	105-109
191	CH ₃	Me	1-Me-cyclopropyl	H	¹ H NMR (CDCl ₃): δ 0.6(t, 2: CH ₂), 1.1 (s, 3: CH ₃), 1.2(t, 2: CH ₂), 2.35(s, 3: CH ₃), 2.4(s, 3: CH ₃), 7.05-8.2(7H aromatic & NH)
192	NO ₂	Me	1-Me-cyclopropyl	H	103-104
193	CF ₃	Br	CH(CH ₃) ₂	H	128-130
194	CF ₃	Br	cyclopropyl	H	148-150
196	CH ₃	CN	CH(CH ₃) ₂	H	106-107
197	CH ₃	CN	cyclopropyl	H	122-123
198	CH ₃	CN	2-Me-cyclopropyl	H	105-107
201	SCF ₃	Me	2-Me-cyclopropyl	H	121-124
202	CF ₃	Et	2-Me-cyclopropyl	H	111-113
203	NO ₂	Me	2-Me-cyclopropyl	H	146-147

No.	R	R ¹	R ³	R ⁷	m.p. (°C)
204	SCHF ₂	Me	2-Me-cyclopropyl	H	98-100
205	CF ₃	Br	1-Me-cyclopropyl	H	85-87
208	CN	Et	cyclopropyl	H	167-168
209	CF ₃	Br	1-Me-cyclopropyl	H	138-140
210	CF ₃	Br	CH=C(CH ₃) ₂	H	110-112
211	OCF ₂	Me	CH(CH ₃) ₂	H	97-98
212	OCF ₂	Me	CH(CH ₃) ₂	COCH(CH ₃) ₂	¹ H NMR (CDCl ₃): δ 0.8 (m, 4: 2xCH ₂), 0.9 (m, 4: 2xCH ₂), 2.0 (m, 2: 2xCH), 2.4 (s, 3: CH ₃), 6.7 (t, 1: CHF ₂), 7.1- 7.4 (7H aromatic)
214	OCF ₂	Me	1-Me-cyclopropyl	H	¹ H NMR (CDCl ₃): δ 0.6 (t, 2: CH ₂), 1.1 (s, 3: CH ₃), 1.2 (t, 2: CH ₂), 2.4 (s, 3: CH ₃), 6.8 (t, 1: CHF ₂), 7.05-8.2 (7H aromatic & NH)
216	NO ₂	CN	CH(CH ₃) ₂	H	163-164
217	NO ₂	CN	cyclopropyl	H	158-159
219	CN	H	C(CH ₃) ₃	H	178-181
220	CN	Br	C(CH ₃) ₃	H	¹ H NMR (CDCl ₃): δ 1.05 (s, 9: C(CH ₃) ₃), 7.15 (s, 1: NH), 7.4-8.1 (7H aromatic)
221	CF ₃	Br	C(CH ₃) ₂ OCOCH ₃	H	¹ H NMR (CDCl ₃): δ 1.6 (s, 6: 2xCH ₃), 1.7 (s, 3: COCH ₃), 7.2-8.2 (7H aromatic & NH)
222	OCF ₃	Br	C(CH ₃) ₃	H	¹ H NMR (CDCl ₃): δ 1.05 (s, 9: C(CH ₃) ₃), 7.4-8.25 (7H aromatic & NH)

No.	R	R ¹	R ³	R ⁷	m.p. (°C)
223	SCF ₃	H	C(CH ₃) ₃	H	69-75
224	CN	Br	CH(CH ₃) ₂	H	165-168
225	SCF ₃	Br	C(CH ₃) ₃	H	¹ H NMR (CDCl ₃): δ 1.05 (s, 9: C(CH ₃) ₃), 7.2 (s, 1: NH), 7.25-8.2 (7H aromatic)
226	CF ₃	HC≡C	CH(CH ₃) ₂	H	108-111
228	CN	CN	C(CH ₃) ₃	H	54-59
229	OCF ₃	Br	CH(CH ₃) ₂	H	133-135
231	OCF ₃	Br	cyclopropyl	H	165-170
232	OCF ₃	CN	CH(CH ₃) ₂	H	124-127
233	CF ₃	Cl	cyclopropyl	H	137-138
234	CF ₃	Cl	CH(CH ₃) ₂	H	115-116
235	CF ₃	Cl	CH ₂ CH(CH ₃) ₂	H	91-92
236	Cl	Cl	cyclopropyl	H	99-100
237	Cl	Cl	CH(CH ₃) ₂	H	142-143
238	Cl	Cl	CH ₂ CH(CH ₃) ₂	H	168-169

TABLE 8



No.	R	R ¹	R ³	R ⁷	m.p. (°C)
25	CF ₃	Me	CH ₃	H	¹ H NMR (CDCl ₃): δ 2.38 (s, 3: CH ₃), 3.65 (s, 3: CH ₃), 6.28 (s, 1: NH), 7.02-7.90 (7H aromatic)

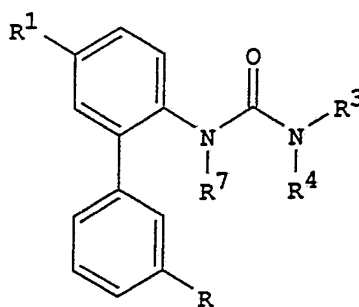
No.	R	R ¹	R ³	R ⁷	m.p. (°C)
26	CF ₃	Me	CH(CH ₃) ₂	H	83-85
27	CF ₃	Me	CH ₂ CCl ₃	H	¹ H NMR (CDCl ₃): δ 2.4 (s, 3), 4.8 (s, 2: CH ₂), 6.5 (s, 1: NH), 7.05-7.80 (7H aromatic)
45	CF ₃	Me	CH ₂ CH ₃	H	¹ H NMR (CDCl ₃): δ 1.22 (t, 3: CH ₃), 2.32 (s, 3: CH ₃), 4.2 (q, 2: CH ₂), 6.28 (s, 1: NH), 7.02-7.90 (7H aromatic)
51	Cl	Me	CH ₂ CF ₃	H	38-40
52	CF ₃	Et	CH ₂ CF ₃	H	51-53
56	CF ₃	Et	CH(CH ₃) ₂	H	92-94
70	CF ₃	Et	cyclopentyl	H	96-98
79	Cl	Me	CH(CH ₃) ₂	H	86-88
81	CF ₃	Et	CH ₂ CH ₂ CH ₃	H	¹ H NMR (CDCl ₃): δ 0.9 (t, 3: CH ₃), 1.25 (t, 3: CH ₃), 1.6 (m, 2: CH ₂), 2.6 (m, 2: CH ₂), 4.1 (t, 2: CH ₂), 6.3 (s, 1: NH), 7.0-7.9 (7H aromatic)
82	Cl	Et	CH(CH ₃) ₂	H	85-87
85	Cl	Et	CH ₂ CH(CH ₃) ₂	H	¹ H NMR (CDCl ₃): δ 0.9 (d, 6: 2xCH ₃), 1.25 (t, 3: CH ₃), 1.9 (m, 1: CH), 2.6 (m, 2: CH ₂), 3.9 (d, 2: CH ₂), 6.4 (s, 1: NH), 7.0-7.9 (7H aromatic)
86	NO ₂	Et		H	¹ H NMR (CDCl ₃): δ 0.9 (d, 6: 2xCH ₃), 1.25 (t, 3: CH ₃), 1.9 (m, 1: CH), 2.6 (m, 2: CH ₂), 3.9 (d, 2: CH ₂), 6.3 (s, 1: NH), 7.0-8.3 (7H aromatic)

No.	R	R ¹	R ³	R ⁷	m.p. (°C)
87	Cl	Me	CH ₂ CH ₃	H	¹ H NMR (CDCl ₃): δ 1.25 (t, 3: CH ₃), 2.3 (s, 3: CH ₃), 4.2 (q, 2: CH ₂), 6.3 (s, 1: NH), 7.0-8.0 (7H aromatic)
88	CF ₃	Et	CH ₂ CH ₃	H	46-48
95	Cl	Et	CH ₂ -cyclopropyl	H	¹ H NMR (CDCl ₃): δ 0.3 (m, 2: CH ₂), 0.6 (m, 2: CH ₂), 1.1 (m, 1: CH), 1.25 (t, 3: CH ₃), 2.6 (q, 2: CH ₂), 3.9 (d, 2: CH ₂), 6.3 (s, 1: NH), 7.0-8.0 (7H aromatic)
96	CF ₃	Pr	CH ₂ CH(CH ₃) ₂	H	62-64
99	CF ₃	Pr		H	¹ H NMR (CDCl ₃): δ 0.95 (t, 2: CH ₃), 1.6 (m, 2: CH ₂), 2.6 (t, 2: CH ₂), 3.7 (s, 3: OCH ₃), 6.35 (s, 1: NH), 7.0-7.9 (7H aromatic)
100	CF ₃	Pr	CH(CH ₃) ₂	H	76-78
101	CF ₃	Et	CH ₂ -cyclopropyl	H	46-48
104	CF ₃	Me	CH ₂ -cyclopropyl	H	¹ H NMR (CDCl ₃): δ 0.3 (m, 2: CH ₂), 0.6 (m, 2: CH ₂), 1.1 (m, 1: CH), 2.4 (t, 3: CH ₃), 3.95 (d, 2: OCH ₂), 6.3 (s, 1: NH), 7.0-7.9 (7H aromatic)
105	CF ₃	Me	benzyl	H	56-58
106	Cl	Me	benzyl	H	¹ H NMR (CDCl ₃): δ 2.35 (s, 3: CH ₃), 5.2 (s, 2: CH ₂), 6.45 (s, 1: NH), 7.0-8.0 (7H aromatic)
114	NO ₂	Me	CH ₂ CH ₃	H	106-108
116	CF ₃	Me	CH ₂ CH ₂ Br	H	77-79

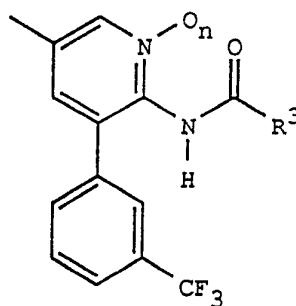
No.	R	R ¹	R ³	R ⁷	m.p. (°C)
117	NO ₂	Et	CH(CH ₃) ₂	H	84-86
119	NO ₂	Et	CH ₂ CH ₃	H	51-53
129	CN	Me	CH(CH ₃) ₂	H	111-113
141	Cl	i-Pr	CH(CH ₃) ₂	H	65-66
142	OCF ₃	Me	CH(CH ₃) ₂	H	92-94
146	NO ₂	Me	CH ₂ CH ₃	H	141-143
150	OCF ₃	Me	CH ₂ CH ₃	H	56-58
157	Cl	Me	CH ₂ CH(CH ₃) ₂	H	50-52
159	Cl	Me	CH ₂ C=CH	H	61-63
164	SCHF ₂	Me	CH(CH ₃) ₂	H	66-68
166	CF ₃	CN	CH(CH ₃) ₂	H	104-105
167	CF ₃	CN	CH ₂ CH(CH ₃) ₂	H	100-102
169	CN	Et	CH(CH ₃) ₂	H	84-85
172	CN	Et	CH ₂ CH ₃	H	73-74
173	CN	Et	CH ₂ CH(CH ₃) ₂	H	¹ H NMR (CDCl ₃): δ 0.9 (d, 6: 2xCH ₃), 1.2 (t, 3: CH ₃), 1.9 (m, 1: CH), 2.6 (t, 2: CH ₂), 3.9 (d, 2: OCH ₂), 6.3 (s, 1: NH), 7.0-7.9 (7H aromatic)
177	CH ₃	Me	CH(CH ₃) ₂	H	¹ H NMR (CDCl ₃): δ 1.2 (d, 6: 2xCH ₃), 2.35 (s, 3: CH ₃), 2.4 (s, 3: CH ₃), 5.0 (m, 1: OCH), 6.3 (s, 1: NH), 7.0-8.0 (7H aromatic)
178	CH ₃	Me	CH ₂ CH(CH ₃) ₂	H	¹ H NMR (CDCl ₃): δ 0.9 (d, 6: 2xCH ₃), 1.95 (m, 1: CH), 2.35 (s, 3: CH ₃), 2.4 (s, 3: CH ₃), 3.9 (d, 2: OCH ₂), 6.55 (s, 1: NH), 7.0-8.0 (7H aromatic)
199	CH ₃	CN	CH(CH ₃) ₂	H	68-69
200	CF ₃	Br	CH(CH ₃) ₂	H	97-98

No.	R	R ¹	R ³	R ⁷	m.p. (°C)
206	Cl	CN	CH ₃	COOCH ₃	113-114
207	Cl	Me	CH ₃	COOCH ₃	103-106
213	OCHF ₂	Me	CH(CH ₃) ₂	H	61-63
215	CF ₃	Br	CH(CH ₃) ₂	H	70-71
218	NO ₂	CN	CH(CH ₃) ₂	H	133-135
227	CN	Br	CH(CH ₃) ₂	H	¹ H NMR (CDCl ₃): δ 1.2 (d, 6: 2xCH ₃), 4.95 (m, 1: OCH), 6.25 (s, 1: NH), 7.25-8.0 (7H aromatic)
230	OCF ₃	Br	CH(CH ₃) ₂	H	81-88

TABLE 9

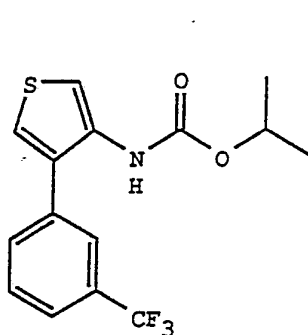


No.	R	R ¹	R ³	R ⁷	R ⁴	m.p. (°C)
28	CF ₃	Me	CH ₂ CH ₃	H	CH ₂ CH ₃	85-87
42	CF ₃	Me	CH(CH ₃) ₂	H	H	178-180
43	CF ₃	Me	CH(CH ₃)CH ₂ CH ₃	H	H	162-164
44	CF ₃	Me	CH ₂ CH(CH ₃) ₂	H	H	165-167
49	CF ₃	Me	CH ₃	CH ₃	H	96-98
80	CF ₃	Et	CH ₃	CH ₃	CH ₃	96-98
90	Cl	Et	CH(CH ₃) ₂	H	H	170-172
115	CF ₃	Me	cyclopropyl	H	H	175-177

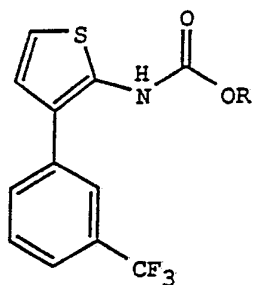
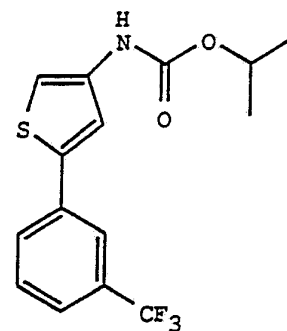
TABLE 10

<u>No.</u>	<u>R³</u>	<u>n</u>	<u>m.p. (°C)</u>
35	(CH ₃) ₃	0	185-187
36	cyclopropyl	0	129-131
37	cyclopropyl	1	125-127
38	CH (CH ₃) ₂	0	147-148

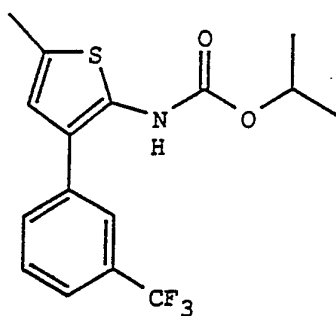
TABLE 11



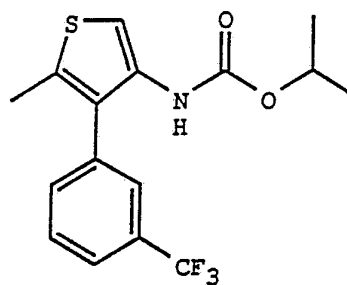
240 m.p.=65-70°C

R=iPr
Et241 m.p.=88-94°C
242 m.p.=55-60°C

243 m.p.=102-106°C



244 m.p.=106-114°C



245 m.p.=110-113°C

TEST A

Seeds of barnyardgrass (*Echinochloa crus-galli*), cheatgrass (*Bromus secalinus*), cocklebur (*Xanthium pensylvanicum*), crabgrass (*Digitaria* spp.), giant foxtail (*Setaria faberii*), morningglory (*Ipomoea* spp.), sorghum (*Sorghum bicolor*), velvetleaf (*Abutilon theophrasti*), and wild oat (*Avena fatua*) were planted into a sandy loam soil and treated preemergence with test chemicals dissolved in a non-phytotoxic solvent. At the same time, these crop and weed species were also treated postemergence with test chemicals. Plants ranged in height from two to eighteen cm and were in the two to three leaf stage for the postemergence treatment. Treated plants and untreated controls were maintained in a greenhouse for approximately eleven days, after which all treated plants were compared to untreated controls and visually evaluated for injury. Plant response ratings, summarized in Table A, are based on a 0 to 10 scale where 0 is no effect and 10 is complete control. A dash (-) response means no test results.

Table A	COMPOUND	Table A	COMPOUND
Rate 2000 g/ha	1	Rate 2000 g/ha	1
POSTEMERGENCE		PREEMERGENCE	
Barnyardgrass	9	Barnyardgrass	10
Cheatgrass	2	Cheatgrass	9
Cocklebur	5	Cocklebur	1
Morningglory	2	Morningglory	9
Giant foxtail	9	Giant foxtail	10
Sorghum	4	Sorghum	8
Crabgrass	9	Crabgrass	10
Velvetleaf	4	Velvetleaf	10
Wild oats	3	Wild oats	9

Table A	COMPOUND
Rate 1000 g/ha	2
POSTEMERGENCE	
Barnyardgrass	8
Cheatgrass	6
Cocklebur	-
Morningglory	6
Giant foxtail	9
Sorghum	9
Crabgrass	9
Velvetleaf	7
Wild oats	7

Rate 400 g/ha	7
POSTEMERGENCE	
Barnyardgrass	5
Cheatgrass	3
Cocklebur	4
Morningglory	8
Giant Foxtail	6
Sorghum	3
Crabgrass	9
Velvetleaf	3
Wild oats	4

Table A	COMPOUND
Rate 1000 g/ha	2
PREEMERGENCE	
Barnyardgrass	8
Cheatgrass	5
Cocklebur	0
Morningglory	9
Giant foxtail	9
Sorghum	9
Crabgrass	10
Velvetleaf	9
Wild oats	6

Rate 400 g/ha	7
PREEMERGENCE	
Barnyardgrass	7
Cheatgrass	5
Cocklebur	0
Morningglory	4
Giant foxtail	9
Sorghum	4
Crabgrass	9
Velvetleaf	3
Wild oats	3

TABLE A COMPOUND

Rate 2000 g/ha 242

POSTEMERGENCE

Barnyardgrass	8
Cheatgrass	5
Cocklebur	0
Crabgrass	9
Giant foxtail	7
Morningglory	0
Sorghum	6
Velvetleaf	0
Wild oats	4

TABLE A COMPOUND

Rate 2000 g/ha 242

PREEMERGENCE

Barnyardgrass	10
Cheatgrass	9
Cocklebur	0
Crabgrass	10
Giant foxtail	10
Morningglory	1
Sorghum	10
Velvetleaf	6
Wild oats	10

TEST B

Seeds of barley (*Hordeum vulgare*), barnyardgrass (*Echinochloa crus-galli*), bedstraw (*Galium aparine*), blackgrass (*Alopecurus myosuroides*), cheatgrass (*Bromus secalinus*), chickweed (*Stellaria media*), cocklebur
5 (*Xanthium pensylvanicum*), corn (*Zea mays*), cotton (*Gossypium hirsutum*), crabgrass (*Digitaria* spp.), giant foxtail (*Setaria faberii*), lambsquarters (*Chenopodium album*), morningglory (*Ipomoea hederacea*), rape (*Brassica napus*), rice (*Oryza sativa*), sorghum (*Sorghum bicolor*),
10 soybean (*Glycine max*), sugar beet (*Beta vulgaris*), velvetleaf (*Abutilon theophrasti*), wheat (*Triticum aestivum*), wild buckwheat (*Polygonum convolvulus*), and wild oat (*Avena fatua*) and purple nutsedge (*Cyperus rotundus*) tubers were planted and treated preemergence
15 with test chemicals dissolved in a non-phytotoxic solvent. At the same time, these crop and weed species were also treated with postemergence applications of test chemicals. Plants ranged in height from two to eighteen cm (one to four leaf stage) for postemergence treatments.
20 Treated plants and controls were maintained in a greenhouse for twelve to sixteen days, after which all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table A, are based on a scale of 0 to 10 where 0 is no effect and 10 is
25 complete control. A dash (-) response means no test result.

