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SUSCEPTIBILITY OF ORNAMENTAL PLANTS TO
SIMAZINE AND OTHER CHEMICALS
ANNUALS, BIENNIALS AND HERBACEOUS PERENNIALS

by

G.W. Ivens

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Susceptibility of ornamental plants to
simazine and other chemicals

ANNUALS, BIENNIALS AND HERBACEOUS PERENNIALS

G.W. Ivens

A.R.C. Weed Research Organisation

The attached tables are a preliminary attempt to summarise the information currently available on the susceptibility of herbaceous flowers and nursery stock to simazine and other herbicides. It is intended to revise them from time to time as further information becomes available.

The author would be glad to receive reports from growers or advisory officers relating to experience with herbicides on any type of ornamental plant, whether already included in the list or not. Information will be equally welcome whether it agrees or disagrees with that presented here, but in order to prevent undue prominence being given to exceptional results, it would be appreciated if reports could be confined to first-hand experience with the species concerned.

If further copies are required they may be obtained from:-

The Information Section,
A.R.C. Weed Research Organisation,
Begbroke Hill,
Kidlington,
Oxford.

Introduction

The object of the present report is to complete the task started in W.R.O. Technical Report No. 1, of providing a summary of the results of various trials with herbicides on ornamental plants. The trials concerned include some conducted by the author, some by nurserymen in the south of England and some from Europe and the U.S.A. reported in the literature.

With the woody species dealt with in the earlier report there was a great preponderance of information on simazine. A greater proportion of herbaceous species are sensitive to simazine and, although with perennial flowers there is still a preponderance of information on this chemical, there is more often a need for some alternative. Consequently more experiments have been done with such chemicals as 2,4-DES and chlorpropham (CIPC). Relatively few annuals or biennials have a worthwhile tolerance to simazine so that information on the alternatives predominates.

Information is given on the whole range of soil-applied herbicides available in Britain and likely to be of value. Contact herbicides, such as paraquat, are not referred to as their successful use depends mainly on their application in such a manner as to avoid contact with the crop plants. Similarly, although information is available on certain other chemicals, such as trifluralin, this is not given as the chemicals are not marketed in Britain. Chloramben, however, is included as it has become available for weed control in chrysanthemums.

As in Technical Report No. 1, the frequency with which each species has given a certain response is indicated. It is evident that very different results are obtained in different experiments and these may often be due to differing weather or soil conditions. Age, size and variety of plant, period of establishment, type of spraying (overall or directed) and formulation (spray or granules) may also vary and are all important in determining susceptibility. The majority of the observations refer to overall spray applications on plants established for two weeks or more after planting. With annuals and biennials information on seedbeds (pre-emergence treatment) is also given where available.

The symbols used are much the same as those in the earlier report. The letter 'A' is an addition and indicates evidence that, when the roots are dipped in activated charcoal at the time of planting, the plant is protected against the effects of a subsequent treatment with simazine. This information is taken from an account of trials in Northern Ireland reported by Gibson (see list of References). 'V' denotes evidence of varietal differences in susceptibility.

Plants normally grown from seed (annuals and biennials) are given in a different section from perennials, the majority of which are propagated vegetatively. The division is made more on the basis of horticultural

practice than on purely botanical grounds, so that a few plants which strictly speaking are perennial are included in the annual section if they are most commonly grown for a single season from seed.

I am glad to acknowledge the help of the growers who have provided information for this report, especially Messrs. Blooms Nurseries, Ltd., Messrs. Hillier and Sons and Messrs. John Waterer, Sons & Crisp, Ltd., and am particularly indebted to Mr. G.R. Jackman of George Jackman & Son (Woking Nurseries) Ltd., for providing plants and a site for experimental work.

Key to Tables

Effects of simazine

Observations refer to doses of 1/2 - 1 lb/ac (active material) applied as an overall spray to plants established for 2 weeks or more.*

- r = resistant - no effect noted.
- ss = slightly susceptible - slight, temporary chlorosis.
- ms = moderately susceptible - more extensive chlorosis, usually with some growth reduction.
- vs = very susceptible - serious injury or growth reduction.

