On Turf, Shrubs, Vines and Trees . . .

MAINTAIN SUCCESS BOOSTING

EDITOR'S NOTE: Interest has been rising almost in direct proportion to the favorable research and experience with growth retardants—and that's a pretty exciting statement! One such product, MAINTAIN, caused a great deal of comment at two recent conferences, the Southern Weed Conference and the North Central Weed Control Conference. U. S. Borax representatives reported research on different formulations of MAINTAIN for use on turf, broadleaf weeds, ornamentals and trees. Because of the interest, we're publishing the complete paper.

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GREENHOUSE and preliminary field testing of chlorflurenol, a new growth retardant, (methyl 2-chloro - 9 - hydroxyfluorene - 9 - carboxylate) was begun by U. S. Borax Research Corporation in 1966. Discovered by E. Merck of Darmstadt, West Germany, the product is now known by the trade name MAINTAIN CF 125.

Research plots were established in 1968 to determine dates and rates best suited for various grass species in the major soil and climatic zones in the United States and Canada. From these tests it was established that the optimum combination rate of one lb/A of MAINTAIN CF 125 plus 3 lbs/A of MAINTAIN 3 (maleic hydrazide) was the most promising.

USDA registration has been obtained for use on turf and associated broadleaved weeds for MAINTAIN CF 125 and MAINTAIN 3.

MAINTAIN CF 125 applied as a foliar spray has proved to be an effective method of retarding the growth of a broad spectrum of woody plants at very low rates. MAINTAIN CF 125 is absorbed and translocated rapidly to the terminal growing points where it interferes with the growth process. Foliage of a treated woody plant is usually darker green in color and remains retarded from two months to a full growing season.

MAINTAIN A is a formulation of chlorflurenol used with an asphalt emulsion as a tree wound dressing. It effectively inhibits growth of sprouts from the exposed cambium, and reduces the number and length of sprouts developing as a result of the pruning cut.

MAINTAIN S, a formulation of chlorflurenol in a solvent system, effectively penetrates the bark of woody plants and moves rapidly to the terminal growing points and inhibits new growth.

In 1968, MAINTAIN CF 125 and MAINTAIN 3 were used at several rates and dates, alone and in combination, throughout the United States and Canada in four major regions — the Northwestern, North Central, Northeastern and Southern. Plots were 100 sq. ft., with either a three or five-foot control strip adjacent to each side of the plot to provide maximum accuracy in plot evaluations. Seventeen grass species were tested and some 35 broadleaved weed species, which were associated with the grasses, were tested.

In 1969, emphasis was placed on test plots of one acre or more which were applied with field-scale equipment available to the cooperator.

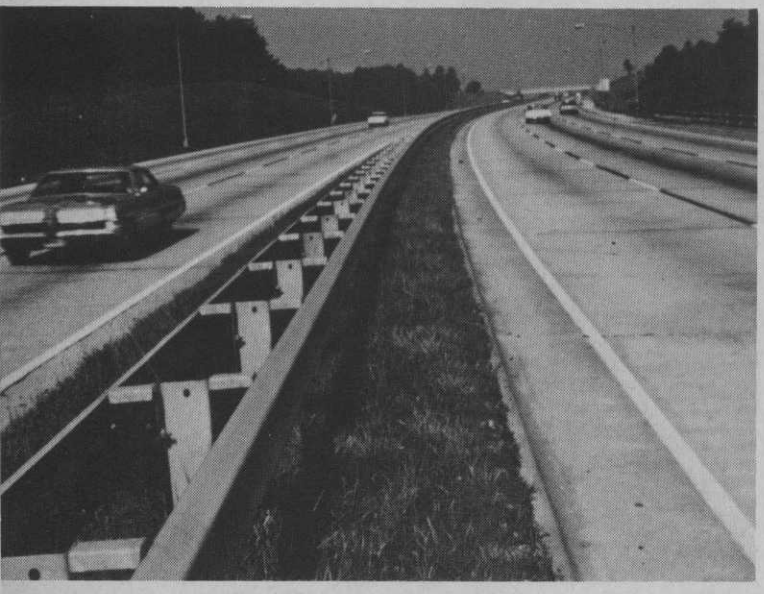
In 1970, the emphasis was geared to expanding field use and experiences.