COMPOUND

Rate 2000 g/ha	3	4	5	8	9	10	11	13	14	15	16	17	19	22	23	26	29	31	32	33	34	35	36	37	38	42	43	44	48	
POSTEMERGENCE																														
Barley	0	2	7	2	1	0	0	0	6	0	0	0	0	3	5	6	7	1	0	8	1	0	0	6	1	0	5	2	2	2
Barnyardgrass	0	5	9	9	2	0	1	0	9	2	8	6	9	9	9	9	9	3	3	9	4	0	0	10	1	8	9	3	2	10
Bedstraw	2	-	9	6	5	2	9	0	5	-	9	8	9	10	9	9	9	7	5	8	9	2	0	8	6	5	4	2	2	6
Blackgrass	0	7	9	8	0	0	1	0	2	0	2	0	5	8	9	10	1	1	9	2	0	0	8	1	2	5	1	1	5	6
Cheatgrass	0	1	9	5	0	0	1	0	1	0	0	0	4	7	9	5	1	1	6	1	0	0	7	1	1	6	0	0	5	5
Chickweed	1	3	9	7	4	2	5	0	3	0	4	2	8	8	9	9	6	4	8	7	2	1	5	2	6	4	1	0	5	5
Cocklebur	1	1	8	4	1	1	3	0	7	0	2	-	8	3	2	8	2	3	8	7	1	0	3	2	0	5	2	1	0	5
Corn	1	4	9	5	2	0	1	0	8	0	6	4	8	8	4	6	2	3	8	7	1	0	3	2	0	5	2	1	5	5
Cotton	2	1	10	10	7	0	5	0	2	0	7	6	9	10	10	8	8	4	9	8	2	1	0	7	1	1	6	3	1	6
Crabgrass	0	8	9	6	1	0	2	0	9	2	8	3	9	9	9	9	9	3	3	9	2	1	0	9	9	6	9	5	4	9
Giant foxtail	0	8	9	8	3	0	1	0	8	2	6	2	9	9	9	9	1	2	9	2	0	0	9	9	3	2	8	1	4	7
Lambsquarter	3	-	-	9	4	3	8	0	6	3	3	4	9	7	8	10	9	7	9	10	0	0	1	6	6	2	-	5	3	1
Morningglory	2	3	9	7	2	4	4	0	9	2	7	3	9	8	8	9	5	3	7	8	1	2	9	5	3	5	2	3	8	6
Nutsedge	0	1	5	1	0	0	0	0	9	0	0	-	8	2	3	2	1	-	8	0	0	0	5	0	0	-	-	0	1	1
Rape	2	7	10	10	2	0	5	0	9	4	9	6	9	8	9	10	7	7	8	9	3	0	4	7	1	9	5	1	6	6
Rice	0	3	7	1	2	0	1	0	7	0	3	0	6	3	3	2	1	2	4	2	0	0	4	1	3	5	0	1	1	6
Sorghum	0	2	8	1	1	0	2	0	7	0	1	2	7	7	6	5	2	3	6	3	0	0	7	1	2	3	0	0	7	7
Soybean	3	3	8	9	1	0	6	0	7	1	7	5	9	9	9	9	5	7	6	7	3	2	8	6	3	8	2	2	4	4
Sugar beet	2	7	10	8	5	2	8	0	9	0	8	5	9	9	10	9	4	7	10	10	7	0	9	8	2	10	9	5	6	6
Velvetleaf	0	1	9	1	0	3	-	0	7	0	2	5	7	9	10	9	6	3	9	7	0	2	4	4	2	2	2	2	2	4
Wheat	0	0	5	3	1	0	1	0	7	0	0	5	5	4	5	2	0	8	2	0	0	4	0	4	0	0	3	0	0	4
Wild buckwheat	-	3	-	2	3	0	2	0	2	1	1	1	9	9	7	10	3	2	9	3	-	7	8	8	7	6	0	2	6	6
Wild oat	1	0	10	5	0	0	2	0	6	0	0	0	5	9	9	9	1	0	8	1	0	0	5	0	0	4	1	1	1	6

Table B

Rate 2000 g/ha POSTEMERGENCE	COMPOUND														
	50	80	84	107	108	110	118	128	144	145					
Barley	1	0	1	4	8	4	0	2	7	4					
Barnyardgrass	3	0	4	7	9	5	0	6	9	9					
Bedstraw	4	1	5	5	6	1	0	6	10	9					
Blackgrass	2	1	5	4	7	2	0	3	9	8					
Cheatgrass	1	0	3	1	4	1	0	3	9	9					
Chickweed	2	-	5	4	8	-	0	5	10	-					
Cocklebur	4	1	3	0	5	5	0	5	8	2					
Corn	2	0	2	2	7	2	0	4	9	4					
Cotton	8	0	3	10	-	2	0	8	10	10					
Crabgrass	2	3	8	7	9	4	5	3	9	9					
Giant foxtail	1	1	5	5	8	7	2	3	9	7					
Lambsquarter	9	1	8	4	9	1	0	8	9	6					
Morningglory	8	2	4	1	8	5	5	4	9	7					
Nutsedge	0	0	0	1	3	2	0	0	5	1					
Rape	9	1	9	1	7	6	0	7	10	7					
Rice	1	0	1	1	7	2	0	2	8	3					
Sorghum	1	1	2	2	6	1	0	2	9	8					
Soybean	6	2	4	3	5	1	2	6	9	6					
Sugar beet	9	4	7	7	10	9	0	8	10	7					
Velvetleaf	6	2	5	7	4	1	0	4	9	8					
Wheat	0	0	1	0	5	3	0	2	7	5					
Wild buckwheat	2	1	5	2	7	2	1	7	8	7					
Wild oat	2	0	4	4	7	2	0	2	9	8					

COMPOUND

Rate 2000 g/ha PREMERGENCE	3	4	5	8	9	10	11	13	14	15	16	17	19	22	23	26	29	31	32	33	34	35	36	37	38	42	43	44	48
Barley	0	1	10	1	0	0	2	0	0	0	0	0	1	2	2	5	9	1	0	6	0	0	0	1	1	0	2	1	1
Barnyardgrass	2	8	10	10	2	1	9	0	10	4	10	10	10	10	9	10	10	8	9	10	9	5	0	9	3	8	9	4	2
Bedstraw	0	5	10	9	0	-	10	0	8	0	9	8	9	1	10	9	0	3	10	8	9	7	9	8	7	10	7	7	8
Blackgrass	1	7	10	9	5	-	-	0	10	0	10	10	10	7	10	10	6	6	10	8	0	0	9	1	5	8	4	2	8
Cheatgrass	0	1	10	10	0	0	3	0	10	0	3	7	8	5	10	10	6	3	9	4	1	0	6	1	2	5	1	0	2
Chickweed	0	5	10	10	0	2	8	0	7	0	10	7	10	9	9	7	2	10	3	9	8	9	9	9	9	2	0	8	0
Cocklebur	0	0	3	0	0	0	0	0	5	0	1	2	1	6	0	9	0	2	2	0	0	0	3	0	2	0	0	0	0
Corn	0	3	8	3	0	0	1	0	9	0	3	1	8	1	1	8	1	0	7	2	1	0	8	1	4	7	2	0	4
Cotton	1	1	9	3	0	0	0	0	1	0	0	3	6	-	1	6	8	0	4	0	0	0	3	1	0	1	0	3	0
Crabgrass	2	10	10	10	10	7	10	0	10	7	10	10	10	9	10	10	9	10	10	10	9	7	9	8	10	10	9	7	9
Giant foxtail	3	10	10	10	5	5	10	0	10	10	10	10	10	9	10	10	10	10	10	10	3	2	10	4	10	10	7	4	10
Lambsquarter	0	-	10	10	2	6	9	0	10	0	10	8	-	-	10	-	-	-	-	9	9	8	9	9	-	9	9	7	9
Morningglory	0	2	10	10	1	0	3	0	9	0	6	4	10	6	0	10	2	2	6	7	0	0	10	8	7	9	3	2	4
Nutsedge	0	3	10	1	-	0	0	0	9	0	9	0	7	0	10	2	0	4	0	4	0	0	1	0	0	1	0	0	0
Rape	0	9	10	10	1	0	3	0	10	0	9	10	10	1	1	10	3	1	10	3	0	0	3	4	0	10	10	5	0
Rice	1	1	7	2	0	0	0	0	8	0	4	2	7	1	1	5	1	0	5	2	1	0	1	1	2	1	1	0	0
Sorghum	1	2	9	1	0	0	2	0	8	0	3	1	5	2	2	8	2	0	6	4	0	0	3	0	2	2	0	0	4
Soybean	0	6	10	0	0	0	0	0	7	0	3	0	8	0	1	9	0	0	5	2	0	0	5	3	3	7	0	0	1
Sugar beet	0	10	10	10	0	0	8	0	10	0	10	6	10	8	8	10	0	8	9	6	0	10	8	7	8	10	9	7	10
Velvetleaf	0	4	10	9	0	2	6	0	10	0	8	5	8	8	10	10	0	0	9	2	0	0	9	2	4	4	0	0	5
Wheat	0	1	9	2	0	0	3	0	9	0	1	1	8	1	2	9	0	0	5	1	0	0	1	0	0	1	0	0	0
Wild buckwheat	0	9	-	-	1	0	-	0	10	0	4	0	9	1	9	10	1	5	8	4	0	0	2	6	1	9	2	4	6
Wild oat	1	5	10	7	0	0	8	0	9	0	8	6	9	8	10	10	5	2	9	5	3	0	4	1	1	4	2	0	3

Table B

COMPOUND

Rate 2000 g/ha PREMERGENCE	50	80	84	107	108	110	118	128	144	145
Barley	1	0	2	0	3	2	0	0	5	1
Barnyardgrass	10	0	5	7	8	9	0	6	10	7
Bedstraw	7	2	4	8	9	5	0	8	10	-
Blackgrass	8	2	4	7	10	7	0	6	10	3
Cheatgrass	3	0	5	3	6	1	1	6	10	4
Chickweed	9	2	8	10	9	10	2	9	10	8
Cocklebur	0	0	0	4	0	2	0	2	7	3
Corn	4	0	0	6	4	5	0	2	8	0
Cotton	0	0	0	3	1	3	0	0	10	1
Crabgrass	9	7	7	8	10	10	3	8	10	5
Giant foxtail	10	0	9	4	10	10	0	10	10	4
Lambsquarter	10	2	9	9	9	7	0	9	10	7
Morningglory	6	0	1	5	10	3	0	2	10	1
Nutsedge	0	0	0	0	3	4	0	0	2	0
Rape	8	0	10	2	10	9	0	2	10	1
Rice	1	0	0	2	4	1	0	1	6	0
Sorghum	10	0	3	0	3	6	0	2	9	2
Soybean	0	0	0	6	4	3	0	0	9	-
Sugar beet	3	1	7	9	10	9	0	10	10	5
Velvetleaf	1	0	2	10	10	4	0	5	10	7
Wheat	0	0	2	0	3	2	0	0	7	1
Wild buckwheat	3	0	0	1	7	9	0	7	9	7
Wild oat	6	1	6	3	8	2	0	4	9	5

Table B

COMPOUND

Rate 1000 g/ha POSTEMERGENCE	4	5	6	7	9	10	11	14	17	18	19	21	22	23	24	26	28	29	30	31	32	33	39	40	41	45	46	47	49	
Barley	0	6	1	1	1	0	0	1	5	0	2	2	8	2	5	1	6	3	1	7	0	6	0	3	2	0	5	0	1	2
Barnyardgrass	2	9	1	7	1	0	1	1	9	4	9	8	9	9	9	1	9	3	2	9	2	9	4	10	1	0	10	1	0	7
Bedstraw	2	9	3	5	2	0	6	-	3	9	6	10	8	9	7	9	6	5	9	5	9	7	5	1	0	5	3	5	5	
Blackgrass	4	10	4	5	0	0	1	2	0	7	3	9	8	9	2	8	1	2	8	1	7	1	4	1	0	9	0	3	5	
Cheatgrass	0	9	2	2	0	0	0	1	0	4	1	9	4	7	2	2	2	2	7	1	4	1	3	1	0	5	0	3	2	
Chickweed	1	-	3	6	2	0	3	3	1	4	2	8	8	9	9	5	2	5	8	2	7	5	3	2	0	4	2	5	4	
Cocklebur	1	7	2	3	0	0	2	2	2	2	5	9	4	2	1	7	2	2	8	3	5	5	5	0	0	3	2	2	3	
Corn	3	8	2	3	1	0	1	8	1	7	4	9	7	4	1	3	1	2	7	2	8	3	6	2	0	5	0	2	2	
Cotton	1	10	2	9	2	0	2	1	7	8	4	-	10	10	3	10	1	7	10	6	8	8	9	9	1	10	1	9	8	
Crabgrass	4	9	2	2	1	0	1	9	3	8	4	9	9	9	5	9	3	2	7	3	8	2	8	2	0	9	0	2	7	
Giant foxtail	3	9	1	6	2	0	1	8	2	8	3	9	7	7	9	4	7	2	1	8	2	8	2	7	2	1	9	-	1	
Lambsquarter	-	10	-	9	2	0	8	6	4	8	8	9	3	8	1	9	5	6	10	5	9	8	9	7	0	10	3	8	5	
Morningglory	3	8	4	4	2	2	2	8	2	8	5	7	8	7	3	8	5	5	9	3	7	7	6	3	2	9	4	4	6	
Nutsedge	0	4	0	1	0	0	0	3	0	2	2	6	1	2	1	1	0	0	6	2	3	0	0	0	0	1	0	0	0	
Rape	2	9	3	5	3	0	5	8	5	9	8	10	7	8	3	10	7	5	9	7	6	9	10	1	0	6	2	4	8	
Rice	1	7	1	1	0	0	0	8	0	8	1	8	1	2	0	2	1	1	6	2	4	0	1	1	2	2	4	0	2	
Sorghum	1	8	0	2	1	0	1	6	2	7	4	9	7	5	1	4	2	2	5	2	5	3	4	1	0	4	0	1	0	
Soybean	3	9	4	8	1	1	4	8	4	9	8	10	6	8	2	9	8	4	9	4	4	6	9	2	1	9	0	4	8	
Sugar beet	6	10	7	5	7	0	8	9	1	9	8	10	9	9	8	9	7	3	10	8	9	9	9	4	0	10	8	5	8	
Velvetleaf	0	9	3	3	0	0	2	3	3	8	4	9	8	10	1	7	2	8	9	7	5	5	7	2	0	8	0	5	2	
Wheat	0	5	1	2	0	0	0	5	0	3	1	8	2	2	0	3	1	1	5	0	4	1	2	1	0	4	0	2	0	
Wild buckwheat	2	10	-	-	-	0	2	2	1	2	4	9	7	8	3	8	2	2	7	4	7	4	8	2	0	9	2	3	3	
Wild oat	0	9	2	1	0	0	1	6	0	8	2	9	8	6	1	5	2	2	7	0	6	0	2	1	0	5	0	2	0	

Table B

COMPOUND

Rate 1000 g/ha POSTEMERGENCE	51	52	53	54	56	57	58	59	60	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	81	
Barley	1	2	2	2	2	2	0	2	0	1	0	0	1	0	1	0	0	1	0	1	0	2	0	1	1	0	1	0	1
Barnyardgrass	7	5	2	7	9	2	2	9	2	2	3	2	1	1	2	2	0	4	0	3	2	6	3	5	3	0	2	2	4
Bedstraw	5	8	6	7	9	3	4	7	4	5	3	2	4	3	5	5	0	5	5	6	2	5	7	6	6	4	7	9	9
Blackgrass	2	3	3	2	5	2	2	4	1	2	1	1	1	1	3	2	0	1	1	2	1	5	2	3	3	0	3	5	5
Cheatgrass	1	2	2	2	5	2	1	2	1	1	1	0	1	2	4	4	0	1	0	1	0	1	0	1	3	0	3	4	5
Chickweed	7	4	7	5	7	2	3	5	3	4	2	1	3	1	6	3	0	4	3	6	1	3	2	2	4	3	4	5	5
Cocklebur	3	5	5	6	7	5	3	7	3	5	0	2	3	0	3	1	0	5	1	4	0	2	3	2	2	1	3	1	1
Corn	2	5	3	2	3	3	2	3	2	3	2	1	2	0	1	1	0	1	1	1	1	4	2	3	2	0	2	1	1
Cotton	9	10	9	9	9	9	8	9	9	8	10	4	1	3	1	5	1	0	7	2	3	0	6	1	1	2	1	2	4
Crabgrass	7	7	6	-	9	3	6	8	6	4	5	2	3	2	5	1	0	2	3	3	4	5	2	3	5	1	4	8	8
Giant foxtail	3	4	4	7	5	3	4	9	3	4	3	2	4	2	3	1	0	2	0	2	4	4	2	2	6	1	3	2	2
Lambsquarter	9	9	8	8	9	9	0	9	-	9	1	3	2	2	6	2	0	7	-	10	1	2	3	7	9	-	4	4	
Morningglory	7	5	6	5	9	7	1	9	4	2	1	1	1	2	3	2	2	5	4	5	3	7	7	4	4	2	5	5	5
Nutsedge	0	0	0	1	2	0	0	0	0	0	-	0	-	0	-	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Rape	4	4	7	8	8	8	0	8	3	6	1	3	6	1	5	2	0	7	1	8	1	1	8	1	7	0	9	1	1
Rice	2	2	1	1	3	3	1	4	3	4	1	0	2	0	1	1	0	1	0	1	0	4	2	1	2	0	2	0	0
Sorghum	1	1	1	1	3	2	1	2	2	3	2	0	1	2	1	1	0	0	1	2	0	2	1	0	2	0	1	0	0
Soybean	3	7	1	2	6	3	2	6	4	4	1	1	2	0	2	1	1	4	2	3	1	6	5	3	5	1	5	5	5
Sugar beet	9	8	9	9	9	9	2	9	7	5	1	6	6	3	5	5	0	9	6	7	1	8	6	7	9	1	8	8	8
Velvetleaf	7	7	6	7	7	0	0	7	3	3	3	2	3	2	3	1	2	3	2	3	0	3	1	2	4	0	7	3	3
Wheat	1	2	2	2	2	0	0	1	1	1	1	0	1	0	2	2	0	1	0	1	1	0	0	0	1	0	1	2	2
Wild buckwheat	3	7	6	8	8	2	7	3	1	5	2	1	3	1	5	1	2	-	5	5	0	2	7	2	4	2	2	5	5
Wild oat	1	2	1	3	4	0	1	2	1	3	2	0	1	1	3	1	0	2	2	2	3	1	5	1	1	3	0	1	2

Table B

COMPOUND

Rate 1000 g/ha POSTEMERGENCE	113	114	115	116	117	119	122	124	125	126	127	130	131	132	133	134	135	136	137	138	139
Barley	3	4	0	1	2	2	4	6	8	3	6	2	5	8	3	6	1	3	1	2	0
Barnyardgrass	9	4	4	1	2	1	9	9	9	4	9	3	9	9	5	9	6	9	6	1	0
Bedstraw	7	3	4	5	5	8	7	7	9	7	8	5	7	9	5	7	8	7	7	5	0
Blackgrass	8	7	1	1	2	2	8	9	9	4	9	3	8	9	6	7	4	6	4	3	1
Cheatgrass	6	2	1	2	1	2	5	8	8	4	8	2	7	7	4	5	3	6	3	2	0
Chickweed	6	5	2	3	3	8	5	9	8	7	7	5	8	9	7	9	-	7	-	4	-
Cocklebur	7	3	5	1	5	5	5	2	7	2	7	4	5	5	5	9	5	7	2	4	1
Corn	8	6	2	2	2	2	7	9	9	3	8	2	8	7	2	8	3	6	4	4	0
Cotton	5	3	3	4	3	4	2	5	2	-	9	7	8	9	9	8	9	10	9	8	5
Crabgrass	8	7	5	5	3	3	7	8	9	2	8	3	7	9	3	9	2	6	4	1	1
Giant foxtail	9	6	5	3	3	3	9	9	9	3	9	3	8	8	3	9	2	6	4	1	1
Lambsquarter	6	3	5	4	8	6	7	7	8	6	9	7	8	8	8	7	6	8	7	3	2
Morningglory	9	5	6	4	6	5	7	7	9	1	7	3	5	6	5	4	4	7	3	5	3
Nutsedge	7	0	1	0	0	0	5	-	7	0	-	0	-	3	3	0	0	0	0	0	0
Rape	6	8	7	0	6	4	6	9	9	8	9	7	6	7	9	8	5	9	5	4	0
Rice	7	1	2	2	4	3	6	7	8	2	9	1	6	5	3	3	2	2	2	1	0
Sorghum	5	2	0	3	2	0	5	9	8	2	7	1	8	7	2	8	2	3	1	1	0
Soybean	4	1	3	2	6	4	6	7	9	9	10	7	7	5	7	4	5	7	2	2	1
Sugar beet	8	9	8	6	9	9	9	9	10	8	10	8	9	10	10	10	9	10	6	7	1
Velvetleaf	6	4	3	7	7	7	9	2	5	2	5	4	4	7	6	4	5	5	2	1	1
Wheat	3	2	0	0	1	1	4	8	9	1	7	1	3	4	2	3	1	3	0	1	0
Wild buckwheat	9	3	3	3	4	7	4	9	9	8	9	6	8	7	6	6	4	5	5	5	3
Wild oat	6	4	0	0	1	1	4	8	9	4	7	3	6	7	3	5	2	4	2	2	0

Table B
COMPOUND

Rate 1000 g/ha POSTEMERGENCE	140	141	142	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164
Barley	0	0	3	2	1	8	8	4	2	1	1	5	7	1	0	0	1	2	1	9	8	2
Barleyardgrass	1	1	9	6	2	9	9	9	3	3	1	6	9	1	4	7	7	9	8	9	9	8
Bedstraw	-	4	9	3	-	10	10	-	10	8	2	8	10	10	3	7	-	9	9	8	9	8
Blackgrass	2	0	7	3	1	9	9	8	2	5	2	9	8	2	1	5	6	7	6	9	10	8
Cheatgrass	1	0	4	2	1	8	9	6	1	3	0	4	7	1	1	3	5	3	3	8	9	3
Chickweed	-	4	9	-	5	-	-	9	7	5	4	8	10	4	1	3	6	5	8	9	10	9
Cocklebur	2	1	7	0	2	8	8	4	5	6	2	4	8	3	-	5	3	5	5	6	9	7
Corn	1	1	5	6	2	9	9	7	2	2	0	5	8	1	1	6	3	7	7	9	9	1
Cotton	8	3	10	8	9	10	10	10	9	8	3	4	9	5	7	9	8	10	10	9	9	9
Crabgrass	2	1	8	6	5	9	9	7	2	3	1	6	6	2	3	3	3	8	9	9	9	6
Giant foxtail	2	0	5	7	1	9	9	5	2	2	1	7	4	2	2	5	3	8	9	9	9	5
Lambsquarter	5	3	9	2	5	9	10	9	7	8	3	8	10	3	3	5	4	7	9	9	9	9
Morningglory	4	1	8	3	0	9	9	7	5	7	-	7	8	6	2	7	5	9	9	9	9	8
Nutsedge	0	1	5	2	0	5	4	1	0	0	0	1	5	0	0	0	2	2	0	8	7	1
Rape	0	2	9	2	1	7	9	9	6	5	1	8	10	4	2	6	4	8	7	8	9	9
Rice	0	0	4	0	0	8	9	4	0	2	0	1	2	0	1	3	3	5	4	9	8	1
Sorghum	1	0	6	6	1	9	9	4	0	2	0	3	5	1	1	4	3	4	4	9	9	2
Soybean	3	1	9	1	4	7	8	7	5	4	2	4	8	7	1	7	4	8	7	8	9	7
Sugar beet	1	2	10	2	3	10	10	10	8	10	2	9	10	9	3	10	9	10	10	10	10	9
Velvetleaf	1	0	9	1	5	9	9	7	2	4	2	2	4	3	2	4	9	8	8	8	6	
Wheat	0	0	2	3	1	9	7	4	2	2	0	5	7	2	0	1	1	3	2	8	9	2
Wild buckwheat	3	3	8	4	2	9	9	8	3	5	1	6	9	4	2	3	8	7	8	9	9	8
Wild oat	0	0	4	3	1	9	9	5	3	2	1	6	8	1	1	2	2	4	7	9	9	2

Table B
COMPOUND

Rate 1000 g/ha POSTEMERGENCE	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186
Barley	5	2	7	0	2	0	0	2	0	0	3	2	0	0	2	2	2	1	3	2	3	6
Barnyardgrass	9	7	9	4	9	9	1	9	1	2	7	8	3	3	9	9	9	2	9	8	7	9
Bedstraw	8	9	3	3	4	4	3	3	3	3	4	4	5	2	7	8	8	7	8	8	7	9
Blackgrass	8	9	3	8	1	5	7	3	7	3	4	5	3	2	6	7	8	2	8	4	4	8
Cheatgrass	6	5	2	1	1	3	2	2	2	2	2	2	2	1	4	3	5	3	5	3	3	7
Chickweed	9	9	7	8	4	3	3	3	3	3	4	5	3	2	8	8	8	3	6	6	8	7
Cocklebur	3	6	2	2	3	3	2	3	2	2	3	3	4	1	4	4	7	1	7	7	7	8
Corn	7	6	1	7	5	7	3	3	3	1	6	7	2	2	7	7	6	1	6	5	2	8
Cotton	8	10	8	7	9	9	7	-	7	9	10	9	9	10	10	10	10	8	10	10	10	9
Crabgrass	6	4	2	1	3	3	4	2	2	2	9	9	5	6	9	9	6	3	7	8	6	9
Giant foxtail	6	2	1	1	2	5	5	1	1	1	9	9	2	2	7	9	6	3	9	8	6	9
Lambsquarter	9	9	7	3	5	6	6	2	6	8	8	8	9	7	9	7	9	6	6	8	9	10
Morningglory	8	9	3	3	8	9	8	2	3	6	6	7	6	2	8	8	8	5	10	7	6	9
Nutsedge	2	2	0	0	2	2	0	0	0	0	5	3	1	0	2	4	2	2	3	3	0	-
Rape	9	9	4	3	8	0	0	8	7	4	7	7	5	3	6	5	5	2	9	8	9	10
Rice	3	0	0	1	2	4	6	1	1	0	3	4	1	0	3	3	4	0	4	2	2	8
Sorghum	6	2	0	1	3	4	2	1	0	1	3	6	2	1	0	6	6	1	6	3	2	6
Soybean	8	8	4	7	7	7	6	4	5	4	7	7	6	4	8	6	8	2	9	5	7	9
Sugar beet	10	9	8	9	8	8	9	7	6	5	9	10	7	3	10	9	9	3	10	9	9	9
Velvetleaf	3	6	2	2	7	4	3	2	1	1	3	5	2	4	4	7	6	5	8	7	8	7
Wheat	5	2	0	0	1	0	0	3	0	1	1	0	0	0	0	1	2	1	3	2	2	4
Wild buckwheat	8	10	2	5	6	6	3	4	7	6	6	6	2	2	6	5	9	3	6	7	6	9
Wild oat	7	4	0	3	1	2	7	1	0	2	3	2	2	0	5	9	4	2	6	3	3	8