- r etc = single observation
- r etc = two observations
- R etc = three observations
- R etc = four or more observations
- R* etc = seven or more observations; frequently denoting treatments used extensively in practice, normally without occurrence of damage.

- A = activated charcoal on roots at planting has given protection from subsequent treatment with simazine.
- (A) = activated charcoal has reduced effect of simazine, but has not completely prevented damage.
- A = activated charcoal has not given appreciable protection.

- D = treatment in dormant season or directed application advisable.
- S = refers to pre-emergence treatment of seedbeds.
- V = evidence that some varieties are more susceptible to damage than others.

- (ss), (ms) etc = damage occurred in one trial, but was probably due, in part at least, to weather conditions.

* Note that the tables refer to lower doses than those relating to woody species in Technical Report No. 1.

Effects of other chemicals

Atrazine	$\frac{1}{2}$ - 1 lb/ac applied as for simazine
Chloramben	2 - 4 lb/ac applied as for simazine
CIPC (Chlorpropham)	1 - 2 lb/ac applied as for simazine
2,4-DES	4 - 6 lb/ac applied as for simazine
Diuron	$\frac{1}{2}$ - 1 lb/ac applied as for simazine

Table of susceptibilities

A. Annuals and biennials

Species	2,4-DES 4 lb/ac	CIPC 1-2 lb/ac	Other chemicals
Acroclinium - see Helipterum			
Ageratum conyzoides	R ms	vs ms	simazine <u>ms</u> chloramben r
Alyssum maritimum (Sweet Alyssum)	R	ms	simazine r ms chloramben r ms
Amaranthus gangeticus	r		
Antirrhinum majus (Snapdragon)	<u>R</u>	<u>R</u>	simazine <u>r</u> ms chloramben <u>r</u>
Aster - see Callistephus			
Bellis perennis	r	r	
Browallia grandiflora	-	ms	simazine ms
Calendula officinalis (Pot Marigold)	r <u>ss</u> S	r ss R ss S	simazine <u>vs</u> S chloramben ss S
Calliopsis - see Coreopsis			

Species	2,4-DES 4 lb/ac	CIPC 1-2 lb/ac	Other chemicals
Callistephus hortensis (China Aster)	R ms ss S	R r S	simazine <u>ms</u> r and ms vs S chloramben <u>r</u> and r S
Catananche caerulea - listed under perennials			
Celosia cristata (Crested Cockscomb)	R	r	simazine ms r chloramben r
Centaurea cyanus (Cornflower)	r r ms S	r <u>R</u> ss S	simazine <u>ms</u> vs S chloramben r S
" moschata (Sweet Sultan)	ms ss ms S	ss <u>r</u> S	simazine vs S chloramben r S
Cheiranthus cheiri (Wallflower)	<u>r</u> r S	r <u>r</u> <u>ss</u> S	simazine <u>ss</u> and vs ms S chloramben r S CIPC/fenuron ss and ms S CIPC/diuron ms and ms S
Chrysanthemum carinatum (Annual Chrysanthemum)	ss <u>ss</u> S	ss <u>r</u> ss S	simazine <u>vs</u> S chloramben ss S
Cleome, unspecified	r		
Coleus blumei	<u>r</u>	r	simazine r
Coreopsis tinctoria (= Calliopsis)	<u>r</u>	r ms	
Cosmos bipinnatus	r	ms	...simazine <u>ms</u>
Cynoglossum amabile (Chinese Forget-me-not)	r		simazine ms
Delphinium consolida (Larkspur)	r ss r ss S	ss <u>ss</u> ms S	simazine r and r ms S chloramben r S

