blotch. To verify that the seedlings were infected with the virus, eight healthy avocado seedlings were inoculated with buds and bark patches from each seedling with symptoms. After two months, the 16 test seedlings exhibited sunblotch symptoms, thereby confirming the presence of the virus in the two seedlings.

The remaining 109 progeny seedlings from the pollen recipient tree which did not exhibit symptoms of sunblotch were budded with healthy Fuerte variety buds to see if they were carrying the virus in the manner of symptomless carrier trees. To date, these are all negative for sunblotch, but are still under observation. All of the seedlings in the 1977 control group have also been negative for sunblotch.

The whole experiment was repeated during the 1978 growing season, and a crop of 64 seed was harvested. These were planted along with 20 seed from the healthy Zutano control tree. Two seedlings grown from the 1978 crop exhibited symptoms of sunblotch and are known to be infected. The remaining 62 progeny seedlings from the pollen recipient tree and the 20 control seedlings have not exhibited symptoms. The 62 symptomless seedlings from the 1978 crop are also being tested to see if they are carrying the virus in the manner of symptomless carrier trees. So far, results are negative.

The experiment has been repeated during the 1979 growing season with the only essential difference being that the virus-infected pollen donor trees are all recovered, symptomless carrier trees.

Subsequent to the fruit harvests from both the 1977 and 1978 growing seasons, tests were made to determine whether the Zutano pollen recipient tree had become infected with the virus while pollen transmission was occurring. After the 1977 harvest, 12 healthy seedlings were inoculated with five buds each from the pollen recipient tree. Each bud was from a separate budstick, and thus 60 budsticks in all were utilized. So far, all of these test seedlings are negative.

Similar tests following the 1978 harvest are underway, and the test seedlings are still under observation. To date, there is no evidence that the virus has moved into the pollen recipient tree. However, because definitive evidence concerning possible transmission of the virus to the pollen recipient tree is of considerable importance, additional tests will be conducted following the harvest of fruit from the 1979 growing season.

Pollen transmission of sunblotch virus in avocado has thus been experimentally demonstrated. Fortunately, the indicated rates (1.8 percent for 1977 and 3.125 percent for 1978) were rather low, but the fact that it does occur is of considerable practical importance. It would appear to be of special importance in the Indexing Program to establish virus-free sources of seed and budwood. Perhaps the regulation regarding the minimum distance between a candidate tree and a known or suspected virus-infected tree should be reconsidered. The present minimum distance of 50 feet, which precludes natural root grafting, seems to be a rather small distance in view of possible pollen transmission of sunblotch virus.

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Warm season turf growth control with Embark

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Santa Ana hybrid bermudagrass, foreground (left), is untreated while that at right had been sprayed with Embark at the rate of 0.75 pound per acre four weeks previously.

Chemical growth regulation of turfgrass has been studied and practiced since the 1950 s, especially on untrafficked turfs such as alongside highways, under and around fences, and in cemeteries. In closely cut, highly trafficked turfgrass swards, however, growth reduction has not been practiced because of turf discoloration from available chemicals, and the restricted recuperative ability of turf following wear damage. The two compounds that have been available for turf growth control for years have been MH and cloroflurenol. A new chemical, Embark, diethanolamine salt of [N-[2,4-dimethyl-5[[(triflurome-thyl)-sulfonyl] amino] phenyl] acetamide] became commercially available in California in 1978. Embark has caused growth inhibition and short-term discoloration; its label, therefore, specifies a single application per season, thereby minimizing hazards from unknown root growth and recuperative factors.

Methods

Several field trials to evaluate Embark were conducted from 1975 to 1977 on turf sites in southern California. The compound was applied with a CO_2 pressurized sprayer at a volume of 100 gal/A to 5-x-10-foot plots, using five replications in each experiment. Treatments were made two or three days after mowing because preliminary results showed that applications immediately after mowing were less successful. Normal turfgrass maintenance, including fertilization and irrigation, was followed to insure good growth during the trial. Color, leafblade height, seedhead height and density, and dry weight were measured at various times following chemical applications.

Results

Treated Santa Ana hybrid bermudagrass turf (table 1) showed a slight deterioration of green color in the second or third week after Embark application. This typical response for bermudagrass lasted about one week and was followed by recovery to a good green color. Mowing at four weeks resulted in a retention of good color on treated turf, while the taller, not-treated turf had a poor color for one week. Turf was mowed four weeks after treatment because of uneven growth caused by the gradual loss of inhibition.