Table B

COMPOUND

Rate 1000 g/ha POSTEMERGENCE	187	188	189	190	191	192	193	194	196	197
Barley	6	2	0	3	2	1	4	5	2	3
Barnyardgrass	8	2	0	5	2	3	9	9	2	7
Bedstraw	8	2	3	6	3	4	9	9	7	8
Blackgrass	4	2	0	4	2	6	5	7	5	6
Cheatgrass	3	1	0	3	2	3	4	5	3	3
Chickweed	7	4	3	7	3	3	9	9	6	6
Cocklebur	6	1	1	2	2	3	4	7	5	7
Corn	8	1	0	6	2	2	6	7	2	5
Cotton	6	6	2	9	5	7	10	9	7	7
Crabgrass	3	2	1	2	2	2	9	9	2	2
Giant foxtail	7	3	0	4	2	3	9	9	4	3
Lambsquarter	8	3	2	2	6	7	9	9	7	7
Morningglory	4	6	4	6	6	4	7	9	4	8
Nutsedge	1	0	0	1	0	0	3	1	1	1
Rape	8	2	0	2	6	4	7	8	2	9
Rice	4	1	0	2	1	1	4	3	2	2
Sorghum	3	1	0	2	1	1	4	5	1	2
Soybean	7	2	2	6	3	5	7	9	3	5
Sugar beet	9	4	0	4	8	7	10	9	8	10
Velvetleaf	7	2	2	3	2	2	8	7	2	3
Wheat	4	2	0	2	2	2	3	4	2	2
Wild buckwheat	6	5	2	7	2	7	8	9	3	7
Wild oat	6	1	0	3	3	2	6	8	3	5

Table B

COMPOUND

Rate 1000 g/ha PREEMERGENCE	4	5	6	7	9	10	11	14	17	18	19	21	22	23	24	26	28	29	30	31	32	33	39	40	41	45	46	47	49	
Barley	0	9	0	0	0	0	0	1	0	1	3	1	8	1	3	0	7	0	0	6	0	3	0	6	0	0	7	0	0	0
Barnyardgrass	5	10	0	9	1	0	3	10	9	10	10	10	10	7	10	1	10	3	3	10	8	10	8	10	0	0	10	0	3	9
Bedstraw	8	10	0	9	0	0	9	8	8	9	2	10	2	9	0	9	9	9	0	10	1	9	5	9	0	0	10	1	3	8
Blackgrass	2	10	0	5	1	0	8	9	10	10	10	10	6	9	0	10	5	3	10	4	9	5	10	0	0	10	3	6	9	
Cheatgrass	0	10	3	5	0	0	3	2	5	10	4	10	3	7	0	10	1	2	10	1	6	2	10	0	0	10	1	2	3	
Chickweed	7	10	2	9	0	-	5	8	1	9	9	9	7	-	0	10	5	2	10	1	10	4	9	0	3	9	1	8	9	
Cocklebur	0	1	0	0	0	0	-	2	-	2	1	1	1	0	0	9	0	0	3	-	2	2	2	2	0	-	0	0	0	
Corn	3	7	0	1	0	0	0	6	0	8	4	7	4	1	0	7	0	0	5	0	5	0	4	0	0	5	2	0	3	
Cotton	0	8	0	0	0	0	0	0	0	2	9	2	10	0	1	0	1	0	2	3	0	1	0	0	0	1	0	1	0	
Crabgrass	10	10	0	10	3	6	10	10	10	10	10	10	9	10	7	10	9	8	10	10	10	10	2	2	10	8	9	10		
Giant foxtail	10	10	0	10	5	3	10	10	10	10	10	10	10	9	1	10	9	9	10	10	10	10	1	2	10	3	10	10		
Lambsquarter	-	10	0	9	0	0	9	10	2	10	-	10	-	-	-	10	-	2	10	-	9	10	0	0	9	-	-	-	-	
Morningglory	2	10	0	4	0	0	1	8	0	9	8	10	2	0	1	10	0	2	10	0	7	2	2	0	0	9	0	1	2	
Nutsedge .	-	3	0	0	-	0	0	6	0	5	2	8	0	1	-	10	0	0	2	0	0	0	0	3	0	4	0	0	0	
Rape	5	10	0	10	0	0	3	9	3	9	9	10	0	0	0	10	0	1	10	1	7	4	10	0	0	10	1	3	10	
Rice	1	8	0	0	0	0	0	7	0	8	3	6	0	0	0	4	0	0	4	0	3	0	1	0	0	1	0	1	1	
Sorghum	1	8	0	1	0	0	0	8	0	7	3	8	3	1	0	6	0	0	4	0	6	2	2	0	0	4	0	2	2	
Soybean	6	8	0	0	0	0	0	5	0	8	3	6	0	1	0	4	1	0	7	0	2	0	4	0	0	2	0	9	5	
Sugar beet	9	10	2	10	0	0	9	10	1	10	8	10	7	3	0	10	8	0	10	9	10	6	9	0	0	10	8	7	10	
Velvetleaf	4	10	0	8	0	0	0	6	4	9	2	10	8	10	0	9	4	0	8	0	8	1	7	2	0	10	1	0	0	
Wheat	0	9	0	1	0	0	2	1	1	2	1	9	0	0	0	5	0	0	6	0	3	0	3	0	0	6	0	0	0	
Wild buckwheat	9	10	-	-	0	0	-	7	0	10	2	10	3	4	0	10	0	0	10	1	8	2	9	0	0	10	1	3	9	
Wild oat	2	10	1	2	0	0	7	8	7	10	8	10	5	6	0	10	2	2	10	1	9	5	10	0	0	10	0	2	2	

Table B

COMPOUND

Rate 1000 g/ha PREEMERGENCE	51	52	53	54	56	57	58	59	60	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	81
Barley	0	2	0	2	5	0	0	2	0	0	0	0	0	0	0	0	0	2	1	1	0	1	0	0	0	0	3	2
Barnyardgrass	9	7	2	9	10	4	2	10	2	2	0	1	0	0	0	0	0	8	6	9	1	9	6	9	8	1	10	9
Bedstraw	2	3	2	6	9	1	2	8	0	6	0	0	0	0	1	0	0	9	0	6	0	7	5	9	9	0	6	6
Blackgrass	8	10	0	8	10	6	2	2	9	1	6	0	2	2	0	1	0	1	7	1	6	1	8	9	6	0	9	9
Cheatgrass	3	7	0	2	10	2	3	8	1	2	0	1	2	0	0	0	0	6	3	4	1	4	3	6	5	0	8	7
Chickweed	5	6	0	6	9	1	9	9	1	6	0	0	5	0	3	0	0	9	9	7	3	9	8	9	10	0	10	9
Cocklebur	-	0	0	0	0	2	3	2	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	1	1	0	0	0
Corn	1	2	0	3	4	0	0	3	0	0	3	0	0	0	0	0	0	0	3	1	2	5	4	4	3	0	4	2
Cotton	0	0	0	0	1	0	-	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Crabgrass	10	10	6	10	10	9	8	8	7	10	7	2	5	3	0	0	3	9	8	9	7	10	9	9	10	0	10	9
Giant foxtail	10	10	6	10	10	9	8	10	8	9	9	7	7	5	1	0	0	9	1	10	8	10	9	10	9	3	10	8
Lambsquarter	9	9	0	9	10	8	0	9	0	9	-	0	-	0	-	0	0	8	3	9	0	9	9	9	9	0	10	9
Morningglory	1	2	1	0	5	0	1	6	0	0	1	0	0	0	0	0	0	0	2	0	1	6	4	8	8	0	0	1
Nutsedge	0	0	0	0	0	9	0	4	0	0	0	-	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0
Rape	2	2	0	2	9	2	0	2	1	4	0	0	4	0	3	0	0	3	0	5	0	5	4	0	7	0	5	0
Rice	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0	3	0	2	0
Sorghum	3	2	0	1	6	0	0	6	0	0	0	0	1	0	0	0	0	2	0	1	1	5	0	5	6	0	3	2
Soybean	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	3	0	0	0
Sugar beet	9	8	3	8	9	7	0	10	0	9	-	2	5	0	3	0	0	9	2	8	2	10	9	9	9	0	9	9
Velvetleaf	0	0	1	2	8	0	0	10	0	3	1	0	0	0	0	0	0	2	1	2	0	10	8	9	9	0	3	6
Wheat	0	1	0	0	4	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	1	1	0	2	1
Wild buckwheat	2	6	2	8	9	0	0	0	0	2	0	0	3	0	2	0	0	2	2	5	0	7	4	1	10	0	8	5
Wild oat	7	9	1	5	10	2	2	2	9	2	1	0	1	0	0	0	3	5	8	1	1	7	3	3	5	0	5	8

Table B

COMPOUND

Rate 1000 g/ha PREEMERGENCE	82	83	85	86	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	109	111	112
Barley	2	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	3	2	4
Barnyardgrass	3	5	0	1	9	0	1	0	2	0	0	0	0	0	4	0	0	0	3	0	9	2	0	9	10	9
Bedstraw	5	9	0	2	9	0	2	0	2	1	3	0	0	-	0	0	0	5	0	0	9	0	0	10	9	6
Blackgrass	7	9	0	2	10	1	5	0	3	0	0	0	0	0	2	0	0	7	0	0	9	0	0	10	9	8
Cheatgrass	6	8	2	0	10	0	2	0	2	0	0	-	0	0	3	0	0	7	0	1	8	0	0	8	7	4
Chickweed	7	10	0	0	9	0	2	0	2	0	0	0	0	0	-	0	0	3	0	-	6	0	0	10	10	9
Cocklebur	0	5	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	-	0	0	1	0	4	6	4	7
Corn	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0	0	9	8	6
Cotton	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	0	-	-	2	4
Crabgrass	9	8	1	6	10	1	6	0	8	2	1	0	0	0	8	-	0	0	8	0	10	3	0	10	9	9
Giant foxtail	9	10	2	6	10	2	3	1	5	2	2	0	0	0	1	0	0	9	0	1	10	2	0	10	10	10
Lambsquarter	4	10	3	0	9	7	10	0	2	0	-	0	0	-	3	0	0	0	0	0	9	0	0	9	9	9
Morningglory	0	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	5	0	0	10	10	9
Nutsedge	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	7	0
Rape	1	3	0	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	10	10	10
Rice	1	0	0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	2	2	0	2	8	3	2
Sorghum	2	6	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0	1	8	6	4
Soybean	1	0	0	0	2	0	0	0	0	0	0	-	0	0	0	4	0	2	0	0	1	0	2	8	7	6
Sugar beet	7	8	2	0	10	1	6	0	4	0	1	0	0	0	2	0	0	2	0	2	9	0	0	10	10	9
Velvetleaf	0	8	0	0	7	1	3	0	0	0	0	0	0	0	0	0	0	1	0	1	5	0	0	10	10	10
Wheat	1	2	0	0	3	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	1	0	0	3	3	3
Wild buckwheat	5	10	0	0	8	0	10	0	0	0	-	0	0	0	0	0	0	1	0	0	3	0	0	3	8	3
Wild oat	6	6	0	0	9	0	1	0	2	0	0	0	0	0	3	0	0	4	0	0	7	0	0	10	4	4

Table B

COMPOUND

Rate 1000 g/ha PREEMERGENCE	113	114	115	116	117	119	122	124	125	126	127	130	131	132	133	134	135	136	137	138	139
Barley	3	0	0	0	1	0	1	1	4	1	3	0	2	2	1	2	1	3	2	1	0
Barnyardgrass	9	10	8	3	5	3	9	10	10	8	10	8	9	9	9	10	10	10	7	1	0
Bedstraw	9	5	4	4	6	1	9	9	10	10	9	9	9	9	5	8	9	9	3	1	0
Blackgrass	9	8	2	1	8	4	4	8	8	4	9	9	10	10	9	9	9	5	5	2	0
Cheatgrass	6	3	1	0	2	1	3	7	5	4	6	4	8	5	7	7	8	8	7	3	0
Chickweed	10	10	8	-	9	9	9	10	10	9	9	8	9	10	-	-	9	-	7	-	0
Cocklebur	6	0	0	0	0	0	2	7	9	0	7	0	0	2	0	0	0	1	2	0	0
Corn	5	4	2	0	0	0	6	9	9	6	7	1	8	8	3	6	2	5	1	0	0
Cotton	8	1	3	0	0	-	1	0	6	2	5	0	0	0	0	0	0	1	0	0	0
Crabgrass	9	9	9	8	9	7	8	10	10	9	9	8	10	10	9	9	10	9	9	6	1
Giant foxtail	10	10	7	6	9	8	10	10	10	10	10	10	10	10	10	10	10	10	9	6	2
Lambsquarter	9	9	9	2	9	7	9	10	10	10	10	9	10	9	10	10	10	9	9	7	3
Morningglory	10	3	8	0	0	0	10	10	10	2	10	2	9	10	3	8	1	9	1	0	0
Nutsedge	6	5	0	0	-	0	-	7	5	4	7	0	3	0	0	0	0	0	0	0	0
Rape	8	6	10	1	4	0	4	10	10	9	7	5	10	9	6	10	10	7	4	0	0
Rice	8	1	0	0	0	0	5	6	5	3	5	1	3	2	2	1	0	3	0	0	0
Sorghum	6	3	3	0	2	0	3	7	10	8	7	3	7	4	3	5	2	3	1	1	0
Soybean	6	0	4	0	2	0	4	9	9	8	9	0	4	5	2	1	0	5	0	0	0
Sugar beet	9	9	8	5	9	0	10	10	10	10	10	7	9	10	9	10	10	8	8	4	0
Velvetleaf	10	2	3	0	2	0	10	10	10	1	10	0	9	10	3	9	5	7	6	0	0
Wheat	2	1	1	0	1	0	2	4	3	0	3	1	5	3	1	6	2	4	1	-	0
Wild buckwheat	3	1	1	0	2	0	5	10	6	9	8	4	7	4	4	6	8	4	0	1	0
Wild oat	3	3	0	2	3	2	2	6	4	4	6	4	4	9	7	7	6	8	7	1	0

Table B

COMPOUND

Rate 1000 g/ha PREMERGENCE	140	141	142	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164
Barley	0	0	9	4	0	7	8	6	2	1	0	7	2	0	0	1	0	1	1	6	8	1
Barnyardgrass	0	0	10	9	1	10	10	10	6	7	0	8	10	3	2	8	8	10	9	10	10	10
Bedstraw	10	0	10	-	0	10	10	9	8	9	0	9	9	2	0	9	3	10	10	10	9	9
Blackgrass	1	0	10	8	0	10	10	10	2	5	2	8	8	0	0	9	5	7	7	10	10	4
Cheatgrass	5	0	10	2	0	10	10	9	3	4	0	7	8	2	0	2	2	3	2	9	10	4
Chickweed	6	0	9	6	0	9	9	9	5	8	0	9	9	8	0	9	4	9	9	9	10	4
Cocklebur	0	0	4	0	0	2	5	3	0	0	0	0	2	0	0	0	0	0	3	4	3	0
Corn	0	0	9	7	0	7	7	6	1	2	0	4	7	0	0	4	0	6	7	9	8	1
Cotton	0	0	9	0	0	3	6	5	0	0	0	0	0	0	0	0	0	2	1	10	9	1
Crabgrass	5	0	10	9	1	10	10	10	5	2	2	9	9	5	3	6	8	10	10	10	10	10
Giant foxtail	7	0	10	8	2	10	10	10	6	8	2	10	10	5	5	9	8	10	10	10	10	9
Lambsquarter	-	0	10	6	0	10	10	9	7	7	0	9	9	5	0	9	6	9	10	10	10	10
Morningglory	0	0	9	2	0	10	10	10	5	3	0	8	10	1	1	10	2	8	10	10	10	10
Nutsedge	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	3	7	5	0
Rape	0	0	10	4	0	10	10	10	0	1	0	8	10	1	0	9	1	9	10	10	10	10
Rice	0	0	4	0	0	5	4	4	0	0	0	0	0	0	0	0	2	1	4	3	7	1
Sorghum	0	0	7	6	1	8	8	7	0	3	-	1	8	0	0	3	2	3	3	6	9	1
Soybean	0	0	4	0	0	5	3	5	0	1	0	1	8	0	0	5	0	6	4	8	9	1
Sugar beet	8	0	10	9	0	10	10	10	1	4	0	10	10	9	0	9	4	10	9	10	10	9
Velvetleaf	0	0	10	1	0	10	10	10	4	2	0	9	10	1	0	5	1	10	10	10	10	5
Wheat	0	0	6	4	0	6	6	5	1	2	0	8	7	0	0	2	0	1	1	10	10	1
Wild buckwheat	10	0	10	3	0	10	9	9	1	3	0	8	7	1	0	1	0	10	10	10	9	8
Wild oat	3	0	10	4	0	10	9	10	4	6	0	9	9	1	0	2	1	4	5	10	10	7

Table B
COMPOUND

Rate 1000 g/ha PREMERGENCE	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186
Barley	3	6	0	4	0	0	0	0	0	0	1	1	0	0	2	0	4	0	7	3	2	1
Barnyardgrass	10	9	2	6	8	8	9	4	3	1	9	10	9	1	10	9	10	2	10	9	7	10
Bedstraw	10	9	-	9	8	9	8	6	8	9	5	8	9	10	10	10	9	0	9	5	9	9
Blackgrass	10	10	2	3	4	3	5	1	4	3	7	8	6	2	9	9	10	4	10	7	9	5
Cheatgrass	8	10	1	6	2	2	3	3	2	2	3	3	2	0	9	4	8	2	10	5	6	9
Chickweed	9	10	3	9	9	9	9	8	4	4	9	9	2	1	9	9	9	4	10	10	9	9
Cocklebur	5	4	0	0	0	0	1	0	0	0	0	0	0	0	1	0	3	-	1	1	1	3
Corn	6	3	0	4	0	8	5	1	0	0	3	3	1	0	4	6	5	0	3	1	1	7
Cotton	3	5	0	1	0	0	7	0	0	0	0	0	0	0	5	0	8	0	5	0	1	4
Crabgrass	10	10	3	10	10	9	10	8	9	2	10	10	10	7	10	10	10	7	10	10	10	10
Giant foxtail	10	10	6	9	10	9	8	9	9	5	10	10	10	2	10	10	10	3	10	10	9	10
Lambsquarter	10	10	5	9	9	9	10	10	9	10	9	5	8	2	10	10	10	7	10	9	9	10
Morningglory	10	10	2	7	3	10	5	0	6	1	7	4	1	0	10	2	10	0	10	9	8	10
Nutsedge	8	0	0	2	0	7	0	0	0	0	10	4	0	0	4	0	0	0	3	0	0	1
Rape	10	10	0	3	5	0	3	3	0	0	3	4	4	0	10	3	8	0	10	10	8	10
Rice	2	1	0	2	2	1	5	0	0	0	0	0	0	0	2	0	1	0	2	1	1	4
Sorghum	2	2	0	2	0	0	0	1	0	0	4	2	1	0	5	2	5	1	8	1	1	2
Soybean	6	3	0	3	0	1	5	0	3	0	3	0	0	0	3	0	5	0	4	3	2	9
Sugar beet	10	10	9	10	9	9	10	8	10	4	9	9	7	0	10	10	10	2	10	9	8	10
Velvetleaf	10	7	1	8	8	8	10	0	0	1	1	6	5	0	10	6	10	5	10	10	10	10
Wheat	6	6	0	3	0	0	0	1	0	0	0	1	0	0	1	0	3	0	5	3	4	4
Wild buckwheat	6	10	0	7	5	3	4	4	6	0	6	2	4	0	10	10	10	0	4	5	1	4
Wild oat	9	10	4	5	3	2	5	3	0	0	3	3	2	0	8	8	9	3	10	6	6	7

Table B	COMPOUND
Rate 0.08 g/ha	2
POSTEMERGENCE	
Barley	0
Barnyardgrass	2
Bedstraw	1
Blackgrass	2
Cheatgrass	1
Chickweed	3
Cocklebur	0
Corn	1
Cotton	3
Crabgrass	1
Giant foxtail	2
Lambsquarter	0
Morningglory	2
Nutsedge	0
Rape	0
Rice	1
Sorghum	0
Soybean	2
Sugar beet	0
Velvetleaf	1
Wheat	0
Wild buckwheat	-
Wild oat	0

Table B	COMPOUND
Rate 0.08 g/ha	2
PREEMERGENCE	
Barley	0
Barnyardgrass	1
Bedstraw	0
Blackgrass	1
Cheatgrass	0
Chickweed	-
Cocklebur	0
Corn	0
Cotton	0
Crabgrass	6
Giant foxtail	6
Lambsquarter	-
Morningglory	0
Nutsedge	0
Rape	0
Rice	0
Sorghum	0
Soybean	0
Sugar beet	0
Velvetleaf	0
Wheat	0
Wild buckwheat	0
Wild oat	1

Table B	COMPOUND
Rate 0.02 g/ha	2
POSTEMERGENCE	
Barley	0
Barnyardgrass	1
Bedstraw	1
Blackgrass	0
Cheatgrass	0
Chickweed	1
Cocklebur	0
Corn	1
Cotton	1
Crabgrass	0
Giant foxtail	1
Lambsquarter	-
Morningglory	2
Nutsedge	0
Rape	0
Rice	0
Sorghum	0
Soybean	1
Sugar beet	0
Velvetleaf	0
Wheat	0
Wild buckwheat	-
Wild oat	0

Table B	COMPOUND
Rate 0.02 g/ha	2
PREEMERGENCE	
Barley	0
Barnyardgrass	0
Bedstraw	0
Blackgrass	0
Cheatgrass	0
Chickweed	0
Cocklebur	0
Corn	0
Cotton	0
Crabgrass	1
Giant foxtail	1
Lambsquarter	0
Morningglory	0
Nutsedge	0
Rape	0
Rice	1
Sorghum	0
Soybean	0
Sugar beet	0
Velvetleaf	0
Wheat	0
Wild buckwheat	-
Wild oat	0

Table B

COMPOUND

Rate 400 g/ha POSTEMERGENCE	1	3	4	5	8	9	10	11	12	13	14	15	16	17	19	22	23	26	29	31	32	33	34	35	36	37	38	42	43
Barley	1	0	0	3	1	0	0	0	0	0	0	0	0	0	0	1	2	4	3	1	0	2	0	0	2	0	0	2	1
Barnyardgrass	7	0	0	9	4	0	0	1	0	0	7	2	2	4	6	8	8	9	1	1	9	3	0	0	2	1	2	6	0
Bedstraw	5	0	2	9	4	1	0	8	0	0	1	0	10	-	6	5	-	9	6	2	6	5	0	0	4	3	3	5	0
Blackgrass	2	0	1	10	1	0	0	0	0	0	1	0	2	0	2	5	6	2	2	0	3	1	0	0	1	0	1	4	1
Cheatgrass	1	0	0	6	1	0	0	0	0	0	0	0	0	0	1	2	2	2	2	0	2	1	0	0	1	0	0	1	0
Chickweed	2	0	1	7	5	0	0	2	-	0	2	0	4	1	3	4	7	5	2	1	5	3	0	0	1	1	2	2	0
Cocklebur	8	0	0	7	3	0	0	2	1	0	2	0	1	2	3	2	1	5	2	1	5	4	1	0	1	1	0	3	1
Corn	3	1	1	7	3	0	0	1	0	0	6	0	3	1	3	5	1	5	1	2	5	4	1	0	1	1	0	3	1
Cotton	9	0	1	10	6	0	0	1	3	0	2	0	7	4	9	7	10	5	7	5	8	8	5	0	0	0	3	0	0
Crabgrass	7	0	1	9	1	0	0	1	3	0	6	2	4	2	3	8	9	8	3	2	7	2	0	0	3	1	1	6	1
Giant foxtail	4	0	2	9	3	1	0	1	1	0	5	1	2	2	3	5	8	4	1	1	7	3	0	0	5	1	1	6	1
Lambsquarter	-	0	1	-	7	1	0	8	4	0	3	0	3	-	8	1	4	8	6	2	8	7	0	0	3	2	2	-	2
Morningglory	2	1	2	8	4	1	0	3	2	0	8	2	6	1	8	7	6	7	1	3	7	6	1	0	6	5	5	2	2
Nutsedge	7	-	0	2	1	0	0	0	0	0	2	0	1	0	1	0	1	2	0	1	3	0	0	0	-	-	0	-	-
Rape	5	0	1	9	3	0	0	2	3	0	0	0	4	5	8	5	7	9	3	2	6	9	1	0	1	2	0	6	2
Rice	2	0	0	7	2	0	0	0	0	0	2	0	1	0	1	0	1	3	1	2	3	0	0	0	1	1	2	2	1
Sorghum	1	0	0	5	2	0	0	1	0	0	3	0	1	2	2	3	2	3	2	2	4	1	0	0	1	0	2	2	0
Soybean	8	2	2	9	7	0	0	4	5	0	6	1	4	4	5	6	6	8	2	6	5	4	2	0	5	6	2	7	2
Sugar beet	8	0	5	9	7	0	0	7	1	0	5	0	6	0	8	9	9	7	1	7	10	9	2	0	6	3	1	8	5
Velvetleaf	6	0	0	9	1	0	0	0	3	0	2	0	1	5	0	5	9	7	4	6	6	4	0	0	2	1	4	1	1
Wheat	0	0	0	3	2	0	0	0	0	0	0	0	0	0	1	2	2	2	1	0	1	1	0	0	0	0	0	0	0
Wild buckwheat	5	-	-	8	-	0	0	1	2	0	1	0	1	1	3	6	5	4	2	1	7	4	0	0	2	2	2	1	1
Wild oat	1	0	0	6	1	0	0	0	0	0	0	0	0	0	3	3	7	5	1	0	6	1	0	0	0	0	0	2	0