Use of MAINTAIN CF 125 in combination with MAINTAIN 3 has been found to be economically effective in retarding grasses. Optimum retardation is obtained when treatments are made after spring mowing.

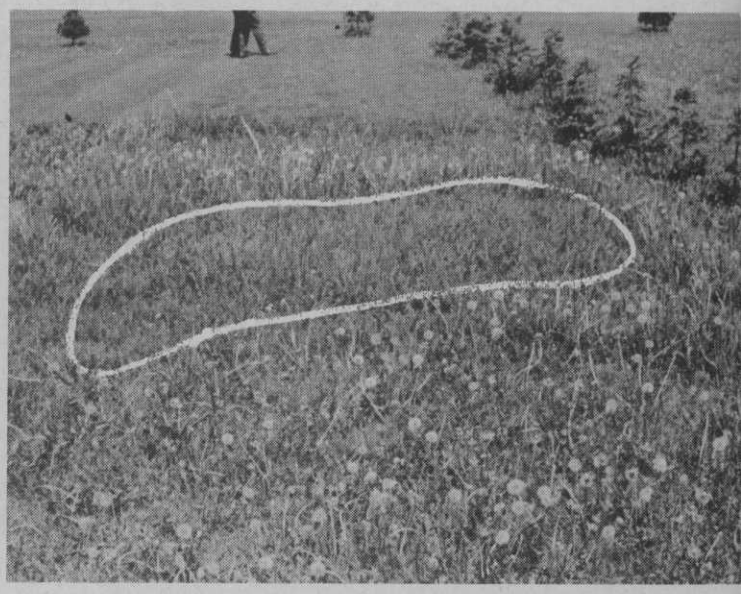
The MAINTAIN combination treatment does the following:

1. Interferes with the development of early growth stages of grasses, keeping the vegetative growth short and inhibiting the development of seed heads.

2. The active material translocates to the growing points of grass and



This median on a highway near Atlanta, Ga., was treated with 2 lbs./acre of MAINTAIN CF 125. In saving several mowings, it meant increased safety for workmen and traffic.



MAINTAIN 3 and CF 125 demonstrated excellent dandelion control at 1 gal. of each per acre at Rosemere in Quebec, Canada. Plots were treated in September and evaluated in July.

GROWTH RETARDANTS

primarily retards the top growth, thus leaving the root system vigorous for a healthy turf.

3. It keeps turf greener for an extended period of time.

4. It controls unwanted annual grasses and broadleaved weeds in the turf, thus improving the turf appearance and making moisture and nutrients available to the turf which would otherwise be utilized by undesirable weeds.

5. It gives consistent season-long control of a broad spectrum of broadleaved weeds, such as dandelion, dock, black medic, oxalis, etc.

6. It permits the more efficient use of men and equipment.

7. For practical purposes, it is nonvolatile, therefore, much safer to use than such products as 2,4-D.

8. It has a short life in the soil, thus eliminating the residual problem associated with many pesticide products.

TABLE I — Effective MAINTAIN CF 125 Foliar Application Rates

Species	pts./100 Gal.*	Species	pts./100 Gal.*
Deciduous Hardwood		Shrubs	
Alder, Red	4-8	Abelia	1-2
Ash	1-3	Acacia	1-3
Cottonwood, Black	6-8	Calliandra	½-1
Elm, Siberian	2-4	Crape Myrtle	1-2
Maple, Big Leaf	1-2	Elaeagnus	1-2
Vine	1-2	Eugenia	½-1
Silver	2-4	Eunonymus	1-2
Willow, Golden	2-4	Hibiscus	½-1
Gymnosperms		Jasmine	1-2
Fir	⅓-1	Melaleuca	1-2
Juniper	⅓-1	Oleander	4-8
Pine	⅓-1	Plumbago	1-2
Spruce, Sitka	⅓-1	Privet	½-1½
Redwood	⅓-1	Pittisporum	1-2
Vines and Ground Cover		Xylosma	1-4
Ice Plant	2-4		
Ivy, Algerian	4-8		
English (Hahns)	1-2		

* Rates: 1 pint/100 gallons of water = 1 tsp./gallon = 150 ppm

Woody Plant Research

Preliminary tests in 1966 and 1967 with foliar applications of MAINTAN CF 125 indicated that it was a very active and effective growth inhibitor of woody plant species. In 1969, a major research effort was directed toward finding the most suitable rate, date, and type of application for the various species.