Species	2,4-DES 4 lb/ac	CIPC 1-2 lb/ac	Other chemicals
Dianthus barbatus (Sweet William)	ss S	r ms r ss ms S	simazine ms vs and <u>vs</u> ms S chloramben ms S CIPC/fenuron ss and <u>vs</u> S
Dianthus chinensis (Pink)	-	ss ms	simazine ms chloramben ms
Digitalis purpurea (Foxglove)	-	r	simazine r
Dimorphotheca aurantiaca	-	r	simazine r
Godetia grandiflora	-	-	simazine vs S CIPC/diuron ms S
Gypsophila elegans	r ss ms S	ms VS S	simazine <u>vs</u> S chloramben ms S
Helianthus annuus (Sunflower)	vs	<u>r</u> S	simazine <u>vs</u> S chloramben <u>r</u> S prometryne <u>r</u> S linuron ss S
Helipterum roseum (= Acroclinium roseum)	ms	-	simazine ms
Iberis umbellata (Candytuft)	-	r	simazine ms
Impatiens balsamina (Balsam)	r ms	r	simazine r ms chloramben r
Lathyrus odoratus (Sweet Pea)	ss <u>r</u> S	r ms <u>r</u> S	simazine ss and r ss S chloramben r S
Limnanthes douglasii (Poached Egg Plant)	-	-	chloramben r
Lobelia erinus	<u>r</u> ms	-	simazine ms

Species	2,4-DES 4 lb/ac	CIPC 1-2 lb/ac	Other chemicals
Lobelia ilicifolia	-	r	simazine ms
Lupinus hirsutus	-	r ss	simazine <u>r</u> chloramben ss
" luteus	ms	r ss	simazine <u>r</u> chloramben ss
Marigold - see Calendula and Tagetes			
Matthiola incana (Stock)	ss <u>r</u> vs S	ss <u>vs</u> S	simazine <u>ms</u> and ms vs S chloramben ms S
Myosotis sylvatica (Forget-me-not)	-	ms	simazine ms
" unspecified	-	r	simazine vs
Papaver somniferum (Opium Poppy)	-	-	chloroxuron r
Petunia, hybrids	<u>R</u> ms	<u>MS</u> r	simazine <u>R</u> ms chloramben <u>R</u> ms ss
Phlox drummondii	R	<u>ms</u> vs	simazine MS r chloramben ms
Primula malacoides	-	-	simazine ms
Ricinus communis (Castor Oil Plant)	ms	r	chloramben r
Rudbeckia bicolor	-	-	chloramben r simazine r
Salvia splendens (Scarlet Sage)	R ss	<u>vs</u> r	simazine <u>r</u> ss chloramben R
Scabiosa atropurpurea (Annual Scabious)	r r ms S	r r ss vs S	simazine <u>vs</u> S chloramben r S
Silybum marianum (Blessed Thistle)	-	r	

Species	2,4-DES 4 lb/ac	CIPC 1-2 lb/ac	Other chemicals
Tagetes erecta (African Marigold)	<u>R</u> ms ss	R	simazine <u>r</u> <u>ms</u> chloramben <u>R</u> ms
" patula (French Marigold)	<u>R</u>	r	simazine R chloramben <u>R</u>
" signata	ss	r S	simazine r and <u>vs</u> S
	ms S		chloramben r and ms S
Torenia fournieri	r		
Tropaeolum majus (Nasturtium)	r		
Verbena hybrida	-	r ms	simazine r
Viola tricolor (Pansy)	r ms	<u>ms</u> r	simazine VS ms ss r chloramben <u>vs</u> r
Zinnia elegans	<u>R</u> ms ms S	R r	simazine <u>ms</u> <u>r</u> ss and ss ms S chloramben R <u>ss</u>

B. Perennials

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
Achillea filipendulina (= A. eupatorium)	<u>r</u>	
" 'Moonshine'	r	
" ptarmica	r ms	
" unspecified	r	2,4-DES r
Aconitum fischeri (Monkshood)	ss (A)	
" napellus	r	
" variegatum bicolor (= A. bicolor)	r	