Table B

COMPOUND

Rate 400 g/ha POSTEMERGENCE	44	48	50	80	84	87	107	108	110	118	128	129	144	145
Barley	0	0	0	0	0	2	0	2	0	0	0	4	4	4
Barnyardgrass	1	2	1	0	3	3	2	5	1	0	2	7	9	7
Bedstraw	2	5	3	0	5	2	-	6	1	0	4	8	10	7
Blackgrass	0	1	1	0	3	3	4	2	1	0	1	7	9	4
Cheatgrass	0	1	1	0	2	3	1	1	0	0	1	-	8	7
Chickweed	0	3	2	0	4	5	3	4	1	0	3	8	7	-
Cocklebur	1	2	3	0	1	2	0	4	3	0	4	7	7	0
Corn	1	2	1	0	1	1	1	5	0	0	3	6	8	2
Cotton	5	8	8	0	1	3	2	2	0	0	8	9	10	9
Crabgrass	1	2	1	1	3	4	4	7	2	0	2	5	9	7
Giant foxtail	1	1	1	0	1	3	1	6	3	0	2	5	9	5
Lambsquarter	5	2	6	1	5	3	4	7	0	0	7	8	9	2
Morningglory	2	1	7	2	1	3	0	7	3	4	3	3	9	5
Nutsedge	-	0	0	0	0	0	-	1	0	0	0	2	2	1
Rape	1	2	9	0	6	3	0	5	3	0	2	8	10	2
Rice	1	0	0	0	0	2	0	4	1	0	2	4	7	1
Sorghum	0	2	1	0	0	1	2	3	0	0	2	2	7	5
Soybean	1	2	3	0	1	1	2	5	0	1	5	9	9	5
Sugar beet	-	2	9	0	1	9	2	9	2	0	6	8	9	3
Velvetleaf	1	2	1	0	2	3	0	3	0	0	3	5	8	7
Wheat	0	0	0	0	0	0	0	-	0	0	0	3	4	2
Wild buckwheat	1	3	1	1	4	-	2	5	1	0	5	7	8	7
Wild oat	0	0	2	0	2	2	1	5	0	0	1	4	7	6

Table B

COMPOUND

Rate 400 g/ha PREMERGENCE	1	3	4	5	8	9	10	11	12	13	14	15	16	17	19	22	23	26	29	31	32	33	34	35	36	37	38	42	43
Barley	1	0	0	6	1	0	0	0	0	0	0	0	0	1	0	0	1	4	0	0	1	0	0	0	0	0	0	0	0
Barnyardgrass	7	0	1	10	7	0	0	0	2	0	9	1	7	8	10	6	3	10	2	4	10	4	0	0	0	6	1	2	6
Bedstraw	6	0	2	10	7	0	0	-	-	2	0	3	0	2	1	5	2	10	0	0	9	1	7	-	8	4	3	9	5
Blackgrass	7	0	0	10	5	0	0	-	0	0	9	0	7	10	10	6	3	10	1	1	10	2	0	0	0	3	0	0	4
Cheatgrass	3	0	0	9	2	0	0	0	0	0	1	0	1	3	2	0	3	9	1	0	3	1	0	0	1	0	0	3	0
Chickweed	1	0	2	9	8	0	0	1	0	0	6	0	2	0	9	5	7	9	0	1	9	1	0	0	8	3	3	9	0
Cocklebur	0	-	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	8	0	0	0	2	0	0	-	0	0	-	0
Corn	3	0	1	4	1	0	0	0	1	0	6	0	0	0	0	4	2	0	4	0	0	5	0	0	0	2	0	0	3
Cotton	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Crabgrass	10	0	9	10	10	0	0	0	8	7	0	10	2	8	9	10	9	6	10	4	9	10	8	2	8	3	7	9	7
Giant foxtail	10	0	8	10	10	0	0	10	5	0	10	3	10	10	10	9	10	10	8	9	10	8	0	0	8	1	4	9	4
Lambsquarter	10	0	-	9	9	0	0	3	8	0	10	0	10	-	-	-	-	10	0	-	-	7	0	0	0	9	4	8	10
Morningglory	1	0	0	10	3	0	0	0	1	0	8	0	0	0	5	2	0	10	0	0	5	2	0	0	2	2	0	5	0
Nutsedge	0	0	0	3	0	0	0	0	0	0	7	0	0	0	2	0	0	1	0	0	0	0	0	0	-	0	-	0	0
Rape	7	0	1	9	6	0	0	0	0	0	7	0	2	3	3	0	0	10	0	0	7	2	0	0	1	1	0	10	5
Rice	1	0	0	4	1	0	0	0	0	0	5	0	0	0	4	0	0	2	0	0	2	0	0	0	2	0	0	1	0
Sorghum	1	0	0	3	1	0	0	0	0	0	5	0	0	0	3	0	0	3	0	0	3	0	0	0	0	0	0	0	0
Soybean	0	0	1	3	0	0	0	0	0	0	4	0	0	0	4	0	0	5	0	0	2	0	0	0	0	0	0	0	0
Sugar beet	7	0	8	10	-	0	0	0	0	0	10	0	1	0	-	1	1	10	0	0	9	6	0	0	0	7	0	3	9
Velvetleaf	9	0	0	8	5	0	0	0	0	0	3	0	0	0	2	6	9	9	0	0	8	2	0	0	0	0	0	1	0
Wheat	0	0	0	5	0	0	0	0	0	0	1	0	0	1	0	0	0	4	0	0	2	0	0	0	0	0	0	0	0
Wild buckwheat	-	0	0	-	7	-	0	0	-	0	7	0	1	0	7	0	2	10	0	0	-	2	0	0	0	3	1	-	8
Wild oat	7	0	0	9	0	0	0	2	0	0	4	0	2	6	5	2	6	9	1	1	9	2	0	0	0	0	0	2	0

Table B

Rate 400 g/ha PREMERGENCE	COMPOUND																			
	44	48	50	80	84	87	107	108	110	118	128	129	144	145						
Barley	0	0	0	0	0	1	0	2	0	0	0	1	3	0						
Barnyardgrass	3	0	1	0	0	8	3	7	5	0	3	8	10	1						
Bedstraw	3	4	2	0	0	2	-	3	0	0	1	10	9	-						
Blackgrass	2	2	2	0	2	6	4	4	1	0	3	8	10	0						
Cheatgrass	0	0	2	0	1	3	1	1	1	0	1	4	9	0						
Chickweed	0	2	3	0	2	8	8	9	3	0	-	9	9	-						
Cocklebur	0	0	0	0	0	0	1	0	0	0	0	1	6	1						
Corn	0	0	0	0	0	1	3	5	3	0	0	5	4	0						
Cotton	0	0	0	0	0	0	3	1	0	0	0	0	9	0						
Crabgrass	0	6	9	6	4	9	-	10	8	0	5	9	10	2						
Giant foxtail	6	7	10	0	3	10	3	9	3	0	9	10	10	2						
Lambsquarter	2	-	10	0	7	9	7	9	0	0	9	9	10	5						
Morningglory	1	0	1	0	0	0	3	6	0	0	0	2	9	0						
Nutsedge	0	0	0	0	0	0	0	-	0	0	0	4	3	0						
Rape	8	1	3	0	1	3	0	3	0	0	0	10	10	0						
Rice	0	0	0	0	0	0	0	3	0	0	0	2	4	0						
Sorghum	0	3	0	0	0	2	0	3	2	0	0	2	6	1						
Soybean	0	0	0	0	0	1	1	4	0	0	0	4	6	0						
Sugar beet	5	2	0	0	2	7	2	9	2	0	3	9	10	1						
Velvetleaf	0	0	0	0	0	0	10	2	0	0	0	8	10	2						
Wheat	0	0	0	0	0	0	0	1	0	0	0	2	3	0						
Wild buckwheat	1	2	1	0	0	1	2	6	0	0	0	5	10	0						
Wild oat	0	0	2	0	1	4	1	6	0	0	1	4	9	0						

Table B

COMPOUND

	1	3	4	5	6	7	9	10	11	12	14	17	18	19	21	22	23	24	26	28	29	30	31	32	33	39	40	41	45	
Rate 200 g/ha POSTEMERGENCE																														
Barley	0	0	0	2	0	0	0	0	0	0	0	0	0	1	1	4	0	2	0	3	2	1	2	0	1	0	2	0	0	4
Barnyardgrass	2	1	0	9	0	2	0	0	1	1	8	3	8	7	9	5	4	1	7	2	1	7	2	8	2	3	0	0	5	
Bedstraw	8	0	3	8	1	3	2	0	4	3	1	-	10	5	9	-	10	-	8	5	2	7	2	8	5	4	2	0	3	
Blackgrass	1	0	0	5	1	1	1	0	0	0	0	0	0	2	1	-	3	2	0	2	0	0	2	0	-	1	1	0	5	
Cheatgrass	1	0	0	4	1	0	0	0	0	0	0	0	3	0	4	1	2	0	3	1	2	5	0	2	1	1	0	0	2	
Chickweed	2	0	1	6	1	5	0	0	1	1	0	1	2	2	5	5	5	2	4	0	2	8	1	5	3	2	1	0	3	
Cocklebur	4	1	2	8	0	1	1	0	2	2	2	2	3	5	6	1	1	0	3	1	1	6	3	4	6	2	0	0	1	
Corn	2	0	1	5	1	2	0	0	0	0	6	1	5	3	6	2	2	1	2	1	2	5	2	4	2	3	0	0	2	
Cotton	7	0	3	9	2	9	0	0	1	4	1	6	6	8	7	8	9	1	3	0	6	8	3	8	7	7	3	0	9	
Crabgrass	3	0	3	6	1	2	0	0	1	1	3	2	4	3	9	5	8	2	6	1	3	4	1	8	2	3	0	0	7	
Giant foxtail	2	0	1	6	0	3	0	0	1	1	4	2	5	2	9	4	6	1	3	1	1	3	1	5	2	4	0	0	6	
Lambsquarter	8	0	1	-	-	8	0	0	4	7	3	2	7	8	5	1	-	2	5	1	4	8	3	3	6	9	1	0	9	
Morningglory	3	0	1	9	2	2	0	0	3	3	8	1	6	4	7	3	4	2	5	1	0	0	2	0	1	0	0	0	7	
Nutsedge	-	0	7	1	0	0	0	0	0	0	2	0	5	6	10	2	2	2	9	1	0	0	2	0	1	0	0	0	-	
Rape	8	0	4	8	0	5	2	0	2	2	0	5	6	6	10	2	2	2	9	1	3	7	2	6	6	7	0	0	4	
Rice	0	0	2	4	0	1	0	0	0	2	1	0	2	1	5	0	0	0	0	0	0	4	2	2	0	1	0	0	1	
Sorghum	1	0	0	4	0	1	0	0	1	0	2	2	2	2	4	2	2	1	2	1	1	4	1	2	2	1	0	0	1	
Soybean	7	1	4	8	0	5	1	0	2	5	6	5	9	7	10	2	6	2	9	6	3	5	3	3	4	8	0	1	7	
Sugar beet	8	0	8	9	2	4	2	0	5	6	5	0	7	7	9	7	9	3	7	5	3	3	9	4	9	7	9	0	9	
Velvetleaf	3	0	1	8	4	2	0	0	0	2	2	0	5	1	5	2	9	0	7	0	3	8	4	7	4	4	0	0	6	
Wheat	1	0	0	2	0	1	0	0	0	0	0	0	1	0	3	1	2	0	1	0	1	2	0	1	1	0	0	0	2	
Wild buckwheat	7	0	2	7	0	-	0	0	1	1	-	0	2	2	7	3	5	2	5	0	1	5	1	5	2	1	0	0	5	
Wild oat	1	0	0	6	1	0	0	0	0	0	0	0	1	1	5	1	3	0	2	1	0	3	0	3	1	1	0	0	2	

Table B

COMPOUND

Rate 200 g/ha POSTEMERGENCE	46	47	49	51	52	53	54	56	57	58	59	60	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77
Barley	0	1	0	0	2	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barnyardgrass	0	0	0	4	2	1	3	5	1	1	7	1	1	2	2	1	1	2	1	0	0	0	1	0	1	1	1	4
Bedstraw	3	2	4	4	5	5	5	7	2	2	4	2	2	2	2	0	2	3	3	0	0	4	1	1	5	7	5	7
Blackgrass	0	2	2	1	3	0	1	3	1	0	2	0	1	0	0	1	1	2	0	0	1	0	0	1	2	1	1	1
Cheatgrass	0	1	0	1	2	1	2	3	0	0	1	0	0	0	0	1	1	1	1	0	2	0	1	0	2	0	1	2
Chickweed	2	2	2	4	4	3	4	6	0	2	3	1	4	2	1	3	1	3	1	0	2	1	3	0	4	2	2	3
Cocklebur	0	0	3	1	2	2	1	6	2	0	5	0	3	0	1	1	0	1	0	0	3	0	2	0	1	1	1	1
Corn	0	2	0	1	2	0	2	2	0	1	2	1	3	1	1	1	0	1	0	0	1	0	1	0	1	1	0	1
Cotton	2	7	7	9	10	5	8	9	5	6	5	4	9	2	1	1	0	1	0	0	1	0	1	0	1	1	0	1
Crabgrass	0	0	0	3	6	2	8	7	1	2	4	4	3	2	1	3	1	2	1	0	3	0	1	0	2	0	1	1
Giant foxtail	0	1	0	2	2	1	3	3	2	2	6	2	2	2	1	2	1	2	1	0	2	1	2	3	1	0	1	2
Lambsquarter	2	2	-	3	7	3	5	8	3	0	9	-	3	1	1	2	0	1	1	1	0	2	1	0	2	0	1	2
Morningglory	3	4	6	1	2	1	0	7	0	2	8	3	1	1	0	1	1	1	1	0	-	1	-	0	3	2	7	2
Nutsedge	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	1	2	0	4	5	-	2
Rape	1	0	2	3	2	5	5	8	6	0	4	0	4	1	1	2	0	2	0	0	0	0	0	0	0	0	0	0
Rice	0	0	0	1	1	0	1	2	1	0	2	1	2	0	1	2	0	0	0	0	5	0	5	0	1	5	1	1
Sorghum	0	1	0	1	1	0	0	3	1	0	2	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Soybean	2	2	6	1	3	2	2	4	1	0	6	1	2	1	2	1	0	1	1	0	2	0	0	0	0	0	0	0
Sugar beet	3	1	7	5	8	6	9	9	5	0	6	0	5	0	1	2	0	2	0	0	3	1	2	0	5	4	2	2
Velvetleaf	0	1	2	1	5	1	3	5	1	0	6	0	1	2	0	3	1	2	0	0	6	1	4	0	7	7	7	5
Wheat	0	1	0	0	1	0	0	2	0	0	5	0	1	2	0	0	1	2	0	0	3	1	1	0	2	1	1	2
Wild buckwheat	2	3	2	3	4	5	7	8	1	2	1	1	0	0	1	1	1	0	0	1	1	0	0	1	0	1	0	0
Wild oat	0	1	0	0	0	0	1	3	0	0	1	0	0	0	0	0	1	2	0	0	2	1	1	0	1	1	0	1

Table B
COMPOUND

Rate 200 g/ha POSTEMERGENCE	78	79	81	82	83	85	86	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
Barley	0	1	1	2	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Barnyardgrass	0	2	2	3	2	0	0	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	4	1	1
Bedstraw	0	7	7	5	6	1	1	6	1	3	0	1	0	0	1	0	1	0	0	0	0	2	2	5	2	2
Blackgrass	0	1	2	2	1	0	0	4	0	1	0	0	0	0	1	0	0	1	0	0	0	1	2	0	0	0
Cheatgrass	0	1	2	2	3	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	2	1	0	2	1	0
Chickweed	0	2	2	2	5	1	1	5	1	1	0	0	0	0	1	0	0	1	0	0	1	1	2	4	2	1
Cocklebur	0	1	0	3	3	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Corn	0	1	0	1	2	0	1	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	2	0
Cotton	0	0	0	3	2	0	1	6	0	0	0	1	0	0	0	0	0	0	0	0	3	0	0	2	1	0
Crabgrass	0	2	4	2	3	0	0	3	0	2	0	1	0	0	2	0	0	0	0	0	2	1	1	3	5	1
Giant foxtail	0	3	1	2	3	0	0	2	1	1	0	1	0	0	2	1	0	0	0	0	1	0	0	2	2	1
Lambsquarter	0	5	1	3	4	0	1	5	1	2	0	1	1	1	1	0	0	1	0	0	2	1	1	5	3	1
Morningglory	0	2	5	4	6	0	0	5	2	1	0	2	2	2	2	0	2	2	1	0	2	1	1	3	0	1
Nutsedge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	0	7	0	6	0	0	0	2	1	1	0	1	0	0	1	0	0	0	0	1	0	0	1	4	0	0
Rice	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0
Sorghum	0	1	0	1	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0
Soybean	0	3	2	3	2	0	1	6	1	1	0	1	1	0	2	0	1	1	0	0	0	0	1	6	1	0
Sugar beet	0	7	6	7	7	2	8	8	1	2	0	4	1	1	0	0	0	4	0	0	1	0	1	9	1	0
Velvetleaf	0	2	2	2	3	0	0	3	0	1	0	1	0	0	0	0	0	0	0	0	2	0	0	1	2	0
Wheat	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Wild buckwheat	1	3	2	2	5	0	0	4	1	1	1	1	1	0	1	0	1	0	0	0	3	1	2	3	0	0
Wild oat	0	1	1	1	2	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0

Table B

COMPOUND

Rate 200 g/ha POSTEMERGENCE	109	111	112	113	114	115	116	117	119	122	124	125	126	127	130	131	132	133	134	135	136
Barley	6	3	1	2	1	0	0	1	1	0	0	2	5	1	1	2	2	2	2	0	1
Barnyardgrass	9	5	7	5	2	1	1	1	0	4	3	6	6	1	5	6	7	3	7	2	6
Bedstraw	8	3	4	4	2	3	3	6	3	3	5	6	4	4	7	7	8	5	7	6	6
Blackgrass	9	2	5	7	1	1	1	1	1	1	4	8	1	4	2	6	6	3	6	2	6
Cheatgrass	5	1	2	3	0	0	0	1	0	0	1	7	0	3	2	4	3	2	2	2	1
Chickweed	7	7	6	5	4	2	2	-	4	3	6	8	4	6	4	7	8	4	-	3	2
Cocklebur	4	2	7	3	2	4	0	4	1	4	1	4	3	5	4	4	4	4	6	4	5
Corn	7	4	5	6	2	1	2	1	1	4	5	8	1	4	2	5	4	2	5	4	4
Cotton	1	1	2	3	2	2	2	1	1	-	2	3	-	2	7	7	8	8	8	3	3
Crabgrass	5	7	5	6	8	3	6	4	2	7	7	5	2	-	3	7	6	2	7	2	5
Giant foxtail	8	8	5	8	3	3	2	3	2	6	8	8	1	7	2	5	4	2	7	2	9
Lambsquarter	7	4	7	6	2	5	2	8	1	6	3	6	2	8	4	5	5	5	5	7	3
Morningglory	8	5	7	6	4	3	-	6	3	5	3	6	2	8	2	7	4	4	2	3	6
Nutsedge	3	2	0	4	1	0	0	2	0	1	2	1	-	2	0	2	1	2	1	4	0
Rape	9	9	3	4	4	4	0	5	2	3	9	9	4	5	3	5	5	7	2	6	7
Rice	4	2	2	6	2	0	2	3	0	2	1	2	0	6	1	3	2	3	1	2	2
Sorghum	4	2	2	3	0	0	0	2	0	0	2	1	1	2	0	4	3	3	3	0	3
Soybean	5	1	5	4	2	3	3	5	3	6	5	7	6	8	6	5	5	6	2	7	3
Sugar beet	9	8	10	8	5	8	3	8	6	9	9	8	7	8	3	9	10	8	8	7	8
Velvetleaf	5	2	4	3	3	2	4	3	6	8	1	2	3	3	1	4	5	2	1	3	2
Wheat	6	6	1	2	1	0	0	1	1	1	2	7	0	1	1	1	2	1	1	1	1
Wild buckwheat	6	6	5	7	2	1	2	5	1	1	7	7	1	5	4	5	6	4	3	2	3
Wild oat	7	4	2	3	1	0	1	1	1	1	1	8	1	2	1	3	5	2	4	1	2

Table B

COMPOUND

Rate 200 g/ha POSTEMERGENCE	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161
Barley	0	1	0	0	0	1	2	0	6	6	2	1	2	0	3	2	1	0	1	1	0	1	1	2	0
Barnyardgrass	4	0	0	0	0	7	3	1	9	9	5	2	2	0	2	2	0	2	7	1	1	1	3	7	4
Bedstraw	5	3	-	-	1	-	1	2	-	-	8	7	7	3	6	10	3	6	10	1	3	5	3	9	10
Blackgrass	2	1	0	0	0	5	0	0	9	5	5	1	3	0	1	5	1	1	5	1	0	1	3	4	6
Cheatgrass	1	1	0	0	0	1	0	0	6	5	3	1	1	0	2	5	1	2	5	1	1	1	3	2	3
Chickweed	-	1	5	-	2	9	2	0	9	-	-	4	4	3	7	9	3	7	9	3	1	4	4	-	7
Cocklebur	1	2	0	1	1	5	0	0	7	2	1	3	2	1	4	5	1	4	5	2	1	4	2	4	3
Corn	1	1	0	1	0	3	3	1	7	7	3	1	1	0	1	5	1	1	5	1	1	1	2	4	4
Cotton	9	4	5	7	1	10	5	5	10	10	8	7	6	1	4	7	1	4	7	2	7	7	7	8	10
Crabgrass	2	2	1	1	0	5	2	2	9	9	6	2	2	0	1	2	0	1	2	2	2	2	-	4	6
Giant foxtail	2	1	0	1	0	3	1	3	9	9	2	2	1	0	1	2	1	1	2	1	1	2	3	5	6
Lambsquarter	1	1	2	5	0	8	0	0	9	9	8	5	7	1	7	9	1	7	9	3	1	4	2	7	8
Morningglory	2	1	1	3	1	2	1	1	8	8	5	3	4	1	4	7	1	4	7	3	1	4	3	5	9
Nutsedge	0	0	0	0	0	1	0	0	2	2	0	0	0	0	1	1	0	1	1	0	0	0	0	1	0
Rape	4	2	0	0	0	7	2	0	10	6	5	1	4	0	5	8	2	5	8	2	0	5	1	3	5
Rice	0	0	0	0	0	3	0	0	6	8	1	1	1	0	1	1	0	1	1	0	0	1	3	2	2
Sorghum	0	0	0	0	0	3	1	0	7	7	1	0	1	1	0	2	1	1	2	1	0	1	2	3	2
Soybean	1	2	0	2	1	9	0	1	7	7	5	3	4	1	4	6	1	4	6	4	1	4	3	7	7
Sugar beet	5	2	0	0	3	8	3	0	10	10	10	7	7	0	8	10	0	8	10	7	0	7	4	9	9
Velvetleaf	2	1	0	1	0	3	1	1	9	8	1	1	2	1	3	1	1	3	1	2	1	3	7	7	8
Wheat	0	0	0	0	0	2	2	0	5	5	2	1	2	0	2	2	0	2	4	0	0	1	0	1	1
Wild buckwheat	3	1	0	2	-	5	2	1	7	9	-	3	3	1	3	5	1	3	5	2	2	1	3	6	8
Wild oat	1	1	0	0	0	2	0	0	8	6	3	1	1	0	2	3	0	2	3	1	0	1	1	2	1