Species selected in various areas of the U.S. and Canada were those considered to be major problem trees in the cooperator's area of operation.

The 1970 woody plant testing program was limited to three MAINTAIN CF 125 formulations.

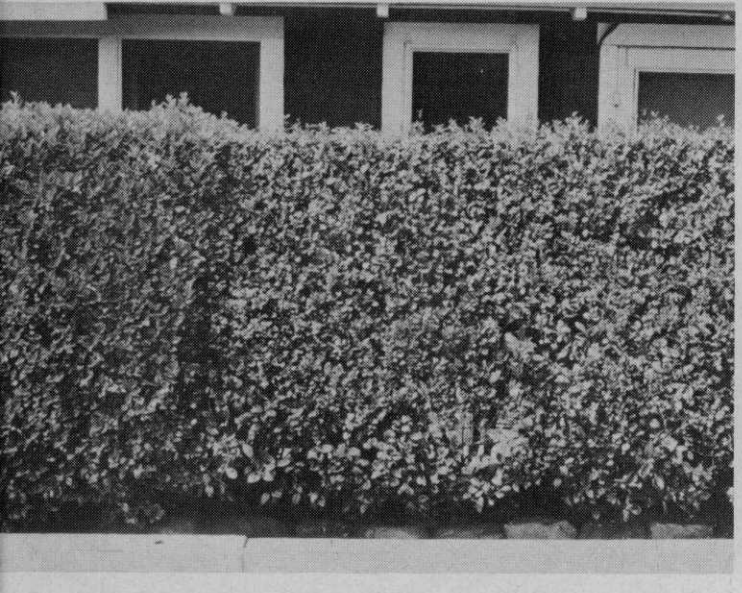
1. MAINTAIN CF 125 as a foliar spray at 10—1,250 ppm.

2. MAINTAIN A a O.25% and 1% asphalt tree wound dressing applied with an aerosol spray can or a paint brush.

3. MAINTAIN S as a 0.25% solvent formulation was tested as an aerosol spray, and as a concentrate to be diluted in No. 2 diesel fuel and applied with a conventional knapsack sprayer to bark only.

MAINTAIN CF 125 Foliar Applications

Cumulative research data from MAINTAIN CF 125 applied as a



CF 125 gave this kind of control at 100 ppm on this privet hedge in Monrovia, Calif.

Silver maple in the Davey Tree Expert Company test on the left got 200 ppm. The untreated is at right.

foliar spray from 1967 through 1970 have established the efficacy of the product on vines, shrubs and trees.

A foliage spray should be made after a flush of growth or after pruning and the new leaves have fully developed so that the plant is in the desired density, size and shape. Tender new growth may curl or twist. Flowering species treated before bud expansion may have a blossom reduction.

Applications generally maintain woody plants by inhibiting terminal growth that develops after treatment. In general, retardation holds for two months (on rapidly growing and frequently trimmed hedges), to six months on vines such as Algerian Ivy, or a year or more on deciduous hardwoods.

Gymnosperms (conifers, junipers, etc.) must be treated before buds expand in order to prevent distortion of new growth. Treatment when candles are tender often causes developing branches to droop.

Table I summarizes effective application rates for various species which have been successfully treated under field conditions.

Table III — 1970 Summary of Percent Growth Retardation from Use of MAINTAIN S

Species	Evaluation Months After Treatment	Percent Retardation	
		Sprout Length	Sprout Number
Ash	8	100	100
Camphor	3	4	78
Live Oak	5½	38	27
Osage-Orange	2½	100	100
Osage-Orange	2½	100	100
Scotch Pine	5	54**	
Scotch Pine	5	92**	
Sweet Gum	5½	0	91
Water Oak	5½	100	100
Water Oak	5½	63	83
Water Oak	3	100	100

* Knapsack Applications ** Twig Measurements

MAINTAIN A for Tree Wounds

This formulation was well received by people in the tree trimming industry as they are conditioned to painting cuts or "shiners" to keep them inconspicuous to casual observers, and to prevent infection by bacteria and fungi.