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
Agapanthus, unspecified	r	
Ajuga, unspecified (Bugle)	ss	
Althaea rosea (Hollyhock)	r ms	2,4-DES <u>r</u>
Alyssum saxatile (Gold Dust)	ms	2,4-DES r, CIPC ms
Anaphalis triplinervis (Pearly Everlasting)	ms vs A	
" yedoensis	ms	
Anchusa azurea (Alkanet)	<u>ms</u> r V	2,4-DES r
" barrelieri	-	2,4-DES r
" myosotidiflora - see Brunnera macrophylla		
Anemone appenina	-	2,4-DES r
" hupehensis japonica (= A. japonica)	r	2,4-DES <u>r</u>
Anthemis tinctoria (Chamomile)	r vs A	
Aquilegia, hybrids (Columbine)	<u>MS</u> A	CIPC <u>r</u>
" unspecified	r	2,4-DES r
Arabis muralis (= A. rosea)	ms	CIPC ms
Arenaria unspecified (Sandwort)	ms	2,4-DES r, CIPC r ms diuron ms
Artemesia albula	-	2,4-DES r
" lactiflora	(ss)	
" unspecified	ms	
Aruncus sylvester (= Spiraea aruncus)	r (ss)	
Asclepias tuberosa (Butterfly weed)	-	2,4-DES
Aster acris	r	
" amellus	r	

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
Aster cordifolius	r	
" Dumosa hybrids	r	
" x frikartii	-	2,4-DES r
" novae-angliae	r	2,4-DES r
" novi-belgii (Michaelmas Daisy)	R <u>ss</u> ms V	2,4-DES <u>r</u> , CIPC r
" yunnanensis 'Napsbury'	r	2,4-DES r CIPC/fenuron ss
" unspecified	ms	2,4-DES r, CIPC r
Astilbe, hybrids (inc. A. arendsii)	R (ms)	CIPC r
Astrantia major (Masterwort)	r	
Aubrietia deltoides	vs	
Baptisia australis	-	2,4-DES r
Begonia, hybrids	r	
Bergenia ligulata	r	
" 'Morgenrood'	r	
" stracheyi	r	
Betonica robusta - see Stachys macrantha		
Brunnera macrophylla (= Anchusa myosotidiflora)	r ms	2,4-DES r
Bupthalmum salicifolium	r	
" speciosum	(ss)	
Caladium, unspecified	-	atrazine r chloramben r diuron ms
Caltha palustris (Kingcup)	(ms)	
Campanula carpatica	r ms	CIPC r
" glomerata dahurica	r	
" grandiflora - see Platycodon grandiflorus		
" grandis (= latiloba)	(ms)	

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
Campanula lactiflora	(ss)	
" latifolia 'Brantwood'	(ms)	
" persicifolia	r vs (A)	2,4-DES r
" porscharskyana	r	
" portenschlagiana (= C. muralis)	r	
" unspecified	ss	
Catananche caerulea (Cupid's Dart)	-	2,4-DES r
Centaurea dealbata	(ss)	2,4-DES r
" glastifolia	(ms)	
" montana	r	
" ruthenica	r	
" unspecified	r	
Cerastium tomentosum (Snow in Summer)	-	2,4-DES r
Chelone barbata - see Penstemon barbatus		
" obliqua	r	
Chrysanthemum coccineum (= C. roseum) (Pyrethrum)	R MS vs ss V A	2,4-DES <u>r</u> , CIPC r ss
" maximum (Shasta Daisy)	R* <u>ss</u> ms vs V (A)	2,4-DES <u>R</u> CIPC r ms, diuron ms
" maximum 'Cobham Gold'	ms	
" morifolium (Autumn Flowering Chrysanthemum)	<u>MS*</u> SS <u>r</u> vs	2,4-DES <u>R*</u> , CIPC <u>R*</u> chloramben R diuron MS r
" uliginosum (Moon Daisy)	r	
Cimicifuga foetida (= C. simplex) (Bugbane)	(ms)	
" racemosa	-	CIPC r
Clematis recta	-	2,4-DES r
Convallaria majalis (Lilly of the Valley)	-	2,4-DES r ss, CIPC <u>R</u>