Leafblade height was reduced by 56 percent four weeks after treatment. Seedhead density and frequency were also reduced by Embark, and clippings at four weeks weighed 57 percent less than those from the untreated plots. Reductions in height and density of bermudagrass seedheads, although frequently observed, have not been consistent.

Chlorflurenol sprays at 1 and 2 lb/A on common bermudagrass did not influence turf color (table 2). Temporary discoloration was found in common bermudagrass with Embark applied at 1 lb/A, and with a combination of 0.5 lb/A each of chlorflurenol and Embark applied at a 21-day evaluation; good color recovery occurred within 28 days. Significant growth reductions occurred through 28 days only for Embark and for its combination with chlorflurenol. All plots were mowed at 28 days. There were no differences in leafblade height 14 days after mowing.

Table 3 shows leafblade height reductions resulting from Embark treatment in other tests. Approximately four-week growth control was found for hybrid bermudagrass with 0.75 lb/A and for common bermudagrass with 1 lb/A. Growth of St. Augustine grass turf was not reduced at 0.75 lb/A. Single applications of 2 lb/A on hybrid bermudagrass caused more persistent discoloration but did not result in long-term turf damage.

Single applications of Embark could offer an advantage in turf growth control in difficult-to-mow locations such as near fences, around golf course sand traps, and in cemeteries. Response to repeated applications have not been well evaluated. Combining chlorflurenol and Embark for applications may result in growth inhibition at a reduced cost.

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TABLE 1. Effects of Embark on Santa Ana Hybrid Bermudagrass Turf Riverside, 1977

Factor	Days After Treatment	Control	Embark*
Color rating, 1 to 10†	7	1.6a‡	3.1b
	14	1.0a	4.5b
	21	2.0a	3.5b
	28	3.3b	1.4b
	mowed		
	35	5.1b	1.2a
	42	2.8b	1.2a
Leafblade height, cm	21	10.4b	4.7a
	28	11.6b	5.4a
	mowed		
	35	2.8	2.2
	42	5.5	4.8
Seedhead height, cm	21	11.5b	7.0a
	28	14.2b	6.6a
Seedhead density, no./10cm²	21	780b	214a
	28	790b	232a
Dry weight gm/m²	28	243b	103a

*0.75 lb/A on 7-24-75 at 100 gal/A.
†Scale 10 = severe discoloration; 3.5 considered acceptable color.
‡Significance 1% in columns.

TABLE 2. Effects of Chlorflurenol and Embark on Common Bermudagrass Turf Riverside, 1977

Factor	Days After Treatment	Control	Chlorflurenol 1 lb/A	Chlorflurenol 2 lb/A	Chlorflurenol plus Embark 0.5 lb/A each	Embark 1 lb/A
Color rating, 1 to 10†	21	1.5b	1.4b	2.0b	4.7a	5.7a**
	28	1.2b	1.2b	1.2b	2.6a	2.6a*
Leafblade height, cm	21	5.7a	5.5a	4.8ab	4.3b	4.2b*
	28	11.3a	9.6ab	9.3abc	6.0c	6.3bc**
			mowed			
	42	5.0	4.3	4.6	4.9	4.5

*Significance 5%.
**Significance 1%.
†Scale = severe, and 3.5 considered acceptable color.

TABLE 3. Effects of Embark on Vegetative Growth Reduction 1975 - 1977

Location	Turf Species	Rate lb/A*	Days After Treatment	Growth Reduction, %†
Riverside	U3 bermudagrass	1.0	27	35
Riverside	U3 bermudagrass	1.0	27	24
Riverside	U3 bermudagrass	1.0	27	29
Riverside	U3 bermudagrass	0.75	28	29
Riverside	U3 bermudagrass	0.5	14	53
Riverside	U3 bermudagrass	0.5	27	13NS
Riverside	Mixed turf (common bermuda blue grass, fescue)	1.0	21	44
Riverside	Mixed turf (common bermuda blue grass, fescue)	1.0	28	26
Glendale	Common bermudagrass	0.75	21	18
Glendale	Common bermudagrass	0.75	28	31
Glendale	Common bermudagrass	0.75	35	26
Indio	Common bermudagrass	1.0	14	12NS
Indio	Common bermudagrass	1.0	21	25NS
Indio	Common bermudagrass	1.0	28	65
Riverside	Santa Ana hybrid bermudagrass	0.75	14	18
Riverside	Santa Ana hybrid bermudagrass	0.75	21	27
Santa Ana	St. Augustine	0.75	21	29NS
Santa Ana	St. Augustine	0.75	27	29NS

*100 gal/A coverage.
†Significance at 5% where NS not shown.