Table B

COMPOUND

Rate 200 g/ha POSTEMERGENCE	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183
Barley	2	5	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	0	2
Barnyardgrass	9	9	3	6	3	2	0	2	3	4	1	1	1	1	3	3	1	9	3	8	2	6
Bedstraw	9	8	3	6	5	2	3	3	3	3	2	2	3	3	3	3	3	4	4	7	4	8
Blackgrass	5	6	5	5	7	2	3	1	1	2	2	0	3	2	2	1	0	5	4	4	1	3
Cheatgrass	3	4	2	3	3	2	2	1	1	1	2	2	2	1	1	0	0	4	1	3	2	4
Chickweed	9	10	4	7	9	5	3	4	-	3	-	3	3	3	4	3	0	6	4	7	3	6
Cocklebur	6	8	6	3	3	1	1	3	4	4	1	1	0	2	2	2	1	3	2	3	1	6
Corn	8	7	1	6	3	1	1	2	2	4	1	1	1	1	3	2	1	5	4	5	1	3
Cotton	9	9	8	7	8	8	6	8	8	8	5	2	4	7	9	9	4	9	10	9	6	9
Crabgrass	8	7	3	2	3	1	0	3	2	3	1	1	1	6	8	2	2	6	6	2	1	5
Giant foxtail	8	6	2	2	2	1	0	3	2	2	1	1	1	4	1	1	0	6	6	3	1	4
Lambsquarter	9	9	7	9	8	3	5	4	6	3	2	6	5	7	7	8	5	9	2	9	1	8
Morningglory	8	9	5	4	6	2	3	5	5	4	2	3	3	5	2	6	2	7	6	7	4	8
Nutsedge	3	2	0	0	0	0	0	1	2	1	0	0	0	1	1	0	0	2	2	0	0	2
Rape	4	9	7	9	9	4	2	7	0	1	2	2	3	2	3	3	0	6	1	7	0	8
Rice	5	2	0	1	2	0	0	2	2	2	0	0	0	0	1	0	0	2	0	3	0	2
Sorghum	6	6	1	2	2	0	0	2	1	1	1	0	0	1	1	1	1	3	0	2	0	1
Soybean	8	8	6	8	6	3	4	7	7	6	3	5	4	6	6	5	1	6	6	5	1	8
Sugar beet	8	10	9	9	9	6	5	9	9	8	2	2	3	5	3	6	0	10	1	9	0	-
Velvetleaf	6	3	6	2	2	1	1	1	3	2	1	1	1	2	2	2	3	6	3	8	2	6
Wheat	2	6	2	3	2	0	0	1	0	0	0	0	0	0	0	0	0	2	1	1	0	2
Wild buckwheat	8	9	5	6	7	2	5	6	3	2	3	2	2	5	0	2	0	5	2	9	3	5
Wild oat	5	8	2	3	2	0	0	1	0	1	1	0	0	0	0	0	0	5	2	4	0	7

Table B

COMPOUND

Rate 200 g/ha POSTEMERGENCE	184	185	186	187	188	189	190	191	192	193	194	196	197
Barley	1	1	2	3	0	0	0	1	0	0	3	0	1
Barnyardgrass	4	6	8	3	1	0	2	1	1	4	7	1	1
Bedstraw	6	7	7	5	4	2	6	3	4	8	8	4	6
Blackgrass	2	3	5	4	0	0	2	0	1	3	4	2	2
Cheatgrass	1	2	3	3	0	0	2	0	1	3	3	2	2
Chickweed	4	8	7	7	4	2	5	3	4	7	9	3	3
Cocklebur	4	4	6	6	0	0	1	1	1	3	8	4	6
Corn	2	2	4	2	0	0	2	1	1	3	4	1	1
Cotton	9	7	8	8	4	2	8	1	3	10	9	3	8
Crabgrass	3	2	4	2	1	0	2	1	1	7	4	1	2
Giant foxtail	3	3	6	2	1	0	2	2	2	4	5	3	2
Lambsquarter	8	9	9	5	0	0	0	6	7	8	8	2	5
Morningglory	6	6	6	-	3	2	5	4	2	8	8	4	1
Nutsedge	2	0	1	0	0	0	0	0	0	2	1	0	1
Rape	8	8	8	8	0	0	0	3	3	6	9	0	5
Rice	1	1	3	2	0	0	0	0	0	2	2	0	2
Sorghum	1	1	2	2	0	0	1	1	0	2	4	0	1
Soybean	5	6	8	7	0	0	4	2	3	7	7	1	4
Sugar beet	8	7	8	10	0	0	0	5	6	9	9	4	6
Velvetleaf	7	6	3	3	1	0	2	1	1	3	7	2	2
Wheat	0	1	1	2	0	0	0	0	0	2	3	1	2
Wild buckwheat	7	4	8	5	3	0	7	0	3	6	7	3	2
Wild oat	1	2	4	3	0	0	2	0	0	4	4	3	2

Table B
COMPOUND

Rate 200 g/ha PREMERGENCE	1	3	4	5	6	7	9	10	11	12	14	17	18	19	21	22	23	24	26	28	29	30	31	32	33	39	40	41	45
Barley	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	10	0	0	3	0	0	3	0	1	0	0	0	0	5
Barnyardgrass	5	0	0	9	0	7	0	0	0	1	8	5	10	5	10	3	1	0	10	0	0	10	2	9	2	8	0	0	10
Bedstraw	3	0	1	10	0	5	0	0	-	1	0	1	10	0	10	-	-	0	10	5	0	7	0	4	1	2	0	0	7
Blackgrass	3	0	1	8	0	2	0	0	0	1	5	10	10	4	10	0	1	0	10	0	0	10	0	7	2	7	0	0	8
Cheatgrass	1	0	0	5	0	2	0	0	0	0	0	2	6	2	6	0	1	0	8	0	0	9	0	4	0	2	0	0	5
Chickweed	0	0	0	6	0	0	0	0	0	3	5	0	9	8	9	7	4	0	9	0	0	9	0	8	1	8	0	0	10
Cocklebur	0	0	0	1	0	-	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Corn	0	0	0	2	0	0	0	0	0	0	3	0	4	0	4	2	0	0	3	0	0	3	0	3	0	0	0	0	2
Cotton	0	0	1	1	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Crabgrass	10	0	8	10	0	8	0	0	6	8	9	8	10	10	10	9	7	0	10	5	4	10	6	10	4	8	0	0	10
Giant foxtail	10	0	7	10	0	9	0	0	3	2	9	9	10	9	10	4	10	0	10	3	4	10	7	10	7	10	0	0	10
Lambsquarter	6	0	-	10	0	8	0	0	0	10	10	-	10	-	10	-	-	0	-	0	0	-	-	-	0	9	0	0	9
Morningglory	0	0	0	7	0	2	0	0	0	0	2	1	8	3	10	1	0	0	3	0	0	7	0	2	1	1	0	0	2
Nutsedge	0	0	0	0	0	-	0	0	0	10	2	0	0	0	1	0	0	0	0	-	-	2	0	0	0	0	0	0	0
Rape	5	0	0	5	0	7	0	0	0	2	4	1	2	1	7	0	0	0	8	0	0	3	0	2	1	2	0	0	8
Rice	0	0	0	2	0	0	0	0	0	0	4	0	3	0	3	0	0	0	0	0	0	1	0	1	0	1	0	0	0
Sorghum	0	0	0	1	0	0	0	0	0	0	3	0	3	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Soybean	0	0	0	2	0	0	0	0	0	1	3	0	3	0	9	1	0	0	1	0	0	4	0	0	0	0	0	0	1
Sugar beet	9	0	6	10	0	8	0	0	0	10	8	0	4	7	2	0	0	0	10	0	0	9	0	9	2	9	0	0	10
Velvetleaf	4	0	2	5	0	0	0	0	0	0	5	1	6	0	8	4	6	0	7	0	0	2	0	4	0	1	0	0	3
Wheat	0	0	0	2	0	0	0	0	0	0	0	1	1	0	1	0	0	0	3	0	0	2	0	1	0	0	0	0	2
Wild buckwheat	0	0	6	-	0	5	0	-	-	2	2	0	1	0	10	1	0	0	7	0	0	5	0	-	0	0	0	0	2
Wild oat	1	0	0	8	0	0	0	0	0	0	0	2	9	4	10	0	1	0	9	0	0	8	0	4	1	6	0	0	9

Table B

Rate 200 g/ha PREMERGENCE		COMPOUND																												
		46	47	49	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77
Barley	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Barnyardgrass	0	0	6	1	2	0	3	8	0	0	9	0	0	0	0	0	1	0	0	0	0	0	1	0	2	0	5	1	4	3
Bedstraw	0	0	0	0	0	0	0	5	0	0	6	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	5
Blackgrass	0	0	2	2	5	0	2	10	0	0	7	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	6	2	4	3
Cheatgrass	0	0	1	0	2	0	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	5	0	1	2
Chickweed	0	1	0	0	4	0	1	7	0	0	5	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	8	1	3	5
Cocklebur	-	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0
Corn	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Crabgrass	3	6	9	7	8	2	9	10	6	2	8	0	0	2	3	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Giant foxtail	1	3	8	8	3	9	10	3	6	9	2	4	0	2	2	2	2	0	-	-	0	8	1	5	1	8	8	8	9	9
Lambsquarter	0	0	-	0	6	0	7	8	0	0	0	9	0	0	0	0	0	0	0	0	0	0	6	0	6	1	9	7	9	9
Morningglory	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	9	9	5	8
Nutsedge	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Rape	0	1	1	0	1	0	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	3	0	1
Sorghum	0	1	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soybean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar beet	2	1	8	2	4	0	8	8	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Velvetleaf	0	0	0	0	0	0	0	2	1	0	5	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	2	3	9
Wheat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	5
Wild buckwheat	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wild oat	0	0	1	2	3	0	2	8	0	0	3	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	1	1	2

Table B

Rate 200 g/ha PREEMERGENCE	COMPOUND																											
	78	79	81	82	83	85	86	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106		
Barley	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Barnyardgrass	0	6	3	1	2	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bedstraw	0	1	2	0	7	-	0	4	0	0	0	0	0	-	0	0	-	0	0	0	0	0	0	5	0	0	0	
Blackgrass	0	6	7	0	3	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	
Cheatgrass	0	2	5	0	1	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	7	0	0	0	
Chickweed	0	1	5	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	
Cocklebur	0	-	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	
Corn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cotton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
Crabgrass	0	10	8	2	7	0	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Giant foxtail	0	10	5	2	7	0	2	10	0	0	0	1	1	0	0	0	0	4	0	0	0	6	0	0	9	0	0	
Lambsquarter	0	6	1	0	9	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	9	0	0	0	
Morningglory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	
Nutsedge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
Rape	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rice	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	1	1	0	0	0	
Sorghum	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Soybean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
Sugar beet	0	5	8	1	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Velvetleaf	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	
Wheat	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
Wild buckwheat	0	1	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Wild oat	0	2	3	0	2	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	

Table B
COMPOUND

Rate 200 g/ha PREMERGENCE	109	111	112	113	114	115	116	117	119	122	124	125	126	127	130	131	132	133	134	135	136
Barley	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0
Barnyardgrass	5	8	6	9	6	3	0	2	0	6	9	9	1	10	2	5	8	4	8	5	0
Bedstraw	9	8	4	5	1	1	-	1	0	3	8	9	2	8	0	5	9	0	-	2	8
Blackgrass	5	6	2	1	2	0	0	2	1	3	4	6	1	4	1	7	7	2	5	3	5
Cheatgrass	3	3	2	1	0	-	0	2	1	2	3	5	2	4	1	4	3	2	3	1	3
Chickweed	9	9	10	10	9	2	0	3	5	6	10	9	2	9	1	9	9	0	-	0	-
Cocklebur	4	2	0	2	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Corn	8	6	2	4	0	0	0	0	0	3	4	4	0	3	0	3	4	2	4	0	1
Cotton	0	0	0	0	-	0	0	-	0	1	0	0	0	0	0	0	0	0	0	0	0
Crabgrass	10	9	9	8	8	5	2	3	3	8	7	9	5	9	4	8	9	0	8	9	8
Giant foxtail	10	10	8	9	9	3	2	4	3	9	9	10	5	9	4	9	10	5	9	9	9
Lambsquarter	9	9	9	7	3	3	0	2	2	9	10	10	8	9	7	8	9	5	9	8	9
Morningglory	10	7	2	9	2	0	0	0	0	5	10	10	1	8	0	7	8	2	1	0	1
Nutsedge	3	2	1	6	0	0	-	0	0	0	2	3	0	1	0	0	2	0	0	0	0
Rape	7	8	3	1	2	2	0	2	0	2	10	10	2	1	0	3	4	0	4	2	4
Rice	5	4	2	2	1	0	0	0	0	0	2	5	0	3	0	2	2	0	0	0	0
Sorghum	4	2	3	5	0	0	0	0	0	0	3	4	2	3	0	4	3	0	2	0	1
Soybean	5	4	3	3	0	0	0	0	0	0	3	2	4	6	0	0	2	0	0	1	1
Sugar beet	10	10	8	9	6	3	0	2	0	9	10	10	10	9	2	7	9	0	7	4	8
Velvetleaf	7	4	2	5	1	0	0	0	0	10	4	10	0	7	0	7	9	0	1	1	1
Wheat	2	0	1	0	0	0	0	0	0	0	2	1	0	0	0	1	2	0	3	0	2
Wild buckwheat	2	7	1	1	0	0	0	0	0	0	6	5	2	4	1	2	-	1	0	1	2
Wild oat	4	2	2	0	2	0	0	1	0	1	4	4	1	2	2	4	5	2	4	2	3

Table B

COMPOUND

Rate 200 g/ha PREMERGENCE	137	138	139	140	141	142	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161
Barley	0	0	0	0	0	3	0	0	5	4	2	0	0	0	0	0	0	0	0	0	0	0
Barnyardgrass	2	0	0	0	0	9	5	0	9	10	9	1	1	0	2	6	0	1	4	2	7	6
Bedstraw	-	2	0	0	0	10	-	0	10	9	9	0	0	0	4	9	0	0	1	0	8	10
Blackgrass	3	0	-	0	-	9	6	0	9	8	9	1	0	0	5	3	0	0	3	1	3	6
Cheatgrass	0	0	0	3	-	8	1	0	8	9	5	2	1	0	5	4	0	0	1	0	1	1
Chickweed	8	0	0	2	0	9	2	0	9	6	9	3	5	0	7	9	2	0	3	1	8	6
Cocklebur	0	0	0	0	0	-	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Corn	0	0	0	0	0	3	4	0	6	4	2	0	0	0	1	2	0	0	0	0	4	3
Cotton	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Crabgrass	6	0	0	0	0	10	5	0	10	9	10	3	0	0	7	9	2	0	3	2	9	10
Giant foxtail	7	1	0	0	0	10	6	0	10	10	9	5	2	0	9	9	1	1	4	4	9	8
Lambsquarter	8	0	0	3	0	9	3	0	10	9	9	4	2	0	9	9	0	0	7	1	9	9
Morningglory	0	0	0	0	0	3	0	0	10	7	3	0	0	0	3	8	0	-	0	0	5	7
Nutsedge	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	1	0	0	0	0	10	0	0	9	7	7	0	0	0	2	10	0	0	0	0	0	0
Rice	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	2	2
Sorghum	0	0	0	0	0	6	1	0	5	5	3	0	0	-	-	-	-	0	0	1	1	1
Soybean	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	1	0	0	0	0	1	0
Sugar beet	0	0	0	2	0	10	0	0	10	10	10	1	1	0	9	10	0	0	4	0	7	6
Velvetleaf	0	0	0	0	0	5	0	0	10	10	5	0	0	0	1	5	0	0	0	0	2	6
Wheat	0	0	0	0	0	4	0	0	4	4	2	0	0	0	2	-	0	0	0	0	0	0
Wild buckwheat	0	0	0	9	-	10	3	0	10	8	8	0	0	0	2	5	0	0	0	0	10	10
Wild oat	8	0	0	0	0	8	0	0	8	8	9	2	2	0	1	3	0	0	1	0	3	2

Table B

COMPOUND

Rate 200 g/ha PREMERGENCE	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183
Barley	4	5	0	2	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Barnyardgrass	9	9	5	6	3	0	3	2	2	5	1	0	0	6	6	3	0	0	9	6	9	0
Bedstraw	9	10	4	10	10	7	7	3	2	2	3	0	0	2	0	2	2	9	4	8	0	9
Blackgrass	5	9	2	8	6	0	0	1	2	1	1	2	0	3	3	4	0	7	3	7	0	10
Cheatgrass	3	9	2	3	4	0	2	0	1	0	2	2	0	2	2	1	0	3	2	5	0	7
Chickweed	9	10	4	9	8	0	8	2	3	7	6	1	2	8	1	-	0	9	7	9	-	9
Cocklebur	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corn	5	6	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	0	0
Cotton	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass	10	10	9	10	9	0	4	3	4	9	1	1	0	7	9	3	1	10	10	10	0	9
Giant foxtail	10	10	7	8	6	2	4	5	5	6	2	0	0	3	9	3	0	9	9	10	0	9
Lambsquarter	9	9	8	9	9	0	9	9	9	9	4	8	10	6	2	1	0	9	5	10	0	10
Morningglory	10	10	5	10	6	1	2	3	2	2	0	0	0	1	1	0	1	10	0	10	0	9
Nutsedge	6	0	0	1	0	0	0	0	0	0	0	0	0	10	0	0	0	-	0	0	0	0
Rape	8	10	5	10	10	0	0	2	0	0	2	0	0	2	2	0	0	4	1	9	0	10
Rice	2	4	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	1
Sorghum	2	7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	0	2
Soybean	3	7	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	3
Sugar beet	10	10	7	10	9	3	5	5	4	10	1	8	0	9	2	2	0	9	3	9	0	5
Velvetleaf	9	7	1	6	1	0	0	2	1	1	0	0	0	0	2	0	1	7	5	10	1	10
Wheat	4	3	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Wild buckwheat	10	9	0	4	4	0	-	2	1	1	2	0	0	1	0	1	0	10	0	10	0	-
Wild oat	10	7	0	3	4	0	2	1	1	1	0	0	0	2	2	0	0	5	3	8	0	8

Table B

Rate 200 g/ha PREMERGENCE	COMPOUND																			
	184	185	186	187	188	189	190	191	192	193	194	196	197							
Barley	0	2	0	1	0	0	0	0	0	3	3	0	0							
Barnyardgrass	4	3	8	7	0	0	2	0	1	8	7	0	1							
Bedstraw	5	4	9	9	0	0	5	0	-	10	9	6	3							
Blackgrass	3	5	3	5	1	0	3	0	0	5	4	0	1							
Cheatgrass	3	3	2	2	0	0	2	0	0	3	4	0	0							
Chickweed	8	7	8	8	4	3	5	0	5	9	9	-	6							
Cocklebur	0	0	0	1	0	0	0	0	0	0	0	0	0							
Corn	0	0	3	2	0	0	0	0	0	0	3	0	0							
Cotton	0	0	0	0	0	0	-	0	0	0	2	0	0							
Crabgrass	6	9	9	10	1	0	3	1	6	10	10	2	5							
Giant foxtail	9	9	9	8	1	0	3	1	4	10	9	1	5							
Lambsquarter	8	8	9	10	2	0	4	0	9	8	9	5	10							
Morningglory	6	3	7	8	1	0	1	0	0	8	9	1	4							
Nutsedge	0	0	0	0	0	0	0	0	0	1	2	0	0							
Rape	4	3	10	10	0	0	0	0	3	5	10	0	2							
Rice	0	1	0	0	0	0	0	0	0	0	1	1	0							
Sorghum	1	0	1	2	0	0	0	0	0	2	2	0	0							
Soybean	0	0	2	3	0	0	0	0	0	2	3	0	0							
Sugar beet	4	2	10	10	-	0	1	0	10	9	10	4	8							
Velvetleaf	7	6	8	5	0	0	1	0	1	6	6	0	1							
Wheat	2	0	2	1	0	0	0	0	0	2	3	0	0							
Wild buckwheat	0	0	2	10	2	0	0	0	0	0	3	4	0							
Wild oat	3	3	3	6	0	0	0	0	0	9	10	-	1							

Table B	COMPOUND				
Rate 100 g/ha	1	12	87	129	144
POSTEMERGENCE					
Barley	1	0	1	1	2
Barnyardgrass	1	0	1	2	7
Bedstraw	5	2	2	4	9
Blackgrass	1	0	2	3	4
Cheatgrass	1	0	1	1	3
Chickweed	1	-	4	4	6
Cocklebur	3	1	0	7	4
Corn	2	0	1	2	5
Cotton	9	0	2	7	9
Crabgrass	2	0	3	2	7
Giant foxtail	1	0	2	2	7
Lambsquarter	-	1	3	7	8
Morningglory	1	0	1	3	8
Nutsedge	-	0	0	1	1
Rape	4	1	2	5	7
Rice	0	0	0	2	4
Sorghum	1	0	1	2	3
Soybean	5	4	1	7	8
Sugar beet	7	0	8	7	9
Velvetleaf	2	0	0	3	5
Wheat	0	0	0	1	1
Wild buckwheat	5	0	4	3	4
Wild oat	1	0	2	2	3

Table B	COMPOUND				
Rate 100 g/ha	1	12	87	129	144
PREEMERGENCE					
Barley	0	0	0	0	0
Barnyardgrass	1	0	5	3	9
Bedstraw	0	0	1	8	9
Blackgrass	4	0	5	4	4
Cheatgrass	1	0	1	1	2
Chickweed	0	0	2	8	9
Cocklebur	0	0	0	-	0
Corn	0	0	0	3	1
Cotton	0	0	0	0	1
Crabgrass	9	5	7	8	9
Giant foxtail	9	1	7	8	10
Lambsquarter	10	0	4	8	10
Morningglory	0	0	0	0	3
Nutsedge	0	0	0	1	2
Rape	0	0	1	1	6
Rice	0	0	0	0	2
Sorghum	0	0	0	0	2
Soybean	0	0	0	0	6
Sugar beet	5	0	4	3	10
Velvetleaf	0	0	0	0	5
Wheat	0	0	0	0	0
Wild buckwheat	0	0	0	1	2
Wild oat	2	0	1	2	6

TABLE B

COMPOUND

Rate 2000 g/ha	240	241	242	243	245
POSTEMERGENCE					
Barley	1	1	0	0	0
Barnyardgrass	2	2	6	1	1
Bedstraw	4	4	2	2	0
Blackgrass	2	1	0	0	0
Cheatgrass	1	2	0	0	0
Chickweed	3	3	1	1	0
Cocklebur	3	5	1	2	0
Corn	1	0	1	0	0
Cotton	0	1	0	0	0
Crabgrass	2	2	2	2	0
Giant foxtail	1	1	0	1	1
Lambsquarter	5	7	2	3	0
Morningglory	2	3	3	3	0
Nutsedge	0	0	0	0	0
Rape	5	6	5	2	0
Rice	0	0	2	0	0
Sorghum	1	0	2	0	0
Soybean	1	2	1	3	0
Sugar beet	5	6	3	7	0
Velvetleaf	1	2	3	3	0
Wheat	0	0	0	0	0
Wild buckwheat	4	6	5	2	0
Wild oat	1	1	0	0	0

TABLE B	COMPOUND				
	Rate 2000 g/ha	240	241	242	243 245
PREEMERGENCE					
Barley		0	0	0	0
Barnyardgrass		5	0	10	0
Bedstraw		3	0	0	3
Blackgrass		4	1	0	1
Cheatgrass		3	1	0	2
Chickweed		3	1	0	1
Cocklebur		0	0	0	0
Corn		1	0	0	0
Cotton		0	0	0	0
Crabgrass		7	0	2	4
Giant foxtail		9	1	3	6
Lambsquarter		8	3	0	1
Morningglory		0	0	0	0
Nutsedge		0	0	0	0
Rape		1	0	0	2
Rice		0	0	0	0
Sorghum		2	0	0	0
Soybean		1	0	0	0
Sugar beet		7	2	0	-
Velvetleaf		0	0	0	0
Wheat		0	0	0	0
Wild buckwheat		3	2	0	-
Wild cat		2	0	0	0