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
Coreopsis grandiflora " verticillata " unspecified	R r vs (A) vs	2,4-DES r
Dahlia, hybrids	<u>R*</u> SS <u>ms</u> D V	2,4-DES R, CIPC R chloramben r diuron r
Delphinium, hybrids	<u>R</u> <u>ms</u> V	2,4-DES R, CIPC <u>r</u> <u>ms</u> diuron ms
Dianthus x allwoodii " caryophyllus (Carnation) " deltoides (Maiden Pink) " plumarius (Garden Pink) " unspecified	- ms ms r r ms	2,4-DES r 2,4-DES ms CIPC ms 2,4-DES r, CIPC r
Dicentra eximea " spectabilis (Bleeding Heart)	(ms) ss ms	2,4-DES r, diuron ms
Dictamnus albus (= D. fraxinella) (Burning Bush)	(ms)	2,4-DES r
Digitalis lutea (Yellow Foxglove)	r	
Diplarrhena moraea	ss A	
Doronicum plantagineum 'Excelsum' (= 'Harper Crewe') " unspecified	r -	CIPC r
Echinacea purpurea " other spp. see Rudbeckia	<u>r</u>	2,4-DES r
Echinops humilis (Globe Thistle) " ritro	<u>r</u> r	
Erigeron, hybrids	<u>R</u> <u>ms</u> vs V (A)	2,4-DES r
Eryngium amethystinum (Sea Holly) " x oliverianum " planum	r r r	

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
Eryngium tripartitum	r	
" 'Violetta'	r	
" unspecified	R	
Eupatorium coelestinum	-	2,4-DES r
" purpureum	r	
Festuca glauca	ms	
" scoparia	ms	
Filipendula purpurea (= Spiraea palmata)	(ms)	
" vulgaris (= Spiraea filipendula)	-	2,4-DES r
Gaillardia aristata	R ss	2,4-DES r, CIPC R
Geranium endressii	(ss)	
" ibericum	r	2,4-DES r
" renardii	r	
" unspecified	r	
Geum x borisii	r ss	
" hybrids	r (ms)(vs) V A	
" montanum	-	2,4-DES r
" unspecified	r	
Gypsophil pacifica	r	CIPC ms
" paniculata	R	
Helenium autumnale	-	CIPC r
" hybrids	<u>r</u> vs A	
" tenuifolium	-	2,4-DES r
Helianthella quinquenervis	r	
Helianthemum chamaecistus (Rock Rose)	r	
Helianthus decapetalus (= H. multiflorus)	r	2,4-DES r
" 'Monarch'	r	

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
Helianthus salicifolius (= H. orgyalis)	r	
" unspecified	r ms V	
Heliopsis patula	(ss)	
" scabra	(ss) ms	2,4-DES r, CIPC r
Helleborus orientalis (Lenten Rose)	ss A	
" unspecified	R	2,4-DES r
Hemerocallis fulva (Day Lily)	r	
" hybrids	<u>R</u>	CIPC r ms
" middendoriana	r	
" minor	r	
" unspecified	<u>r</u>	chloramben r
Heuchera sanguinea (Alum Root)	<u>R</u> vs A	2,4-DES <u>r</u> , CIPC <u>ms</u> r
Hibiscus, unspecified	-	2,4-DES r
Hollyhock - see Althaea		
Hosta albomarginata (Plantain Lily)	r	
" fortunei	<u>r</u>	
" lancifolia	r	2,4-DES r
" sieboldiana (= H. glauca)	r	
" undulata	r	
" ventricosa	r	
" unspecified	<u>r</u>	CIPC r
Iberis sempervirens (Candytuft)	<u>r</u> ms	2,4-DES <u>r</u> , CIPC <u>ms</u> r diuron ms
Inula helenium (Elecampane)	r	
Iris chamaeiris (= I. pumila)	R	CIPC r
" germanica (Flag Iris)	<u>R</u>	2,4-DES r, CIPC <u>r</u>
" graminea	(ms)	
" japonica	-	2,4-DES r
" kaempferi	<u>r</u> ss	CIPC r
" laevigata	r	
" 'Margot Holmes'	r	
" monnieri	(ss)	

