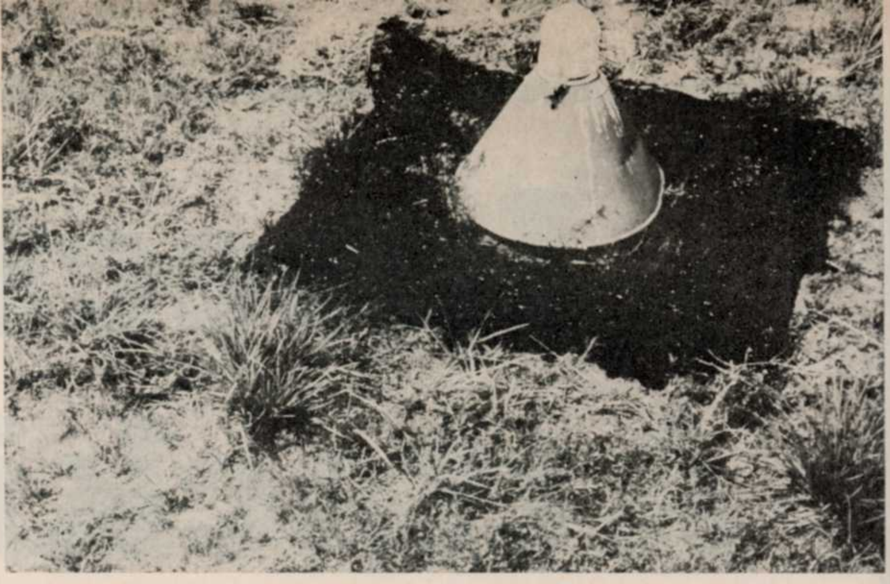

Standard type MC-1 cutback asphalt used in Texas A&M study gives a thin film which barely covers the soil surface.

Can Herbicides be Effectively Impregnated Into Asphalt?

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ASPHALT PAVEMENTS often are victims of invasion by Bermudagrass and certain other plants. Sometimes these plants grow through the pavement from plant parts or seeds contained in the base material; or they may originate from vegetative runners from parent plants outside the paved area. They can also arise from seeds washed or blown into the cracks in the pavement.

Regardless of the means by which vegetation becomes established in asphalt pavements, the plants cause a drastic reduction in the life of the pavement, are unsightly, and present a safety hazard by obscuring the pavement edge.

Adjacent Damage Possible

A number of herbicides can prevent growth of plants in pavements when they are applied directly to the underlying base material. However, several of these materials have damaged plants outside the treated area. The damage is caused by roots absorbing material from the treated area or by water carriage of the herbicides away from the treated area and into contact with plant roots.

Mixing the herbicide with asphalt appears to offer several advantages. A sufficient concentration of herbicide should prevent plants from penetrating the asphalt layer. If the herbicide was contained in the asphalt, damage from leaching or from absorption by plants outside the treated area should be minimized. Oil-soluble formulations which are chemically stable at relatively high temperatures would be desired for this type of treatment. The asphalt-herbicide mixture could be applied as the prime or seal coat, or it could be used around sign posts, under guard rails and in association with other structures.

In August 1964, a cooperative research study by the Texas Transportation Institute at Texas A&M University under sponsorship of the Texas Highway Department and the U. S. Bureau of Public Roads was initiated to study the effect of incorporating herbicides into asphalt.

The experiments were conducted on Easterwood Airport, College Station, Texas, where vegetative growth around runway lights is a safety hazard and requires continual maintenance. Bermudagrass was the predominant plant but other plants such as Johnsongrass, *Sorghum halapense* (L.) Pers., and Dallisgrass, *Paspalum dilitatum* Poir., were were also present.

The soil material on the experimental area was a mixture of surfaces and subsoils used as fill to elevate and level the runways. The soils involved were characteristically fine sandy loams on the surface with tight clay subsoils. Herbicides were applied as surface treatments only, not incorporated into the soil.

Six Herbicides Tested

A square yard area, centered on each light, was scraped bare of vegetation prior to treatment. Six herbicides were selected for application. Application methods for the herbicides were: (1) Applied to the open soil area and

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left exposed; (2) Applied to open soil and covered with an asphalt cap; and (3) Mixed with and applied in the asphalt. Two rates of each herbicide were used, and each treatment was applied around four lights. Herbicides and rates were: (1) TCA, sodium salt, at 100 and 200 lbs. per acre; (2) TCA ester at 100 and 200 lbs. per acre; (3) prometone at 10 and 20 gals. per acre; (4) erbon at 40 and 80 lbs. per acre; (5) fenac at 6 and 12 lbs. per acre; and (6) tritac at 8 and 16 lbs. per acre.