TABLE B	COMPOUND			
Rate 1000 g/ha	240	241	243	244
POSTEMERGENCE				
Barley	0	0	0	2
Barnyardgrass	1	1	1	2
Bedstraw	2	2	1	5
Blackgrass	1	1	0	2
Cheatgrass	0	1	0	1
Chickweed	2	1	1	3
Cocklebur	1	3	2	4
Corn	0	1	0	1
Cotton	1	0	0	5
Crabgrass	1	1	0	3
Giant foxtail	1	1	0	2
Lambsquarter	3	2	7	6
Morningglory	1	1	3	5
Nutsedge	-	0	0	0
Rape	4	5	2	9
Rice	0	0	0	2
Sorghum	0	0	0	2
Soybean	1	1	1	6
Sugar beet	5	3	4	9
Velvetleaf	1	2	2	3
Wheat	0	0	0	1
Wild buckwheat	2	2	1	5
Wild oat	0	0	0	2

TABLE B	COMPOUND			
	Rate 1000 g/ha	240	241	243 244
PREEMERGENCE				
Barley		0	0	0 0
Barnyardgrass		1	0	0 0
Bedstraw		0	0	0 0
Blackgrass		1	1	0 0
Cheatgrass		0	0	0 0
Chickweed		0	0	- 0
Cocklebur		0	0	0 0
Corn		0	0	0 0
Cotton		0	0	0 0
Crabgrass		3	0	- 3
Giant foxtail		7	0	2 1
Lambsquarter		4	0	0 1
Morningglory		0	0	0 0
Nutsedge		0	0	0 0
Rape		0	0	0 1
Rice		0	0	0 0
Sorghum		0	0	0 0
Soybean		0	0	0 0
Sugar beet		5	0	0 0
Velvetleaf		0	0	0 0
Wheat		0	0	0 0
Wild buckwheat		0	0	0 0
Wild oat		1	0	0 0

TABLE B	COMPOUND				
	Rate 400 g/ha	240	241	242	243 245
POSTEMERGENCE					
Barley		0	0	0	0
Barnyardgrass		0	1	3	0 1
Bedstraw		1	3	1	1 0
Blackgrass		0	1	0	0 0
Cheatgrass		0	1	0	0 0
Chickweed		1	2	0	1 0
Cocklebur		1	1	0	1 0
Corn		0	0	0	0 0
Cotton		0	0	2	0 0
Crabgrass		0	1	-	0 0
Giant foxtail		0	0	0	0 0
Lambsquarter		3	2	1	2 0
Morningglory		1	1	0	2 0
Nutsedge		0	0	0	0 0
Rape		2	3	2	0 0
Rice		0	0	1	0 0
Sorghum		0	0	0	0 0
Soybean		1	1	1	1 0
Sugar beet		2	5	0	4 0
Velvetleaf		1	1	0	0 0
Wheat		0	0	0	0 0
Wild buckwheat		1	1	1	1 0
Wild oat		0	0	0	0 0

TABLE B	COMPOUND				
	Rate 400 g/ha	240	241	242	243 245
PREEMERGENCE					
Barley		0	0	0	0
Barnyardgrass		0	0	4	0
Bedstraw		0	0	0	0
Blackgrass		0	0	0	0
Cheatgrass		0	0	0	0
Chickweed		0	0	0	1
Cocklebur		0	0	0	0
Corn		0	0	0	0
Cotton		0	0	-	0
Crabgrass		1	0	0	0
Giant foxtail		3	0	0	0
Lambsquarter		0	0	0	-
Morningglory		0	0	0	0
Nutsedge		0	0	0	0
Rape		0	0	0	0
Rice		0	0	0	0
Sorghum		0	0	0	0
Soybean		0	0	0	0
Sugar beet		0	0	0	-
Velvetleaf		0	0	0	0
Wheat		0	0	0	-
Wild buckwheat		0	0	0	0
Wild oat		0	0	0	0

TABLE B	COMPOUND			
	Rate 200 g/ha	240	241	243 244
POSTEMERGENCE				
Barley		0	0	0 0
Barnyardgrass		0	0	0 2
Bedstraw		1	1	0 6
Blackgrass		0	0	0 1
Cheatgrass		0	0	0 1
Chickweed		1	1	0 1
Cocklebur		0	1	1 2
Corn		0	0	0 1
Cotton		0	0	0 3
Crabgrass		0	0	0 3
Giant foxtail		0	0	0 2
Lambsquarter		2	1	1 1
Morningglory		0	1	0 3
Nutsedge		0	-	0 0
Rape		1	2	0 2
Rice		0	0	0 1
Sorghum		0	0	0 0
Soybean		1	1	1 6
Sugar beet		1	2	1 5
Velvetleaf		0	0	2 2
Wheat		0	0	0 0
Wild buckwheat		1	1	0 2
Wild oat		0	0	0 1

TABLE B Rate 200 g/ha	COMPOUND			
	240	241	243	244
PREEMERGENCE				
Barley	0	0	0	0
Barnyardgrass	0	0	0	0
Bedstraw	0	0	-	0
Blackgrass	0	0	0	0
Cheatgrass	0	0	0	0
Chickweed	0	0	0	0
Cocklebur	0	0	0	0
Corn	0	0	0	0
Cotton	0	0	0	0
Crabgrass	0	0	0	0
Giant foxtail	1	0	0	0
Lambsquarter	0	0	0	0
Morningglory	0	0	0	0
Nutsedge	0	0	0	0
Rape	0	0	0	0
Rice	0	0	0	0
Sorghum	0	0	0	0
Soybean	0	0	0	0
Sugar beet	0	0	0	0
Velvetleaf	0	0	0	0
Wheat	0	0	0	0
Wild buckwheat	0	-	0	0
Wild oat	0	0	0	0

TEST C

The compounds evaluated in this test were formulated in a non-phytoxic solvent and applied to the soil surface before plant seedlings emerged (preemergence application), to water that covered the soil surface (paddy application), and to plants that were in the one-to-four leaf stage (postemergence application). A sandy loam soil was used for the preemergence and postemergence tests, while a silt loam soil was used in the paddy test. Water depth was approximately 2.5 cm for the paddy test and was maintained at this level for the duration of the test.

Plant species in the preemergence and postemergence tests consisted of barley (*Hordeum vulgare*), bedstraw (*Galium aparine*), blackgrass (*Alopecurus myosuroides*), chickweed (*Stellaria media*), corn (*Zea mays*), cotton (*Gossypium hirsutum*), crabgrass (*Digitaria sanguinalis*), downy brome (*Bromus tectorum*), duck salad (*Heteranthera limosa*), giant foxtail (*Setaria faberii*), lambsquarters (*Chenopodium album*), morningglory (*Ipomoea hederacea*), pigweed (*Amaranthus retroflexus*), rape (*Brassica napus*), ryegrass (*Lolium multiflorum*), sorghum (*Sorghum bicolor*), soybean (*Glycine max*), speedwell (*Veronica persica*), sugar beet (*Beta vulgaris*), velvetleaf (*Abutilon theophrasti*), wheat (*Triticum aestivum*), wild buckwheat (*Polygonum convolvulus*), and wild oat (*Avena fatua*). All plant species were planted one day before application of the compound for the preemergence portion of this test. Plantings of these species were adjusted to produce plants of appropriate size for the postemergence portion of the test. Plant species in the paddy test consisted of barnyardgrass (*Echinochloa crus-galli*), rice (*Oryza sativa*), and umbrella sedge (*Cyperus difformis*).

All plant species were grown using normal greenhouse practices. Visual evaluations of injury expressed on

treated plants, when compared to untreated controls, were recorded approximately fourteen to twenty-one days after application of the test compound. Plant response ratings, summarized in Table C, were recorded on a 0 to 5 10 scale where 0 is no injury and 10 is complete control. A dash (-) response means no test result.

Table C

Rate 500 g/ha PREEMERGENCE	COMPOUND															
	39	42	56	74	77	79	88	109	111	113	114	124	134	155	160	161
Barley Igri	30	0	30	30	0	0	0	80	50	60	50	80	10	20	10	30
Bedstraw	100	100	100	90	80	60	90	100	100	100	100	100	100	100	100	100
Blackgrass	100	90	100	80	50	90	100	100	95	95	50	90	100	95	90	90
Chickweed	98	70	100	100	50	50	100	100	100	90	70	100	100	-	85	95
Corn	60	60	0	70	60	10	0	80	90	80	50	80	50	60	60	30
Cotton	0	30	10	0	0	0	0	-	0	40	0	100	0	10	0	0
Crabgrass	100	100	100	100	90	100	100	100	100	100	100	100	100	100	100	100
Downy Brome	70	30	30	50	0	40	20	100	50	70	50	80	30	30	10	20
Giant foxtail	100	100	100	95	80	100	100	100	100	100	100	100	100	100	100	100
Lambsquarters	100	100	98	100	80	100	98	100	100	100	100	100	90	-	95	100
Morningglory	80	100	40	40	60	40	20	100	100	100	70	100	10	100	10	20
Pigweed	100	90	100	100	80	90	100	100	100	100	80	100	100	100	90	90
Rape	80	80	60	70	0	60	10	100	100	50	100	100	90	100	30	40
Ryegrass	60	50	40	70	30	30	40	100	80	80	50	100	90	90	50	50
Sorghum	70	70	40	70	60	40	50	90	90	90	20	90	90	50	50	60
Soybean	40	70	10	30	30	0	0	80	50	70	10	50	10	40	10	10
Speedwell	100	100	100	50	100	100	100	100	-	100	100	100	-	100	-	-
Sugar beet	100	100	70	100	80	98	60	100	100	100	100	100	100	100	100	100
Velvetleaf	80	60	100	100	50	80	80	100	100	100	90	100	100	100	100	100
Wheat	0	0	20	50	0	0	0	60	60	70	0	80	20	50	10	10
Wild buckwheat	90	50	50	40	50	60	0	50	100	60	50	100	70	85	100	70
Wild oat	40	20	40	40	40	30	30	80	50	60	60	90	70	60	40	50

COMPOUND

[illegible]

Table C

COMPOUND

Rate 250 g/ha	125	127	132	134	142	144	149	150	155	160	161	162	163
POSTEMERGENCE													
Barley Igri	-	-	-	-	-	40	-	-	30	10	10	-	-
Barnyard 2 leaf	-	-	-	-	-	90	-	-	85	-	-	85	85
Barnyardgrass	100	100	95	90	95	100	100	95	-	95	95	-	-
Bedstraw	-	-	-	-	-	90	-	-	80	50	-	-	-
Blackgrass	-	-	-	-	-	70	-	-	60	70	60	-	-
Chickweed	-	-	-	-	-	90	-	-	90	40	60	-	-
Corn	-	-	-	-	-	60	-	-	30	30	50	-	-
Cotton	-	-	-	-	-	90	-	-	30	30	20	-	-
Crabgrass	-	-	-	-	-	90	-	-	30	40	30	-	-
Downy Brome	-	-	-	-	-	60	-	-	30	30	30	-	-
Duck salad	95	90	90	80	0	80	95	75	50	40	35	90	90
Giant foxtail	-	-	-	-	-	90	-	-	85	40	50	-	-
Lambsquarters	-	-	-	-	-	90	-	-	80	70	70	-	-
Morningglory	-	-	-	-	-	90	-	-	80	20	30	-	-
Pigweed	-	-	-	-	-	90	-	-	80	40	60	-	-
Rape	-	-	-	-	-	100	-	-	90	40	30	-	-
Rice Japonica	90	85	65	65	50	85	75	70	50	45	40	55	65
Ryegrass	-	-	-	-	-	60	-	-	50	20	20	-	-
Sorghum	-	-	-	-	-	70	-	-	10	20	10	-	-
Soybean	-	-	-	-	-	80	-	-	40	30	20	-	-
Speedwell	-	-	-	-	-	100	-	-	-	-	-	-	-
Sugar beet	-	-	-	-	-	100	-	-	95	70	90	-	-
Umbrella sedge	90	95	90	75	45	90	90	80	95	85	90	90	90
Velvetleaf	-	-	-	-	-	90	-	-	30	20	30	-	-
Wheat	-	-	-	-	-	20	-	-	10	0	0	-	-
Wild buckwheat	-	-	-	-	-	40	-	-	50	20	60	-	-
Wild oat	-	-	-	-	-	60	-	-	30	10	30	-	-

Table C

Table C		COMPOUND																					
		Rate 250 g/ha PREMERGENCE	14	18	21	26	30	32	39	42	45	56	59	74	77	79	88	109	111	113	114	124	125
Barley Igri		60	50	60	40	50	20	20	0	30	20	0	0	0	0	0	0	70	30	50	20	80	90
Bedstraw		50	100	100	100	90	80	60	100	80	80	100	50	80	50	90	100	100	100	100	20	100	100
Blackgrass		60	98	100	100	100	100	100	60	100	100	70	60	20	70	70	80	95	90	30	90	100	
Chickweed		80	90	80	100	90	100	98	70	90	60	70	98	20	50	80	100	95	90	70	100	100	
Corn		60	50	70	40	60	60	50	50	10	0	60	60	40	10	0	60	70	60	20	80	70	
Cotton		30	30	0	30	30	0	0	0	0	0	0	0	0	0	0	0	0	20	0	-	90	
Crabgrass		100	100	100	100	100	100	100	100	100	100	100	100	90	100	100	100	100	100	100	100	100	
Downy Brome		50	90	90	90	60	30	30	0	40	20	0	30	0	20	20	80	30	50	20	80	90	
Giant foxtail		85	100	100	100	100	100	100	98	100	100	100	90	80	100	100	100	100	100	100	100	80	
Lambsquarters		100	100	100	100	100	100	100	100	100	90	100	100	70	100	70	100	95	100	80	100	100	
Morningglory		100	95	80	80	100	50	80	80	20	20	50	20	40	10	0	100	100	100	20	100	100	
Pigweed		70	80	100	100	100	90	100	50	100	100	80	90	70	60	100	100	95	80	80	100	100	
Rape		100	50	100	100	70	60	40	20	70	30	10	60	0	50	0	100	100	20	50	100	100	
Ryegrass		80	85	90	85	85	70	40	0	40	20	30	50	20	0	20	100	70	50	50	100	100	
Sorghum		40	60	80	100	40	70	50	60	40	40	60	60	50	20	50	70	80	70	20	80	80	
Soybean		20	60	50	50	60	0	40	60	0	0	0	0	10	0	0	50	20	70	0	40	70	
Speedwell		-	-	-	100	-	90	100	100	100	100	100	30	90	100	100	100	-	100	90	100	100	
Sugar beet		100	100	100	100	100	100	100	100	100	60	98	100	70	60	60	100	100	100	100	100	100	
Velvetleaf		80	100	100	100	100	100	70	20	80	40	80	100	50	50	50	100	100	100	50	100	100	
Wheat		80	50	80	40	50	30	10	0	0	10	0	25	0	0	0	50	40	20	0	80	90	
Wild buckwheat		90	30	85	90	85	80	50	40	0	20	0	30	50	30	0	50	100	40	20	100	100	
Wild oat		70	70	90	60	80	40	40	0	25	30	10	30	0	10	20	60	50	50	20	80	80	

Table C

Rate 250 g/ha PREMERGENCE	COMPOUND																
	127	132	134	142	144	149	150	155	160	161	162	163					
Barley Igri	60	20	0	20	40	50	10	10	0	0	70	50					
Bedstraw	100	100	90	100	100	100	100	85	95	100	100	100					
Blackgrass	70	100	90	100	100	100	90	90	85	70	100	100					
Chickweed	80	95	90	90	100	95	95	-	85	95	90	100					
Corn	60	70	30	20	60	85	10	10	10	10	90	80					
Cotton	0	0	0	0	0	0	0	0	0	0	0	0					
Crabgrass	100	100	100	100	100	100	100	100	100	100	100	100					
Downy Brome	60	40	10	60	40	60	10	10	0	0	70	100					
Giant foxtail	100	100	100	100	100	100	100	100	100	100	100	100					
Lambsquarters	100	100	90	100	100	100	100	-	95	95	100	100					
Morningglory	100	90	10	85	95	85	30	60	10	10	100	100					
Pigweed	100	100	100	100	100	100	100	100	85	85	100	100					
Rape	50	50	70	100	100	40	40	100	20	30	90	100					
Ryegrass	80	100	90	100	85	100	50	70	30	40	90	100					
Sorghum	70	50	20	20	80	90	10	30	30	40	90	90					
Soybean	60	30	0	10	60	20	10	10	0	0	50	90					
Speedwell	100	100	-	-	-	-	-	90	-	-	-	-					
Sugar beet	100	100	100	100	100	100	100	100	100	100	100	100					
Velvetleaf	100	100	95	95	100	100	100	100	60	85	100	100					
Wheat	60	60	0	20	50	50	0	20	0	0	80	70					
Wild buckwheat	60	50	30	50	50	90	40	60	60	70	100	90					
Wild oat	50	95	70	90	90	90	70	40	20	40	70	90					

COMPOUND

[illegible]

Table C

COMPOUND

	114	124	125	127	132	134	142	144	149	150	155	160	161	162	163
Rate 125 g/ha															
POSTEMERGENCE															
Barley Igri	-	-	-	-	-	-	-	30	-	-	20	0	0	-	-
Barleyard 2 leaf	-	-	-	-	-	-	-	85	-	-	60	-	-	60	80
Barleyardgrass	60	90	100	100	95	85	90	100	95	95	-	90	75	-	-
Bedstraw	-	-	-	-	-	-	-	90	-	-	-	50	30	-	-
Blackgrass	-	-	-	-	-	-	-	50	-	-	40	50	30	-	-
Chickweed	-	-	-	-	-	-	-	90	-	-	80	40	50	-	-
Corn	-	-	-	-	-	-	-	50	-	-	20	20	20	-	-
Cotton	-	-	-	-	-	-	-	90	-	-	30	20	20	-	-
Crabgrass	-	-	-	-	-	-	-	70	-	-	20	20	20	-	-
Downy Brome	-	-	-	-	-	-	-	40	-	-	20	20	20	-	-
Duck salad	70	80	90	80	85	65	0	60	90	60	20	30	10	70	90
Giant foxtail	-	-	-	-	-	-	-	60	-	-	60	30	20	-	-
Lambsquarters	-	-	-	-	-	-	-	90	-	-	40	50	60	-	-
Morningglory	-	-	-	-	-	-	-	85	-	-	30	20	30	-	-
Pigweed	-	-	-	-	-	-	-	90	-	-	80	-	40	-	-
Rape	-	-	-	-	-	-	-	100	-	-	60	30	20	-	-
Rice Japonica	0	65	80	75	65	45	45	75	65	65	20	35	35	50	60
Ryegrass	-	-	-	-	-	-	-	30	-	-	30	0	10	-	-
Sorghum	-	-	-	-	-	-	-	40	-	-	0	10	10	-	-
Soybean	-	-	-	-	-	-	-	70	-	-	30	30	20	-	-
Speedwell	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
Sugar beet	-	-	-	-	-	-	-	100	-	-	90	60	70	-	-
Umbrella sedge	70	80	90	90	80	35	30	90	85	65	90	80	90	80	85
Velvetleaf	-	-	-	-	-	-	-	75	-	-	20	10	20	-	-
Wheat	-	-	-	-	-	-	-	20	-	-	0	0	0	-	-
Wild buckwheat	-	-	-	-	-	-	-	40	-	-	50	20	20	-	-
Wild oat	-	-	-	-	-	-	-	30	-	-	10	10	10	-	-

Table C

Rate 125 g/ha PREMERGENCE		COMPOUND																				
		5	14	18	21	26	30	32	39	42	45	56	59	74	76	77	79	88	109	111	113	114
Barley Igri	0	30	40	100	40	40	0	10	0	10	0	0	0	0	0	0	0	0	50	10	20	0
Bedstraw	100	40	80	100	80	80	70	40	80	50	60	100	30	50	80	20	40	100	80	90	0	
Blackgrass	90	50	98	100	100	100	100	100	40	90	70	70	50	20	0	50	20	80	90	70	20	
Chickweed	100	50	90	80	100	90	100	90	50	70	50	20	80	40	0	20	50	100	90	50	50	
Corn	60	50	50	70	40	50	20	30	40	10	0	40	50	0	0	10	0	50	50	50	0	
Cotton	0	30	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Crabgrass	100	100	100	100	100	100	100	100	98	100	100	100	100	100	60	100	90	100	100	100	100	
Downy Brome	35	20	80	30	60	30	20	20	0	20	0	0	0	0	0	0	0	50	20	30	0	
Giant foxtail	100	70	100	100	100	100	100	100	90	100	100	100	90	80	60	90	100	100	100	100	90	
Lambsquarters	100	100	100	100	100	100	100	100	100	100	70	100	100	80	50	100	50	100	90	100	50	
Morningglory	30	70	80	80	80	60	20	50	60	10	20	40	0	0	20	10	0	100	80	100	20	
Pigweed	100	70	70	100	100	80	90	90	50	100	100	70	90	80	70	60	20	100	90	80	80	
Rape	60	60	50	100	70	20	50	20	0	20	20	0	50	0	0	10	0	100	95	10	20	
Ryegrass	60	20	70	60	60	40	60	20	0	20	0	0	40	0	0	0	0	60	50	40	20	
Sorghum	90	20	50	90	40	25	60	20	30	20	20	30	10	0	20	10	30	60	50	30	20	
Soybean	40	0	40	50	40	30	0	0	20	0	0	0	0	0	0	0	0	30	0	10	0	
Speedwell	100	-	-	100	100	-	50	80	100	100	100	100	10	0	80	100	100	100	-	100	80	
Sugar beet	100	90	100	100	100	100	100	95	50	70	50	60	50	30	50	50	50	100	100	100	30	
Velvet leaf	100	60	100	100	80	80	80	50	0	25	20	80	70	0	20	50	20	100	90	100	30	
Wheat	0	30	30	70	40	30	0	0	0	0	0	0	0	0	0	0	0	40	10	20	0	
Wild buckwheat	20	30	20	80	80	70	80	50	20	0	20	0	0	0	30	0	0	30	100	40	0	
Wild oat	30	20	60	100	60	60	25	20	0	20	20	0	0	0	0	0	0	50	10	40	0	

Table C

COMPOUND

Rate 125 g/ha	124	127	132	134	142	144	149	150	155	160	161	162	163
PREEMERGENCE													
Barley Igri	60	40	10	0	10	20	30	0	0	0	0	40	30
Bedstraw	100	100	90	70	100	100	100	50	60	30	60	100	100
Blackgrass	90	70	100	70	100	85	90	75	60	50	40	90	90
Chickweed	100	80	95	80	90	100	85	80	-	70	80	90	95
Corn	70	60	50	20	10	50	50	10	0	-	0	60	70
Cotton	100	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass	100	100	100	100	100	100	100	100	100	100	90	100	100
Downy Brome	50	50	40	0	20	20	40	10	0	0	0	60	70
Giant foxtail	100	100	100	100	100	100	100	90	100	100	90	100	100
Lambsquarters	100	100	100	90	100	100	95	90	-	90	90	90	95
Morningglory	90	100	50	10	20	90	40	10	60	-	0	95	100
Pigweed	80	100	90	95	100	100	100	95	100	80	50	100	100
Rape	100	20	30	20	60	50	20	10	100	0	10	70	100
Ryegrass	60	40	70	40	50	60	85	10	50	20	30	80	90
Sorghum	60	20	10	10	10	60	80	10	10	10	10	70	80
Soybean	30	50	0	0	10	30	0	0	0	0	0	20	70
Speedwell	100	100	100	-	-	-	-	-	90	-	-	-	-
Sugar beet	100	100	95	100	100	90	100	100	100	100	70	100	100
Velvetleaf	80	100	100	90	90	95	100	70	100	30	60	90	100
Wheat	50	20	30	0	10	20	30	0	0	0	0	70	40
Wild buckwheat	90	60	30	30	20	40	80	20	20	20	50	90	70
Wild oat	80	20	75	20	70	75	80	40	20	10	30	60	70