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
<i>Iris ochroleuca</i>	(ms)	
" <i>orientalis</i> (= <i>I. sanguinea</i>)	r	
" <i>sibirica</i>	<u>R</u>	
" <i>spuria</i>	r	
" 'Tol Long'	ms	
" <i>unguicularis</i> (= <i>I. stylosa</i>)	r ms	
" unspecified	<u>r</u>	2,4-DES R, CIPC r diuron r, chloramben r
<i>Kniphofia</i> , hybrids (Red Hot Poker)	<u>r</u>	
" <i>rufa</i>	r	
" <i>tuckii</i>	r	
" <i>uvaria</i>	r	
" unspecified	<u>r</u>	2,4-DES r
<i>Leucojum aestivum</i> (Summer Snowflake)	-	CIPC r
<i>Liatris pycnotstachya</i>	-	2,4-DES r
" <i>scariosa</i>	-	2,4-DES r
" <i>spicata</i>	ms	
" unspecified	<u>r</u>	
<i>Libertia formosa</i>	r	
<i>Lilium longiflorum</i>	ss	2,4-DES r, CIPC ms diuron r
" unspecified	r	2,4-DES r
<i>Limonium incanum</i> (= <i>Statice incana</i>)	r	
" <i>latifolium</i>	r	
" <i>tataricum</i>	r	
<i>Linum perenne</i>	-	2,4-DES r
<i>Liriope muscari</i> (<i>Ophiopogon spicatus</i>)	-	CIPC r
<i>Lupinus</i> , hybrids	R §	CIPC/fenuron vs
<i>Lychnis chalcedonica</i> (Jerusalem Cross)	r ms (ms)	
" <i>coronaria</i> (Rose Campion)	vs (ms)	2,4-DES r
" <i>viscaria</i>	ms	
<i>Lycoris squamigera</i> (Spider Lily)	-	2,4-DES r

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
Lysimachia clethroides	r	
" punctata	r	
Lythrum salicaria (Purple Loosestrife)	<u>r</u> ss vs (A)	2,4-DES r
Macleaya cordata (Plume Poppy)	r	2,4-DES r
Malva alcea fastigiata	r	
Mentha, unspecified	r	
Mertensia virginica	-	CIPC r
Monarda didyma (Bee Balm)	R vs (A)	2,4-DES r
" fistulosa (Bergamot)	r	
Montbretia, hybrids	vs A	
Nepeta x faassenii (Catmint)	r	2,4-DES r, CIPC r
" 'Six Hills Giant'	r	
Oenothera fruticosa (inc. Knieffia linearis)	r	
" unspecified (Evening Primrose)	r	
Pachysandra terminalis	<u>r</u>	2,4-DES r ms, CIPC r diuron r
Paeonia, hybrids (Paeony)	<u>R*</u> <u>ss</u> D	2,4-DES r, CIPC <u>R</u> chloramben r, diuron <u>r</u>
" lactiflora (= P. albiflora)	R	2,4-DES r, CIPC r ms chloramben r, diuron <u>r</u>
Papaver orientale (Poppy)	<u>ms</u> <u>ss</u> (ss) vs r (A)	2,4-DES r chloramben r
Penstemon barbatus (= Chelone barbata) (Turtle Head)	r	2,4-DES r
" hybridus	vs A	
" unspecified	r	