The asphalt used was standard type MC-1 cutback, applied at the rate of 1 gal. per 4 square yards. At this rate, a thin film was obtained which barely covered the soil surface (see illustration). Only oil-soluble herbicides were mixed with the asphalt. All treatments were made using a knapsack sprayer with a fantype T-jet nozzle. The applications were made with a constant nozzle pressure of 35 p.s.i.

The results shown in Table 1 are from a single study, and present a definite contrast with earlier work in presurface application of herbicides in which all materials applied effectively prevented Bermudagrass and other plants from emerging through new pavements. Of the materials in the present test, only sodium TCA and erbon were included in the earlier presurface experiments.

The higher rates of all materials applied to bare soil except tritac and TCA ester gave better control than did the lower rates (Table 1). The same materials applied to the soil surface and then covered with an asphalt cap performed similarly, except fenac. Of the six materials used, only the higher rates of TCA sodium salt and prometone showed an improved performance when the treated area was covered with asphalt. The lower rate of fenac showed some improvement with capping, but the higher rate was somewhat less effective. Both rates of Tritac were less effective covered than when applied to bare soil.

Three of the materials were oil soluble, and were diluted in asphalt for application. Results of mixing erbon and TCA ester in the asphalt were disappointing. Erbon failed to perform better than when applied directly to the soil at either rate of application. The lower rate of TCA ester was more effective applied in the asphalt, but there was no improvement in effectiveness using the higher rate. Although the lower rate of prometone was somewhat less effective applied in asphalt than directly to the soil surface, the higher rate of prometone applied in asphalt not only was more effective, but gave the best control of all the treatments used.

Bermudagrass was present in all treatments where regrowth was recorded. The reinfestation of Bermudagrass was from emergent plant material rather than encroachment from outside the treated area. Yellow woodsorrel, *Oxalis dillenii* var. *dillenii* also was present in many of the treated areas. Of the plants previously listed as being associated with Bermudagrass, none was present to any degree within any of the treated areas.

Herbicides Must be in Top ¼ Inch of Asphalt

The standard treatment, 200 lbs. per acre of sodium TCA, was somewhat less effective than usual under the conditions of this study. Prometone and erbon were the most persistent of the materials applied to the soil surface. The poor results noted in this experiment may be due in part to the relatively low volume of application used. Past experience has shown that herbicides applied to the base material should be distributed through approximately the top one-fourth inch to be most effective.

The results of this experiment indicate that some herbicides which are oil soluble may be effective when applied directly in asphalt. Although the asphalt solution used in these tests was applied at ambient air temperature, asphalts without solvent usually are heated to temperatures of at least 300°F for application. Consequently, any herbicide dispersed or dissolved in undiluted asphalt would have to be stable at relatively high temperatures. Thickness of the asphalt layer, not a consideration in this test, probably should be treated as an independent variable in future testing. While recommendations cannot be made on the basis of this limited study, further research may develop specifications for applying materials in the surfacing material.

Table 1. Relative control of Bermudagrass and other plant species with herbicides applied on bare soil, on soil and capped with asphalt, or mixed in the asphalt.

Herbicide	Rate/Acre (Lbs. active) ingredient or gallons	Method of Herbicide Application: On Bare Soil	Capped With Asphalt	In Asphalt
		Average Rating*		
TCA, Sodium Salt	100#	1.00	1.00	
	200#	1.25	1.75	
TCA ester	100#	1.00	1.00	1.75
	200#	1.00	1.00	1.00
Prometone	10 gal	1.25	1.25	1.00
	20 gal	1.75	2.25	2.75
Erbon	40#	1.50	1.50	1.50
	80#	2.00	2.00	1.50
Fenac	6#	1.00	1.25	
	12#	1.50	1.25	
Tritac	8#	1.50	1.25	
	16#	1.50	1.00	

*The treated area around each light was evaluated by the following scale.
1.0—No control (Plots not visible)
2.0—Some control (Plots visible)
3.0—Good control (Plots with no live vegetation)