Table C

COMPOUND

Rate 62 g/ha	114	124	125	127	132	134	142	144	149	150	155	160	161	162	163
POSTEMERGENCE															
Barley Igri	-	-	-	-	-	-	-	20	-	-	10	0	0	-	-
Barnyard 2 leaf	-	-	-	-	-	-	-	85	-	-	40	-	-	55	65
Barnyardgrass	40	85	95	70	75	75	90	100	95	95	-	85	70	-	-
Bedstraw	-	-	-	-	-	-	-	80	-	-	60	40	30	-	-
Blackgrass	-	-	-	-	-	-	-	30	-	-	20	30	20	-	-
Chickweed	-	-	-	-	-	-	-	70	-	-	60	30	20	-	-
Corn	-	-	-	-	-	-	-	30	-	-	10	10	10	-	-
Cotton	-	-	-	-	-	-	-	70	-	-	20	20	20	-	-
Crabgrass	-	-	-	-	-	-	-	60	-	-	10	10	10	-	-
Downy Brome	-	-	-	-	-	-	-	20	-	-	10	10	20	-	-
Duck salad	65	70	80	75	70	10	0	20	85	0	0	0	0	65	70
Giant foxtail	-	-	-	-	-	-	-	50	-	-	20	10	10	-	-
Lambsquarters	-	-	-	-	-	-	-	90	-	-	30	20	40	-	-
Morningglory	-	-	-	-	-	-	-	70	-	-	-	10	30	-	-
Pigweed	-	-	-	-	-	-	-	80	-	-	80	20	30	-	-
Rape	-	-	-	-	-	-	-	100	-	-	50	20	10	-	-
Rice Japonica	0	0	50	35	65	35	40	65	60	55	0	30	30	30	50
Ryegrass	-	-	-	-	-	-	-	10	-	-	0	0	10	-	-
Sorghum	-	-	-	-	-	-	-	20	-	-	0	0	10	-	-
Soybean	-	-	-	-	-	-	-	70	-	-	20	10	10	-	-
Speedwell	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
Sugar beet	-	-	-	-	-	-	-	100	-	-	80	50	60	-	-
Umbrella sedge	50	70	80	80	20	15	25	80	30	35	85	50	85	80	85
Velvetleaf	-	-	-	-	-	-	-	65	-	-	10	10	10	-	-
Wheat	-	-	-	-	-	-	-	10	-	-	0	0	0	-	-
Wild buckwheat	-	-	-	-	-	-	-	30	-	-	30	10	20	-	-
Wild oat	-	-	-	-	-	-	-	20	-	-	10	0	0	-	-

Table C

Table C		COMPOUND																					
		14	18	21	26	30	32	39	42	45	56	59	74	76	77	79	88	109	111	113	114	124	
Rate 62 g/ha PREMERGENCE		20	0	100	25	20	0	0	0	0	0	0	0	0	0	0	0	30	0	20	0	20	
Barley Igri		20	80	100	80	30	30	0	20	20	30	50	0	0	20	0	0	100	40	50	0	20	
Bedstraw		20	90	80	98	80	70	70	30	70	40	40	30	0	0	20	0	50	85	20	0	90	
Blackgrass		20	60	80	90	80	100	30	40	70	40	0	60	0	0	20	20	100	80	30	0	60	
Chickweed		0	40	60	10	10	0	10	0	0	0	20	30	0	0	0	0	50	40	30	0	98	
Corn		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50		
Cotton		80	100	100	100	100	100	100	90	100	100	100	80	80	30	80	20	100	100	100	80	100	
Crabgrass		0	30	30	60	20	10	0	0	0	0	0	0	0	0	0	0	0	0	0	80		
Downy Brome		50	100	100	100	100	98	100	60	100	100	95	40	25	40	80	30	100	100	100	50	100	
Giant foxtail		100	100	100	100	90	100	90	50	100	30	80	100	20	20	90	20	100	85	100	0	90	
Lambsquarters		50	60	70	50	50	20	20	0	10	20	0	0	0	20	0	0	80	10	60	0	50	
Morningglory		70	70	50	98	80	80	80	20	100	80	50	80	20	70	30	0	100	80	80	20	80	
Pigweed		30	30	90	30	0	40	10	0	0	0	0	0	0	0	0	0	100	70	0	0	80	
Rape		0	50	50	40	20	25	20	0	0	0	0	0	0	0	0	0	50	10	30	0	50	
Ryegrass		0	20	60	30	20	20	10	0	20	0	10	0	0	0	0	0	25	50	50	0	40	
Sorghum		0	20	20	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Soybean		-	100	100	-	30	70	100	100	100	90	70	10	0	50	95	100	100	-	90	20	100	
Speedwell		90	98	100	90	70	90	90	50	70	30	40	20	0	50	25	10	100	100	100	0	100	
Sugar beet		50	80	100	60	50	70	30	0	20	0	40	40	0	0	0	0	80	75	100	0	80	
Velvetleaf		0	20	60	20	20	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	20	
Wheat		0	0	80	80	20	50	30	0	0	0	0	0	0	20	0	0	30	90	0	0	80	
Wild buckwheat		0	30	100	40	30	10	0	0	0	0	0	0	0	0	0	0	50	0	20	0	30	
Wild oat																							

Table C

	COMPOUND																
Rate 62 g/ha	125	127	132	134	142	144	149	150	155	160	161	162	163				
PREEMERGENCE																	
Barley Igr1	50	20	10	0	0	10	10	0	0	0	0	20	10				
Bedstraw	100	90	80	20	90	100	80	30	30	30	30	100	60				
Blackgrass	80	40	90	30	90	80	90	30	30	20	30	70	80				
Chickweed	100	60	90	60	60	90	75	30	-	30	40	70	90				
Corn	60	50	20	0	10	30	30	0	0	0	0	50	50				
Cotton	30	0	0	-	0	0	0	-	0	0	0	0	0				
Crabgrass	100	100	100	100	100	100	100	90	100	90	70	100	100				
Downy Brome	50	20	20	0	10	10	10	0	0	0	0	40	60				
Giant foxtail	20	100	100	100	100	100	100	90	100	90	70	100	100				
Lambsquarters	100	100	90	80	100	100	90	40	-	75	80	70	90				
Morningglory	90	90	-	0	10	60	30	0	60	0	0	90	70				
Pigweed	100	100	85	50	100	100	100	90	100	60	40	100	100				
Rape	90	0	20	0	10	20	10	0	50	0	0	40	100				
Ryegrass	60	30	50	10	20	40	50	10	10	10	20	70	70				
Sorghum	20	0	10	0	10	20	30	10	0	0	0	40	60				
Soybean	10	10	0	0	0	10	0	0	0	0	0	0	20				
Speedwell	100	100	95	-	-	-	-	-	10	-	-	-	-				
Sugar beet	100	100	90	75	90	90	85	30	40	60	70	100	100				
Velvetleaf	100	90	70	50	90	90	95	50	70	10	20	50	95				
Wheat	20	0	10	0	0	0	0	0	0	0	0	30	10				
Wild buckwheat	50	50	20	10	10	20	60	0	0	10	30	60	30				
Wild oat	60	0	60	0	30	40	50	20	0	0	20	40	50				

Table C

Rate 31 g/ha POSTEMERGENCE		COMPOUND																		
		5	14	18	21	26	30	32	39	45	59	76	125	127	132	142	144	149	150	162
Barley Igri	0	-	-	-	-	-	-	-	10	-	-	-	-	-	-	10	-	-	-	-
Barnyard 2 leaf	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75	-	-	35	35
Barnyardgrass	100	50	100	100	100	100	90	60	70	40	20	80	45	65	75	95	85	95	-	-
Bedstraw	80	-	-	-	-	-	-	20	-	-	-	-	-	-	-	70	-	-	-	-
Blackgrass	10	-	-	-	-	-	-	10	-	-	-	-	-	-	-	20	-	-	-	-
Chickweed	50	-	-	-	-	-	-	30	-	-	-	-	-	-	-	70	-	-	-	-
Corn	60	-	-	-	-	-	-	10	-	-	-	-	-	-	-	20	-	-	-	-
Cotton	40	-	-	-	-	-	-	10	-	-	-	-	-	-	-	60	-	-	-	-
Crabgrass	30	-	-	-	-	-	-	10	-	-	-	-	-	-	-	50	-	-	-	-
Downy Brome	0	-	-	-	-	-	-	10	-	-	-	-	-	-	-	10	-	-	-	-
Luck salad	40	0	50	80	70	40	0	0	40	0	10	70	70	10	0	0	65	0	0	60
Giant foxtail	30	-	-	-	-	-	-	10	-	-	-	-	-	-	-	40	-	-	-	-
Lambsquarters	50	-	-	-	-	-	-	70	-	-	-	-	-	-	-	90	-	-	-	-
Morningglory	30	-	-	-	-	-	-	10	-	-	-	-	-	-	-	60	-	-	-	-
Pigweed	30	-	-	-	-	-	-	50	-	-	-	-	-	-	-	80	-	-	-	-
Rape	0	-	-	-	-	-	-	50	-	-	-	-	-	-	-	80	-	-	-	-
Rice Japonica	70	25	70	70	25	50	30	0	10	10	0	20	0	40	35	55	55	45	0	35
Ryegrass	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-
Sorghum	20	-	-	-	-	-	-	10	-	-	-	-	-	-	-	10	-	-	-	-
Soybean	40	-	-	-	-	-	-	30	-	-	-	-	-	-	-	60	-	-	-	-
Speedwell	100	-	-	-	-	-	-	60	-	-	-	-	-	-	-	90	-	-	-	-
Sugar beet	65	-	-	-	-	-	-	70	-	-	-	-	-	-	-	100	-	-	-	-
Umbrella sedge	85	45	90	80	25	80	80	0	75	10	20	80	80	10	0	80	15	30	60	85
Velvetleaf	50	-	-	-	-	-	-	10	-	-	-	-	-	-	-	55	-	-	-	-
Wheat	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	10	-	-	-	-
Wild buckwheat	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-
Wild oat	0	-	-	-	-	-	-	10	-	-	-	-	-	-	-	10	-	-	-	-

Table C

Rate 31 g/ha PREEMERGENCE	COMPOUND																			
	5	14	18	21	26	30	32	39	45	59	76	125	127	132	142	144	149	150	162	163
Barley Igri	0	0	0	100	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0
Bedstraw	0	0	80	80	40	20	0	0	0	0	0	100	70	30	50	90	60	10	70	50
Blackgrass	70	0	50	80	60	60	60	10	40	0	0	60	20	80	60	30	75	10	50	50
Chickweed	80	20	50	60	80	70	80	0	50	0	0	80	30	80	10	80	50	10	50	60
Corn	50	0	20	50	0	0	0	0	0	0	0	20	20	10	0	20	20	0	20	20
Cotton	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	-	0	0
Crabgrass	100	70	100	100	100	100	100	80	100	95	30	80	60	100	100	100	100	85	95	100
Downy Brome	0	0	20	20	50	20	0	0	0	0	0	30	0	10	0	10	0	0	10	20
Giant foxtail	100	30	100	100	100	100	98	70	100	60	0	0	60	100	100	100	100	70	95	100
Lambsquarters	100	90	100	100	100	80	100	60	80	50	0	100	80	90	70	95	90	40	20	70
Morningglory	20	50	40	50	30	30	10	0	0	0	0	50	20	10	0	50	20	0	20	20
Pigweed	100	70	70	50	98	80	80	70	50	50	0	100	60	50	95	90	85	85	90	100
Rape	30	0	0	70	0	0	20	0	0	0	0	60	0	10	0	10	0	0	0	70
Ryegrass	20	0	20	40	30	0	20	0	0	0	0	40	0	20	0	20	10	0	30	50
Sorghum	70	0	0	50	30	0	10	0	0	0	0	0	0	0	0	10	10	0	20	40
Soybean	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Speedwell	100	-	-	100	90	-	30	-	80	0	0	100	100	95	-	-	-	-	-	-
Sugar beet	90	50	80	100	90	70	90	20	30	0	0	100	100	70	40	80	70	10	70	100
Velvetleaf	60	50	70	80	30	0	50	-	0	30	0	100	50	50	30	90	90	-	0	50
Wheat	0	0	0	50	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wild buckwheat	20	0	0	70	30	20	30	0	0	0	0	20	50	10	0	0	20	0	30	10
Wild oat	0	0	30	40	30	0	0	0	0	0	0	40	0	20	10	10	20	10	10	30

Table C

COMPOUND

Rate 16 g/ha	5	18	21	26	30	76
POSTEMERGENCE						
Barley Igri	0	-	-	-	-	-
Bartyard 2 leaf	-	-	-	-	-	-
Bartyardgrass	100	65	65	50	45	15
Bedstraw	0	-	-	-	-	-
Blackgrass	-	-	-	-	-	-
Chickweed	30	-	-	-	-	-
Corn	20	-	-	-	-	-
Cotton	0	-	-	-	-	-
Crabgrass	0	-	-	-	-	-
Downy Brome	0	-	-	-	-	-
Duck salad	10	-	30	-	-	0
Giant foxtail	0	-	-	-	-	-
Lambsquarters	0	-	-	-	-	-
Morningglory	0	-	-	-	-	-
Pigweed	0	-	-	-	-	-
Rape	0	-	-	-	-	-
Rice Japonica	55	65	55	20	35	0
Ryegrass	0	-	-	-	-	-
Sorghum	0	-	-	-	-	-
Soybean	10	-	-	-	-	-
Speedwell	0	-	-	-	-	-
Sugar beet	0	-	-	-	-	-
Umbrella sedge	80	-	15	-	-	0
Velvetleaf	30	-	-	-	-	-
Wheat	0	-	-	-	-	-
Wild buckwheat	0	-	-	-	-	-
Wild oat	0	-	-	-	-	-

Table C	COMPOUND		
Rate 16 g/ha	5	21	76
PREEMERGENCE			
Barley Igri	0	60	0
Bedstraw	0	50	0
Blackgrass	0	20	0
Chickweed	0	0	0
Corn	20	30	0
Cotton	0	0	0
Crabgrass	30	100	0
Downy Brome	0	0	0
Giant foxtail	30	98	0
Lambsquarters	0	50	0
Morningglory	0	10	0
Pigweed	50	50	0
Rape	0	0	0
Ryegrass	0	20	0
Sorghum	30	0	0
Soybean	20	0	0
Speedwell	0	100	0
Sugar beet	0	50	0
Velvetleaf	0	50	0
Wheat	0	0	0
Wild buckwheat	0	0	0
Wild oat	0	0	0

Table C	COMPOUND			
Rate 8 g/ha	18	21	26	30
POSTEMERGENCE				
Barley Igri	-	-	-	-
Barnyard 2 leaf	-	-	-	-
Barnyardgrass	50	40	30	40
Bedstraw	-	-	-	-
Blackgrass	-	-	-	-
Chickweed	-	-	-	-
Corn	-	-	-	-
Cotton	-	-	-	-
Crabgrass	-	-	-	-
Downy Brome	-	-	-	-
Duck salad	-	-	-	-
Giant foxtail	-	-	-	-
Lambsquarters	-	-	-	-
Morningglory	-	-	-	-
Pigweed	-	-	-	-
Rape	-	-	-	-
Rice Japonica	50	35	10	25
Ryegrass	-	-	-	-
Sorghum	-	-	-	-
Soybean	-	-	-	-
Speedwell	-	-	-	-
Sugar beet	-	-	-	-
Umbrella sedge	-	-	-	-
Velvetleaf	-	-	-	-
Wheat	-	-	-	-
Wild buckwheat	-	-	-	-
Wild oat	-	-	-	-

Table C	COMPOUND			
Rate 4 g/ha	18	21	26	30
POSTEMERGENCE				
Barley Igri	-	-	-	-
Barnyard 2 leaf	-	-	-	-
Barnyardgrass	30	25	25	25
Bedstraw	-	-	-	-
Blackgrass	-	-	-	-
Chickweed	-	-	-	-
Corn	-	-	-	-
Cotton	-	-	-	-
Crabgrass	-	-	-	-
Downy Brome	-	-	-	-
Duck salad	-	-	-	-
Giant foxtail	-	-	-	-
Lambsquarters	-	-	-	-
Morningglory	-	-	-	-
Pigweed	-	-	-	-
Rape	-	-	-	-
Rice Japonica	20	20	0	0
Ryegrass	-	-	-	-
Sorghum	-	-	-	-
Soybean	-	-	-	-
Speedwell	-	-	-	-
Sugar beet	-	-	-	-
Umbrella sedge	-	-	-	-
Velvetleaf	-	-	-	-
Wheat	-	-	-	-
Wild buckwheat	-	-	-	-
Wild oat	-	-	-	-

TEST D

Seeds of barnyardgrass (*Echinochloa crus-galli*),
cassia (*Cassia obtusifolia*), cocklebur (*Xanthium*
pensylvanicum), common ragweed (*Ambrosia elatior*), corn
5 (*Zea mays*), cotton (*Gossypium hirsutum*), crabgrass
(*Digitaria* spp.), fall panicum (*Panicum dicholomiflorum*),
giant foxtail (*Setaria faberii*), green foxtail (*Setaria*
vividis), jimson weed (*Datura stramonium*), johnson grass
(*Sorghum halepense*), morningglory (*Ipomoea* spp.), prickly
10 sida (*Sida spinose*), signalgrass (*Brachiaria*
platyphylla), soybean (*Glycine max*), velvetleaf (*Abutilon*
theophrasti) and wild proso (*Panicum miliaceum*) were
planted into a silt loam soil. Test chemicals, dissolved
in a non-phytotoxic solvent, were then applied to the
15 soil surface within one day after the seeds were planted.
Pots receiving these preemergence treatments were placed
in the greenhouse and maintained according to routine
greenhouse procedures.

Treated plants and untreated controls were
20 maintained in the greenhouse approximately 21 days after
application of the test compound. Visual evaluations of
plant injury responses were then recorded. Plant
response ratings, summarized in Table D, are reported on
a 0 to 100 scale where 0 is no effect and 100 is complete
25 control. A dash (-) response means no test.

Table D	COMPOUND									
Rate 500 g/ha	32	39	45	56	59	88	109	125	132	
PREEMERGENCE										
Barnyardgrass	100	100	100	100	100	75	100	100	100	
Blk Nightshade	95	95	100	95	0	85	100	100	100	
Corn G4689A	70	75	50	10	15	20	85	90	65	
Cotton	0	0	60	0	0	0	80	60	15	
Crabgrass	100	100	100	100	100	100	100	100	100	
Fall Panicum	100	100	100	100	100	-	-	-	-	
Giant Foxtail	100	100	100	100	100	100	100	100	100	
Green Foxtail	100	100	100	100	100	100	100	100	100	
Johnson Grass	100	100	95	65	60	55	100	70	65	
Lambsquarter	95	95	95	95	90	95	95	100	100	
Pigweed	100	100	100	100	75	100	95	100	100	
Ragweed	100	30	100	90	0	65	100	100	65	
Signalgrass	100	100	100	100	100	100	100	100	100	
Smartweed	-	-	100	100	0	55	95	100	90	
Soybean	15	20	45	0	0	0	100	100	15	
Wild Proso	100	100	100	90	80	95	100	100	100	
Wooly Cup Grass	75	100	100	70	80	-	95	85	85	

Table D	COMPOUND								
Rate 250 g/ha	32	39	45	56	59	88	109	125	132
PREEMERGENCE									
Barnyardgrass	100	100	100	70	80	15	100	100	100
Blk Nightshade	95	95	95	90	0	65	95	100	100
Corn G4689A	65	55	30	10	10	0	70	65	40
Cotton	0	0	0	0	0	0	0	25	0
Crabgrass	100	100	100	100	100	75	100	100	100
Fall Panicum	100	100	100	65	100	-	-	-	-
Giant Foxtail	100	100	100	100	95	75	100	100	100
Green Foxtail	100	100	100	95	100	100	100	100	100
Johnson Grass	70	100	70	55	60	15	75	70	55
Lambsquarter	95	95	95	90	90	25	95	100	100
Pigweed	100	95	95	90	60	75	80	95	90
Ragweed	55	15	75	45	0	0	100	100	65
Signalgrass	100	100	95	70	100	75	100	100	100
Smartweed	-	-	60	70	0	15	85	100	80
Soybean	5	10	0	0	0	0	60	55	10
Wild Proso	100	100	100	60	80	20	100	100	65
Wooly Cup Grass	65	95	70	40	65	-	80	75	75

Table D

Table D		COMPOUND												
Rate 125 g/ha PREMERGENCE	18	21	26	30	32	39	45	56	59	88	109	125	132	
Barnyardgrass	100	90	75	100	100	100	100	20	70	0	100	100	95	
Blk Nightshade	95	95	100	95	80	95	95	75	0	65	85	100	100	
Corn G4689A	65	75	20	60	50	30	15	0	0	0	45	45	25	
Cotton	-	0	0	0	0	0	0	0	0	0	0	0	0	
Crabgrass	100	100	100	100	100	100	100	95	100	60	100	100	100	
Fall Panicum	100	100	100	100	100	100	100	60	95	-	-	-	-	
Giant Foxtail	100	100	100	100	100	100	100	65	70	55	95	90	100	
Green Foxtail	100	100	100	100	100	100	100	60	95	55	100	80	100	
Johnson Grass	100	100	90	80	70	75	60	25	45	0	75	65	55	
Lambsquarter	100	100	100	95	90	95	95	80	80	25	95	100	95	
Pigweed	85	80	95	90	85	90	85	85	40	65	60	90	70	
Ragweed	30	80	65	20	55	15	55	45	0	0	55	100	0	
Signalgrass	100	100	100	100	100	100	95	15	65	0	100	100	100	
Smartweed	-	-	-	-	-	-	60	55	0	15	80	95	65	
Soybean	45	15	45	35	0	0	0	0	0	0	45	25	0	
Wild Proso	100	90	30	95	100	100	95	45	70	15	100	65	55	
Woolly Cup Grass	-	-	-	-	65	60	60	15	60	-	70	70	60	

Table D

Rate 62 g/ha PREMERGENCE	COMPOUND														
	18	21	26	30	32	39	45	56	59	88	109	125	132		
Barnyardgrass	70	75	65	95	100	65	50	20	45	0	85	100	65		
Blk Nightshade	80	90	100	95	60	75	60	65	0	0	60	60	85		
Corn G4689A	40	50	5	50	10	10	0	0	0	0	15	25	15		
Cotton	0	-	0	0	0	0	0	0	0	0	0	0	0		
Crabgrass	100	100	100	100	100	100	85	75	100	35	80	100	100		
Fall Panicum	95	95	100	95	75	90	55	0	60	-	-	-	-		
Giant Foxtail	100	100	100	100	100	100	100	35	50	15	85	80	100		
Green Foxtail	100	100	100	100	100	100	80	55	60	15	70	80	100		
Johnson Grass	80	100	55	65	65	60	55	0	20	0	30	45	15		
Lambsquarter	95	100	95	95	85	70	65	40	70	0	80	95	85		
Pigweed	75	70	80	90	80	75	60	60	25	0	45	75	50		
Ragweed	0	20	55	0	50	15	20	35	0	0	0	100	0		
Signalgrass	90	100	100	100	100	100	70	0	15	0	90	100	95		
Smartweed	-	-	-	-	-	-	0	0	0	0	15	85	0		
Soybean	0	0	-	25	0	0	0	0	0	0	0	0	0		
Wild Proso	75	65	25	70	100	80	65	45	60	0	55	60	55		
Woolly Cup Grass	-	-	-	-	15	25	40	0	25	-	55	60	40		

Table D

	COMPOUND														
Rate 31 g/ha	18	21	26	30	32	39	45	56	59	88	109	125	132		
PREEMERGENCE															
Barnyardgrass	40	55	15	55	35	25	15	15	10	0	20	65	50		
Blk Nightshade	0	90	95	95	60	55	0	15	0	0	0	0	85		
Corn G4689A	25	35	0	20	0	0	0	0	0	0	0	0	0		
Cotton	0	0	0	-	0	0	0	0	0	0	0	0	0		
Crabgrass	100	100	100	100	100	75	0	0	100	0	15	55	100		
Fall Panicum	75	85	75	50	50	65	0	0	10	-	-	-	-		
Giant Foxtail	100	100	100	100	85	80	40	15	30	0	15	55	60		
Green Foxtail	100	100	100	100	90	75	30	15	35	0	0	60	65		
Johnson Grass	70	65	45	40	50	0	15	0	0	0	0	0	0		
Lambsquarter	85	95	90	40	55	0	0	40	0	0	0	90	60		
Pigweed	55	60	75	70	75	55	0	45	20	0	0	65	40		
Ragweed	0	0	20	0	30	15	0	0	0	0	0	100	0		
Signalgrass	55	100	100	100	95	60	15	0	15	0	20	100	60		
Smartweed	-	-	-	-	-	-	-	0	0	0	0	65	0		
Soybean	0	0	0	10	0	0	0	0	0	0	0	0	0		
Wild Proso	60	50	0	25	40	45	20	0	45	0	0	25	15		
Woolly Cup Grass	-	-	-	-	0	0	0	0	10	-	0	40	15		

Table D	COMPOUND			
Rate 16 g/ha	18	21	26	30
PREEMERGENCE				
Barnyardgrass	15	15	0	30
Blk Nightshade	0	0	75	95
Corn G4689A	5	0	0	0
Cotton	0	0	0	0
Crabgrass	80	65	95	100
Fall Panicum	70	35	15	10
Giant Foxtail	70	85	95	60
Green Foxtail	70	100	95	65
Johnson Grass	30	55	-	0
Lambsquarter	80	85	55	20
Pigweed	45	50	50	60
Ragweed	0	0	0	0
Signalgrass	50	15	20	100
Smartweed	-	-	-	-
Soybean	0	0	0	0
Wild Proso	10	15	0	15
Wooly Cup Grass	-	-	-	-

Table D	COMPOUND			
Rate 8 g/ha	18	21	26	30
PREEMERGENCE				
Barnyardgrass	0	0	0	0
Blk Nightshade	0	0	25	85
Corn G4689A	0	0	0	0
Cotton	0	0	0	0
Crabgrass	35	45	50	65
Fall Panicum	0	15	0	0
Giant Foxtail	10	45	65	40
Green Foxtail	10	70	65	40
Johnson Grass	0	30	20	0
Lambsquarter	45	0	50	0
Pigweed	15	50	45	0
Ragweed	0	0	0	0
Signalgrass	0	10	0	15
Smartweed	-	-	-	-
Soybean	0	0	0	0
Wild Proso	0	0	0	0
Wooly Cup Grass	-	-	-	-

TEST E

Plastic pots were partially filled with silt loam soil. The soil was then saturated with water. Indica and Japonica rice (*Oryza sativa*) seedlings at the 2.0 to 2.5 leaf stage, seeds selected from barnyardgrass (*Echinochloa crus-galli*), bulrush (*Scirpus mucronatus*), duck salad (*Heteranthera limosa*), umbrella sedge (*Cyperus difformis*), and tubers selected from arrowhead (*Sagittaria* spp.), waterchestnut (*Eleocharis* spp.), were planted into this soil. After planting, water levels were raised to 3 cm above the soil surface and maintained at this level throughout the test. Chemical treatments were formulated in a non-phytotoxic solvent and applied directly to the paddy water. Treated plants and controls were maintained in a greenhouse for approximately 21 days, after which all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table E, are reported on a 0 to 100 scale where 0 is no effect and 100 is complete control. A dash (-) response means no test result.