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
Phlox paniculata (= P. decussata)	<u>VS</u> <u>ms</u> <u>ss</u> r A	2,4-DES R, CIPC <u>vs</u> ms
" subulata	-	2,4-DES r, CIPC ms
Physostegia virginiana	<u>r</u> (ms) V	
Platycodon grandiflorus (Campanula grandiflora)	r	2,4-DES r
Polemonium coeruleum (Jacob's Ladder)	r	2,4-DES r
Polianthes tuberosa (Tuberose)	-	CIPC r
Polyanthus - see Primula		
Polygonatum multiflorum (Solomon's Seal)	-	CIPC r
Polygonum affine	r	
" bistorta (Bistort)	r	
" campanulatum	(ss)	
Potentilla atrosanguinea	-	2,4-DES r
" hybrids	(ms)	
" unspecified	r	
Poterium - see Sanguisorba		
Primula auricula (Auricula)	r	
" candelabra types	ms	
" Polyanthus hybrids	r ss ms	2,4-DES r, CIPC r
" veris (Cowslip)	ms	CIPC r
" vulgaris (Primrose)	<u>ss</u>	
Pulmonaria angustifolia	(ss)	
" saccharata	(ms)	
Pyrethrum - see Chrysanthomum coccineum		
Ranunculus acris 'Flore Pleno'	(ms)	
" asiaticus	ss	2,4-DES r, CIPC r

Species	Simazine ½-1 lb/ac	Other chemicals
Rudbeckia deamii	r	
" laciniata	-	2,4-DES r
" nitida 'Herbstsonne'	r	
" purpurea - see Echinacea		
" speciosa	-	2,4-DES r
" sullivantii	<u>r</u>	
" unspecified	<u>r</u>	CIPC r
Sagina subulata	vs	
Salvia azurea grandiflora	-	2,4-DES r
" haematodes	(ss)	
" pratense	-	2,4-DES r
" x superba (S. nemorosa)	r	
" unspecified	r	2,4-DES r
Sanguisorba obtusa (= Poterium obtusum)	(ms)	
Scabiosa caucasica (Scabious)	R <u>ss</u> (ms) vs V A	2,4-DES R
Sedum acre (Wall Pepper)	r	
" album (Stonecrop)	r	
" 'Autumn Joy'	r	
" sieboldii	r	
" spectabile	<u>R</u>	2,4-DES r
" unspecified	<u>r</u>	2,4-DES r, CIPC r diuron ms
Sidalcea, hybrids (Greek Mallow)	<u>R</u>	
Solidago, hybrids (Golden Rod)	R ms	
X Solidaster luteus (= Aster hybridus luteus)	(ss)	
Spiraea aruncus - see Aruncus		
" filipendula - see Filipendula		
" palmata - see Filipendula		
Stachys lanata (Lamb's Tongue)	vs (A)	2,4-DES r
" macrantha (= Betonica robusta)	r	

Species	Simazine $\frac{1}{2}$ -1 lb/ac	Other chemicals
Statice - see Limonium		
Thalictrum aquilegifolium (Meadow Rue)	(ss)	2,4-DES r
" glaucum	(ss)	2,4-DES r
" minus	r	2,4-DES r
" unspecified	r	
Thermopsis caroliniana	-	2,4-DES r
Tradescantia virginiana	R	
Tritoma - see Kniphofia		
Trollius asiaticus (Globe Flower)	(ms)	
" europaeus	r (ms)	CIPC r
" hybrids	r ms (ms) (A)	
" unspecified	ms	
Valeriana officinalis (All Heal)	r ms	CIPC <u>r</u>
Verbascum, hybrids (Mullein)	R ss ms	
" vernale (= V. chaixii)	r	
Veronia crinita (= V. arkansana)	(ss)	
Veronica 'Barcarolle'	r	
" incana	r	2,4-DES r
" longifolia subsessilis	-	2,4-DES r
" prostrata (= V. rupestris)	r	
" spicata	<u>ms</u> r	2,4-DES r, CIPC ms
" unspecified	ms	
Vinca minor (Periwinkle)	<u>R</u>	2,4-DES ms, CIPC r ms
" unspecified	ss	
Viola cornuta	ms	CIPC ms
" odorata (Sweet Violet)	r	2,4-DES r
" tricolor (Pansy) - see annuals		CIPC/fenuron ms
" Violetta hybrids	ms	

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