MAINTAIN A has effectively retarded sprouting and/or epicormic branching in the following species:

American elm, *Ulmus americana;* ash, *Fraxinus* spp.; bigtoothed aspen, *Populus grandidentata;* black locust, *Robinia pseudacacia;* black walnut, *Juglans nigra;* box elder, *Acer negundo;* camphor, *Camphor officinarum;* Chinaberry, *Melia azedarach;* decorative olive, *Oleaceae spp.;* golden willow, *Salix lasiandra;* hickory, *carya spp.;* Laurel oak, *Quercus laurifolia;* live oak, *Quercus virginiana;* osage-orange, *Maclura pomifera;* Norway maple, *Acer platanoides;* post oak, *Quercus stellata;* red oak, *Quercus rubra;* salt cedar, *Tamarix gallica;* silver maple, *Acer saccharinum;* sweet gum, *Liquidambar styraciflua;* sycamore, *Platanus* spp.; water oak, *Quercus nigra;* wild cherry, *Prunus emarginata;* yellow poplar, *Liriodendron tulipifera.*

Results indicate that MAINTAIN A:

1. inhibits the number and length of cambial and epicormic sprouts;

2. translocates primarily upward, but also to some extent downward

Annual bluegrass control is demonstrated here with CF 125.

This is 2½ months after a MAINTAIN combination treatment of annual grasses along a California roadside.

from the painted cut to inhibit sprout development;

3. with 0.25% active ingredients gives adequate results;

4. aerosol spray and paint brush methods of application are both acceptable in the trade.

5. is a safe and effective chemical tool that assures maximum longevity and satisfactory appearance of a tree properly pruned.

Individual trees differ in growth habit, and many factors influence their growth and vigor. However, MAINTAIN A has proved its efficacy and superiority to accepted standards on many tree species under many conditions, including those considered to be major problems in the test regions. MAINTAIN A tends to promote healing of wounds.

Table II summarizes the percentage retardation obtained.

Table II — 1970 Summary of Percent Growth Retardation From Use of MAINTAIN A

Species	Evaluation Months After Treatment	Percent Retardation	
		Sprout Length	Sprout Number
Ash	8	76	83
Camphor	3	28	56
Live Oak	5½	13	37
Osage-Orange	2½	62	54
Norway Maple	3½	39	37
Silver Maple	1	65	52
Silver Maple	5	31	52
Sweet Gum	5½	0	72
Water Oak	6	20	74
Water Oak	6*	25	96
Water Oak	5½	94	88
Water Oak	5½	25	92
Water Oak	3	0	92
Water Oak	3	17	84

* 1% active ingredient

MAINTAIN S for Bark Treatment

MAINTAIN S has shown considerable potential on gymnosperms an deciduous hardwoods in retarding the growth at the terminal growing points and retarding sprouts which result from trimming.

Aerosol and knapsack spray methods have both been very effective. The knapsack applications are more effective when applied as a barkband treatment. This may be due to higher amounts of material being applied by this method.

A full season of growth control has been obtained from a single application.

Caution — MAINTAIN S is for bark treatment only; applications to foliage will cause burning. The product retards only that portion of the plant which develops after treatment.

Three different methods of applying MAINTAIN S were used successfully in 1970:

1. Bark band—main truck or specific limb treatments — material translocates to growing points and retards new growth.

2. Growth director—application to inside only of a "V" trimmed tree under a power line, or the side of a tree next to a building or power line. Use of this technique causes the growth to be "directed to untreated parts of the plant.

3. Pruned cuts — retards sprouts and epicormic branch development on and near the cut surface.

Table III summarizes the percentage retardation obtained from MAINTAIN S.

Although a heavy rate was used, a MAINTAIN combination treatment around trees in Vancouver, B.C., was satisfactory in appearance.

Crape Myrtle hedge on the left side of the foot bridge shows control with 300 ppm of CF 125, compared with the untreated hedge on the right side.