Table E	COMPOUND		
Rate 1000 g/ha	88	109	113
PADDY			
Arrowhead	-	100	80
Barnyard 2 Leaf	100	98	100
Barnyardgrass	-	-	-
Duck salad	30	100	100
Japonica rice	25	35	50
Umbrella sedge	95	98	90
Waterchestnut	30	40	50

Table E		COMPOUND						
Rate 500 g/ha	5	14	18	26	88	109	113	
PADDY								
Arrowhead	-	-	-	-	0	85	40	
Barnyard 2 Leaf	-	-	-	-	55	95	98	
Barnyardgrass	100	85	100	100	-	-	-	
Duck salad	100	98	98	100	0	100	100	
Japonica rice	55	60	60	40	15	40	40	
Umbrella sedge	98	98	100	100	80	98	100	
Waterchestnut	90	55	60	30	30	80	80	

Table E	COMPOUND						
Rate 250 g/ha	5	14	18	26	88	109	113
PADDY							
Arrowhead	-	-	-	-	0	60	50
Barnyard 2 Leaf	-	-	-	-	30	90	60
Barnyardgrass	100	90	100	90	-	-	-
Duck salad	100	40	98	100	0	100	100
Japonica rice	60	50	45	30	0	20	15
Umbrella sedge	98	95	100	98	70	98	95
Waterchestnut	90	55	30	20	0	50	30

Table E

COMPOUND

Rate 125 g/ha	5	14	18	26	88	109	113
PADDY							
Arrowhead	-	-	-	-	0	60	-
Barnyard 2 Leaf	-	-	-	-	20	70	40
Barnyardgrass	90	60	100	100	-	-	-
Duck salad	100	40	98	30	0	100	100
Japonica rice	50	25	40	25	0	20	0
Umbrella sedge	98	95	98	98	60	95	80
Waterchestnut	60	30	30	20	0	60	0

Table E

COMPOUND

Rate 64 g/ha	5	14	18	26	88	109	113
PADDY							
Arrowhead	-	-	-	-	0	-	0
Barnyard 2 Leaf	-	-	-	-	0	40	20
Barnyardgrass	100	10	85	50	-	-	-
Duck salad	100	0	45	70	0	90	20
Japonica rice	35	0	35	20	0	0	0
Umbrella sedge	80	50	100	98	30	80	70
Waterchestnut	50	10	30	0	0	30	0

Table E

COMPOUND

Rate 32 g/ha	5	14	18	26	109
PADDY					
Arrowhead	-	-	-	-	30
Barnyard 2 Leaf	-	-	-	-	25
Barnyardgrass	80	0	60	15	-
Duck salad	40	0	-	0	40
Japonica rice	30	0	20	15	0
Umbrella sedge	60	40	98	50	40
Waterchestnut	30	0	20	0	20

TEST F

Plastic pots were partially filled with silt loam soil. The soil was then flooded with water, Japonica rice (*Oryza sativa*) sprouted seeds and 1.5 leaf

5 transplants were planted in the soil. Seeds of barnyardgrass (*Echinochloa crus-galli*) were planted in saturated soil and plants grown to the 1 leaf, 2 leaf and 3 leaf stages for testing. At testing, the water level for all plantings was raised to 2 cm above the soil

10 surface. Chemical treatments were formulated in a non-phytotoxic solvent and applied directly to the paddy water. Treated plants and controls were maintained in a greenhouse for approximately 21 days, after which all species were compared to controls and visually evaluated.

15 Plant response ratings, summarized in Table F are reported on a 0 to 100 scale where 0 is no effect and 100 is complete control. A dash (-) response means no test result.

Table F	COMPOUND		
Rate 1000 g/ha	88	109	113
Flood			
Jap Direct Seed	25	95	40
Jap Rice Eff	0	40	35
2-LF B.Y.Grass	90	95	95
3-LF B.Y.Grass	45	90	85

Rate 500 g/ha	88	109	113
Flood			
Jap Direct Seed	15	98	25
Jap Rice Eff	0	25	35
2-LF B.Y.Grass	75	98	80
3-LF B.Y.Grass	40	90	90

Table F	COMPOUND			
Rate 250 g/ha	88	109	113	
Flood				
Jap Direct Seed	10	45	10	
Jap Rice Eff	0	15	20	
2-LF B.Y.Grass	35	95	85	
3-LF B.Y.Grass	25	80	75	
Rate 125 g/ha	5	88	109	113
Flood				
Jap Direct Seed	95	0	30	0
Jap Rice Eff	85	0	15	15
2-LF B.Y.Grass	90	20	85	60
3-LF B.Y.Grass	80	15	70	45

Table F	COMPOUND				Table F	COMPOUND
Rate 64 g/ha	5	88	109	113	Rate 16 g/ha	5
Flood					Flood	
Jap Direct Seed	85	0	10	0	Jap Direct Seed	70
Jap Rice Eff	80	0	10	10	Jap Rice Eff	40
2-LF B.Y.Grass	85	0	45	45	2-LF B.Y.Grass	65
3-LF B.Y.Grass	80	10	30	0	3-LF B.Y.Grass	65
Rate 32 g/ha	5				Rate 8 g/ha	5
Flood					Flood	
Jap Direct Seed	85				Jap Direct Seed	50
Jap Rice Eff	25				Jap Rice Eff	30
2-LF B.Y.Grass	80				2-LF B.Y.Grass	45
3-LF B.Y.Grass	75				3-LF B.Y.Grass	50

TEST G

Compounds evaluated in this test were formulated in a non-phytotoxic solvent and applied to the soil surface before plant seedlings emerged (preemergence application) and to plants that were in the one-to-four leaf stage (postemergence application). A sandy loam soil was used for the preemergence test while a mixture of sandy loam soil and greenhouse potting mix in a 60:40 ratio was used for the postemergence test. Test compounds were applied within approximately one day after planting seeds for the preemergence test. Plantings of these crops and weed species were adjusted to produce plants of appropriate size for the postemergence test. All plant species were grown using normal greenhouse practices. Crop and weed species include winter barley (*Hordeum vulgare* cv. 'I...'), bedstraw (*Galium aparine*), blackgrass (*Alopecurus myosuroides*), chickweed (*Stellaria media*), downy brome (*Bromus tectorum*), field violet (*Viola arvensis*), green foxtail (*Setaria viridis*), kochia (*Kochia scoparia*), lambsquarters (*Chenopodium album*), Persian speedwell (*Veronica persica*), rape (*Brassica napus* cv. 'Jet Neuf'), ryegrass (*Lolium multiflorum*), sugar beet (*Beta vulgaris* cv. 'US1'), sunflower (*Helianthus annuus* cv. 'Russian Giant'), spring wheat (*Triticum aestivum* cv. 'ERA'), winter wheat (*Triticum aestivum* cv. 'Talent'), wild buckwheat (*Polygonum convolvulus*), wild mustard (*Sinapis arvensis*), wild oat (*Avena fatua*), and wild radish (*Raphanus raphanistrum*). Blackgrass, Galium and wild oat were treated postemergence at two growth stages. The first stage (1) was when the plants had two to three leaves. The second stage (2) was when the plants had approximately four leaves or in the initial stages of tillering. Treated plants and untreated controls were maintained in a greenhouse for approximately 21 to 28 days, after which

all treated plants were compared to untreated controls and visually evaluated. Plant response ratings, summarized in Table G, are based upon a 0 to 100 scale where 0 is no effect and 100 is complete control. A dash
5 response (-) means no test result.

Table G	COMPOUND			
Rate 500 g/ha	26	45	59	88
PREEMERGENCE				
Blackgrass (1)	100	100	60	60
Blackgrass (2)	100	100	45	60
Chickweed	100	100	70	80
Downy brome	100	100	0	0
Field violet	100	100	100	100
Galium (1)	100	100	100	30
Galium (2)	100	80	100	100
Green foxtail	100	100	100	100
Kochia	100	-	-	-
Lambsquarters	100	100	100	50
Persn Speedwell	100	100	100	100
Rape	100	100	0	20
Ryegrass	65	100	90	30
Sugar beet	100	100	70	80
Sunflower	50	-	70	100
Wheat (Spring)	40	30	5	20
Wheat (Winter)	30	10	5	0
Wild buckwheat	100	60	0	40
Wild mustard	100	100	100	90
Wild oat (1)	65	85	10	55
Wild oat (2)	80	90	20	30
Wild radish	100	100	100	100
Winter Barley	40	5	0	0

Table G

COMPOUND

Rate 250 g/ha	21	26	39	45	59	88
PREEMERGENCE						
Blackgrass (1)	90	100	55	90	30	10
Blackgrass (2)	100	100	50	100	45	0
Chickweed	95	100	40	100	-	20
Downy brome	50	50	10	60	0	0
Field violet	100	100	30	100	100	100
Galium (1)	100	100	0	100	60	0
Galium (2)	100	100	50	50	10	100
Green foxtail	100	100	100	100	100	100
Kochia	-	100	-	-	-	-
Lambsquarters	95	100	-	100	60	0
Persn Speedwell	100	100	100	100	30	60
Rape	-	100	95	100	0	20
Ryegrass	70	65	50	80	50	0
Sugar beet	100	100	100	100	-	35
Sunflower	100	20	100	-	0	0
Wheat (Spring)	50	30	15	10	0	20
Wheat (Winter)	50	10	0	10	0	0
Wild buckwheat	100	80	5	60	0	0
Wild mustard	100	100	100	100	100	-
Wild oat (1)	80	50	10	60	5	5
Wild oat (2)	100	65	20	70	5	5
Wild radish	100	100	90	90	90	60
Winter Barley	40	30	10	0	0	0

Table G	COMPOUND						
Rate 125 g/ha	21	26	39	45	59	74	88
PREEMERGENCE							
Blackgrass (1)	60	50	20	90	30	50	0
Blackgrass (2)	90	90	30	80	5	-	0
Chickweed	80	50	0	100	50	90	0
Downy brome	40	0	0	40	0	10	0
Field violet	100	100	0	100	100	50	80
Galium (1)	100	60	0	40	40	0	0
Galium (2)	100	100	30	40	0	10	50
Green foxtail	100	100	100	100	100	80	100
Kochia	-	100	-	-	-	-	-
Lambsquarters	95	90	0	95	60	90	0
Persn Speedwell	100	85	-	100	30	0	30
Rape	100	70	50	100	0	0	0
Ryegrass	60	35	20	80	30	60	0
Sugar beet	100	90	100	100	65	50	35
Sunflower	100	0	100	-	0	-	-
Wheat (Spring)	35	30	0	0	0	5	10
Wheat (Winter)	40	0	0	10	0	0	0
Wild buckwheat	80	30	0	60	0	60	0
Wild mustard	100	100	100	100	100	100	60
Wild oat (1)	55	0	0	30	5	5	0
Wild oat (2)	40	30	5	30	0	5	0
Wild radish	100	100	60	90	20	100	50
Winter Barley	40	10	0	0	0	0	0

Table G

COMPOUND

Rate 64 g/ha	21	26	39	45	59	74	88
PREEMERGENCE							
Blackgrass (1)	50	-	0	80	10	30	0
Blackgrass (2)	80	-	20	60	0	10	0
Chickweed	60	-	0	100	10	0	0
Downy brome	20	0	0	40	0	0	0
Field violet	90	100	0	100	10	50	10
Galium (1)	100	-	0	20	0	0	0
Galium (2)	100	100	0	40	0	0	0
Green foxtail	100	100	100	100	55	80	100
Kochia	-	100	-	-	-	-	-
Lambsquarters	80	90	0	80	40	20	0
Persn Speedwell	100	60	-	100	30	0	0
Rape	100	70	0	30	0	0	0
Ryegrass	40	20	5	70	5	60	0
Sugar beet	50	80	60	100	55	50	30
Sunflower	100	-	100	-	-	0	-
Wheat (Spring)	30	30	0	0	0	5	0
Wheat (Winter)	30	0	0	0	0	0	0
Wild buckwheat	70	10	0	0	0	0	0
Wild mustard	100	100	70	100	70	0	55
Wild oat (1)	40	0	0	25	0	0	0
Wild oat (2)	0	30	0	5	0	5	0
Wild radish	-	100	0	-	0	90	20
Winter Barley	30	0	0	0	0	0	0

Table G

COMPOUND

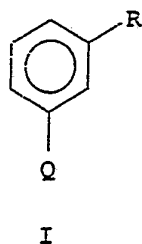
Rate 32 g/ha	21	26	39	45	59	74	88
PREEMERGENCE							
Blackgrass (1)	30	50	0	40	0	0	0
Blackgrass (2)	60	50	0	40	0	0	0
Chickweed	20	50	0	100	10	0	0
Downy brome	20	0	0	20	0	0	0
Field violet	80	100	0	100	0	0	0
Galium (1)	100	40	0	0	0	0	0
Galium (2)	50	60	0	0	0	0	0
Green foxtail	100	100	70	100	0	0	40
Kochia	-	90	-	-	-	-	-
Lambsquarters	80	90	0	0	20	0	0
Persn Speedwell	100	-	30	100	10	0	0
Rape	0	30	0	0	0	0	0
Ryegrass	20	20	0	70	0	0	0
Sugar beet	50	80	40	55	55	0	0
Sunflower	50	0	100	-	0	0	0
Wheat (Spring)	15	0	0	0	0	0	0
Wheat (Winter)	10	0	0	0	0	0	0
Wild buckwheat	40	10	0	0	0	0	0
Wild mustard	100	100	0	100	0	0	50
Wild oat (1)	20	0	0	0	0	0	0
Wild oat (2)	0	30	0	5	0	0	0
Wild radish	100	80	0	90	0	40	0
Winter Barley	10	0	0	0	0	0	0

Table G	COMPOUND	
Rate 16 g/ha	21	74
PREEMERGENCE		
Blackgrass (1)	0	0
Blackgrass (2)	10	0
Chickweed	20	0
Downy brome	0	0
Field violet	50	0
Galium (1)	80	0
Galium (2)	30	0
Green foxtail	100	0
Kochia	-	-
Lambsquarters	40	-
Persn Speedwell	80	0
Rape	0	0
Ryegrass	0	0
Sugar beet	50	0
Sunflower	-	-
Wheat (Spring)	0	0
Wheat (Winter)	0	0
Wild buckwheat	20	0
Wild mustard	60	0
Wild oat (1)	0	0
Wild oat (2)	0	0
Wild radish	10	0
Winter Barley	0	0

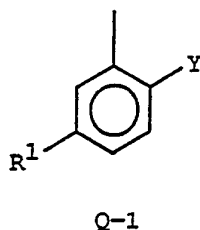
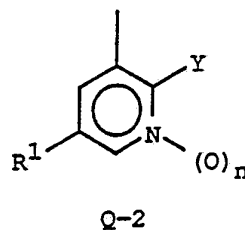
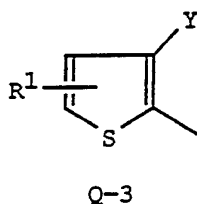
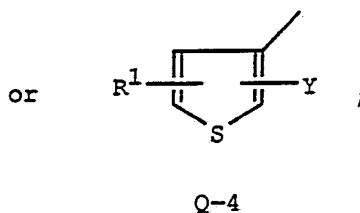
Table G	COMPOUND
Rate 8 g/ha	74
PREEMERGENCE	
Blackgrass (1)	0
Blackgrass (2)	0
Chickweed	0
Downy brome	0
Field violet	0
Galium (1)	0
Galium (2)	0
Green foxtail	0
Kochia	-
Lambsquarters	0
Persn Speedwell	0
Rape	0
Ryegrass	0
Sugar beet	0
Sunflower	0
Wheat (Spring)	0
Wheat (Winter)	0
Wild buckwheat	0
Wild mustard	0
Wild oat (1)	0
Wild oat (2)	0
Wild radish	0
Winter Barley	0

What is claimed is:

1. A method for controlling the growth of
 5 undesired vegetation by applying to the locus to be
 protected an effective amount of a compound of Formula I:



10 wherein
 Q is



15

R is H, C₁-C₂ alkyl, C₁-C₂ haloalkyl, C₁-C₂ alkoxy,
 C₁-C₂ haloalkoxy, C₁-C₂ haloalkylthio, halogen, CN
 or NO₂;

20

Y is NR⁷C(O)XR³;

X is a single bond, O, S or NR⁴;

R¹ is H, C₁-C₃ alkyl, C₁-C₃ alkoxy, C₁-C₃ haloalkoxy,
 C₁-C₃ alkylthio, C₂-C₃ alkynyl, C₂-C₃ alkoxyalkyl,

C₂-C₃ alkylthioalkyl, halogen, NO₂, CN, NHR⁵ or NR⁵R⁶;

5 R³ is C₁-C₅ alkyl optionally substituted with C₁-C₂ alkoxy, OH, 1-3 halogens, OC(O)(C₁-C₂ alkyl) or C₁-C₂ alkylthio; CH₂(C₃-C₄ cycloalkyl); C₃-C₄ cycloalkyl optionally substituted with 1-3 CH₃'s, 1-2 F's or 1-2 Cl's; C₂-C₄ alkenyl; C₂-C₄ haloalkenyl; C₃-C₄ alkynyl; C(O)(C₁-C₂ alkyl); benzyl; or a 5- or 6-membered heterocyclic ring
10 containing one heteroatom selected from O, N and S, each ring optionally substituted with halogen or CH₃;

R⁴ is H, C₁-C₂ alkyl or OCH₃;

R⁵ and R⁶ are independently C₁-C₂ alkyl;

15 R⁷ is H, C₁-C₂ alkyl or C(O)R⁸;

R⁸ is C₁-C₅ alkyl optionally substituted with C₁-C₂ alkoxy, OH, 1-3 halogens, OC(O)(C₁-C₂ alkyl) or C₁-C₂ alkylthio; CH₂(C₃-C₄ cycloalkyl); C₃-C₄ cycloalkyl optionally substituted with 1-3 CH₃'s, 1-2 F's or 1-2 Cl's; C₂-C₄ alkenyl; C₂-C₄ haloalkenyl; C₃-C₄ alkynyl; C(O)(C₁-C₂ alkyl); benzyl; or a 5- or 6-membered heterocyclic ring
20 containing one heteroatom selected from O, N and S, each ring optionally substituted with halogen or CH₃; and
25

n is 0 or 1;

provided that when R³ is C₂ alkenyl, C₂ haloalkenyl or a heterocyclic ring then X is a single bond.

2. The method of Claim 1 wherein R is C₁-C₂ haloalkyl, C₁-C₂ haloalkoxy, C₁-C₂ haloalkylthio, halogen
30 or CN.

3. The method of Claim 2 wherein R¹ is C₁-C₂ alkyl, C₁-C₂ alkoxy, C₁-C₂ alkylthio, C₂-C₃ alkoxyalkyl, C₂-C₃ alkylthioalkyl, Cl, Br, CN, NHR⁵ or NR⁵R⁶; and R⁷ is
35 H.

4. The method of Claim 3 wherein
Q is Q-1 or Q-2; and
R³ is C₁-C₄ alkyl optionally substituted with
C₁-C₂ alkoxy; CH₂ (C₃-C₄ cycloalkyl); C₃-C₄
cycloalkyl optionally substituted with 1-3
CH₃'s; or C₂-C₄ alkenyl.
5. The method of Claim 4 wherein R is C₁-C₂
fluoroalkyl, C₁-C₂ fluoroalkoxy, C₁-C₂ fluoroalkylthio,
Cl, Br or CN.
6. The method of Claim 4 wherein Formula I is 1-
methylethyl [5-methyl-3'-(trifluoromethyl)[1,1'-
biphenyl]-2-yl]carbamate.
7. The method of Claim 4 wherein Formula I is 3-
methyl-N-[5-methyl-3'-(trifluoromethyl)[1,1'-biphenyl]-2-
yl]butanamide.
8. An agriculturally suitable composition for
controlling the growth of undesired vegetation comprising
an effective amount of a compound of any of Claims 1-7
with the further proviso that when Q is Q-1, R¹ is H and
Y is NHC(O)CH₃, then R is other than Br or F, and at
least one of the following: surfactant, solid or liquid
diluent.
9. A compound of Formula I of any of Claims 1-7
with the further proviso that when Q is Q-1, R¹ is H and
Y is NHC(O)CH₃, then R is other than Br or F.

INTERNATIONAL SEARCH REPORT

PCT/US 92/10227

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5	C07C233/15; C07C275/30;	C07C233/59; C07D333/36;
	C07C271/28; A01N37/18;	C07C233/07 A01N47/00
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	C07C ; A01N	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	J. ORG. CHEM., 46(8), 1643-6 1981, STASKUN, BENJAMIN 'Empirical quantitative correlation of substituent size with proton nuclear magnetic resonance chemical shift difference between nonequivalent geminal methylene protons of hindered N-substituted acetanilides and difluorooxyboranes' see page 1646; table III ---	5
X	ACTA CHEM. SCAND., SER. B, B33(5), 352-8 1979, CHRISTENSEN, LEIF ET AL. 'Electrolytically generated nucleophiles. V. Reductive acetylation of some aliphatic and aromatic nitro and nitroso compounds' see page 353; table 2 --- -/-	5
<p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
30 MARCH 1993		15. 04. 93
International Searching Authority		Signature of Authorized Officer
EUROPEAN PATENT OFFICE		PAUWELS G.R.A.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	J. ORG. CHEM., 31(11), 3719-25 1966, SIDDALL, THOMAS H., III 'Proton nonequivalence in N-substituted amides and related compounds' see page 3718; table I ---	5
X	CHEMICAL ABSTRACTS, vol. 95 Columbus, Ohio, US; abstract no. 61643, KOST, A. N. ET AL. 'New synthesis of 2-aminobiphenyls' see abstract & ORG. PREP. PROCED. INT., 13(3-4), 203-7 1981, ---	5
A	EP,A,0 118 093 (NIHON TOKUSHU NOYAKU SEIZO K. K.) 12 September 1984 see page 19; example 29 ---	1
X	US,A,3 149 032 (W.S. WARING) 15 September 1964 see column 1, line 16 - line 36 -----	9

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

US 9210227
SA 67929

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

30/03/93

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0118093	12-09-84	JP-A- 59163359	14-09-84
US-A-3149032		None	