EFFECTS AND TREATMENTS OF PETROLEUM SPILLS ON TURF

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Recent trends to increasingly sophisticated mechanization of turf equipment has resulted in petroleum spills being a greater problem on intensively maintained turf areas, especially golf greens. Procedures for alleviating these stresses and enhancing recovery of the turf have not been investigated. A study was conducted during the summer of 1977 to: (1) determine the specific turfgrass symptoms associated with various types of petroleum spills, (2) assess the comparative rates of turfgrass recovery following petroleum spills, and (3) evaluate potential corrective treatments for their effectiveness in counteracting petroleum spill effects on turf and enhancing turf recovery.

Treatments

Five petroleum products commonly used in turfgrass maintenance equipment were selected as the spill treatments. Included were gasoline, motor oil, hydraulic fluid, brake fluid, and grease. The grease was applied to an area of 0.4 square feet while the other four were sprayed over areas of 4 square feet. The five materials were at ambient air temperature when applied. A list of the petroleum products and the rates at which they were applied is shown in Table 1. The petroleum products were applied to Tifgreen bermudagrass which had been mowed twice weekly at a cutting height of 1 inch with clippings returned. The bermudagrass was irrifated daily (1/4 inch water/day) and received 1 lb N/1000 sq ft/month over the growing season. Although this study was conducted on bermudagrass, the relative responses to the treatments is probably similar for other turfgrass species. However, the absolute recovery time could vary among species.

Table 1. Summary of petroleum products applied.

Petroleum Product	Rate of Application
Gasoline (leaded)	0.25 pints/sq. ft.
Motor Oil (30 SAE)	0.25 pints/sq. ft.
Hydraulic fluid	0.25 pints/sq. ft.
Brake fluid	0.25 pints/sq. ft.
Grease	2.0 oz/sq. ft.

Three corrective treatments and an untreated check were superimposed over the five petroleum spills. The check included a thorough drenching of the spill area with water. The corrective treatments were applied within 20 minutes following the petroleum application. A list of the corrective treatments and their rates of application is shown in Table 2. All treatments were replicated three times.

Table 2. Corrective treatments applied to petroleum spills.

Corrective Treatment	Rate of Application
Calcined clay fines (mm)	2.1 oz/sq. ft.
Activated charcoal	0.2 oz/sq. ft.
Detergent (anionic and non-ionic granules)	0.7 oz/sq. ft.

Injury Symptoms

Since the specific injury symptoms associated with each of the five petroleum products were described in the Texas A&M Turfgrass Field Day Report*, they will be only briefly summarized here. Gasoline spills can best be identified by their odor and rapid burning of the turf. Leaf kill occurred within one hour following a gasoline spill. Motor oil caused a shiny, slick appearance on the grass which persisted for over 48 hours. Damage due to motor oil was slow to occur compared to gasoline, hydraulic fluid, or brake fluid. Hydraulic fluid was similar to gasoline in its initial symptoms on the turf. Leaf kill was not as rapid as that following gasoline spills. The odor of hydraulic fluid was also different from that of gasoline. Brake fluid also had a characteristic odor and caused the turf to turn a pale, greyish-green color that progressed to a light yellow color just before death of the turf. Leaf kill occurred within 24 hours. Grease spills are usually small spots and are characteristically identified by a distinct layer of grease on the surface of the leaves. The grease spill was much slower in the rate of leaf kill compared to the other products.

Results of Corrective Treatments

The recovery rate and the effectiveness of the corrective treatments in enhancing recovery can be summarized as follows:

Gasoline. The turf achieved 85-100% recovery within 4 weeks of the spill. None of the corrective treatments were effective in enhancing recovery.

Motor Oil. Detergent proved to be an effective corrective treatment for motor oil spills. Following the spill 85% of the turf recovered within 4 weeks and 95-100% recovered within 8 weeks. The activated charcoal and calcined clay fines were not as effective since the turf achieved less than 50% recovery in 8 weeks.

Hydraulic Fluid. The results for hydraulic fluid spills and corrective treatments were the same as those for motor oil. Detergent was the most effective corrective treatment. Within 4 weeks 85% of the turf had recovered, compared to 30% recovery in 4 weeks with both activated charcoal and calcined clay fines.

Brake Fluid. Brake fluid was quite water soluble. From 90 to 100% recovery was achieved in 4 weeks on the water drenched check plot. Detergent, however, speeded full recovery to within 2 to 3 weeks following the spill.

Grease. Unfortunately none of the corrective treatments studied were effective. The Tifgreen bermudagrass required 8 to 10 weeks to recover from a grease spill.

In conclusion, detergent proved to be an effective corrective treatment for

motor oil, hydraulic fluid, and brake fluid spills. A summary table showing recommended corrective treatments and recovery times for bermudagrass following five petroleum spills is shown in Table 3. When used, the detergent should be sprinkled over the spill area, thoroughly drenched, and then completely removed from the surface area, preferably with a vacuum. It is important to treat a petroleum spill even if the turf is severely damaged. Removal of the petroleum residue will enhance recovery of the turfgrass.

Table 3. Summary of recommended corrective treatments and recovery times for bermudagrass following five petroleum spills.

Petroleum Product	Recommended Treatment	Recovery Time (Weeks)	
		Treated	Untreated
Gasoline	None	(4)	4
Motor Oil	Detergent	4	8-10
Hydraulic Fluid	Detergent	4	8-10
Brake Fluid	Detergent	2-3	8
Grease	None	8-10	8-10