

Table 1. The Effectiveness of DSMA at 4 lb/A in Controlling Dallisgrass in Bermudagrass as Affected by the Addition of a Surfactant.

	No. of plants per sq. feet	Percent Reduction
Untreated	5.29	0
DSMA	2.25	58
DSMA + 0.5% ethoxylated nonylphenol type	0.53	90

ethylene oxide have generally provided maximum crabgrass control when applied in mixtures containing diuron. In these and other greenhouse studies at the Delta Branch Experiment Station, Stoneville, Mississippi, ethoxylated nonylphenol surfactants containing 15-30 moles of ethylene oxide were also effective in increasing diuron toxicity, but they were comparatively poor in increasing spray-mixture wettability.

Surfactants also enhance the activity of herbicides other than diuron. For example, surfactants increase the activity of 3,4-dichloropropionanilide (DPA), used for the control of grasses in rice; 2,2-dichloropropionic acid (dalapon), used primarily for johnsongrass control; and disodium monomethylarsenate (DSMA), extensively used in the Midsouth for nutgrass and johnsongrass control. In addition, DSMA is very effective for controlling dallisgrass in bermudagrass (Fig. 1). The data in Table 1 shows that 0.5% (wt/v) of surfactant increased the control of dallisgrass by 32% over that of DSMA without surfactant.

Surfactants Can Increase Herbicidal Effectiveness

Surfactants can increase herbicidal effectiveness by: (a) improving plant coverage; (b) removing air films between spray and leaf surface; and (c) increasing foliar absorption and translocation. Surfactants improve plant coverage by reducing the surface tension and thereby increasing the total area of leaf surface that becomes wet. Increased wetting of a leaf surface results in the herbicide being spread over a larger area. Improved plant coverage and removal of air films between spray and leaf surface can increase the

foliar absorption and translocation of herbicides.

Surfactants can also reduce the turbidity of herbicide spray solutions which may affect herbicide effectiveness (Fig. 2). It was originally believed that surfactants greatly reduced the turbidity of diuron suspensions by increasing the solubility of diuron in water. This is now known to be only partially true. Recent research with diuron-surfactant mixtures has suggested that reduced turbidity results from the formation of colloidal solutions and that diuron is incorporated into the colloid micelles by the process of "solubilization." Although additional research is needed to determine what role surfactants are performing in reducing turbidity, herbicidal activity has been greatly increased.

Even though phytotoxicity of many herbicides is increased by adding a low concentration of surfactant to the spray mixture, this may not always be beneficial inasmuch as a surfactant may eliminate species selectivity, thereby causing greater injury to a crop or turf. Therefore, judicious selection of surfactants is extremely important for the farmer, grower, or turf manager because the proper selection of surfactants and concentrations will aid in controlling resistant weed species. It will also lessen the possibility of damage to desirable plants and decrease the cost of herbicidal application.

Present, Future Surfactant Usage

The use of surfactants with herbicides to increase phytotoxicity has grown tremendously within the past four years in Mississippi. In 1960, approximately 64,000 pounds of surfactant were used with herbicides. By 1963 over 500,000 pounds of

surfactant were used to control weeds in agronomic crops, pastures, and rights-of-way. This represents an increase of nearly 700%.

Although there has been a phenomenal increase in the use of surfactants to increase herbicidal action, it appears that this trend has only just begun. In the future a suitable surfactant will probably be chosen for herbicide application, just as a specific solvent is now selected for formulation of a pesticide. Indications are that such information will be available in the next few years. The problem will probably grow more complex. In the future not only will the surfactant be selected for the herbicide, but it will be selected for the particular crop and weed on which the material will be applied. Surfactants will greatly broaden the scope of herbicidal weed control, perhaps enough to surprise even those who are expecting the change.

Protect Young Trees Against Rabbits, Field Mice

Recently planted trees must be given protection during the winter months to prevent rabbits and field mice from eating the bark and causing death of the tree. This reminder is issued by the National Arborist Association, which adds that these precautions should be used to protect shrubs, too.

Ideal protection, which will last several years, is installation of a loose cylinder of ¼-inch hardware cloth, supported by stout stakes about the trunk of the tree. The cylinder should be buried a few inches in the soil to repel burrowing mice, and should be at least 30 inches high to prevent rabbits from reaching over the top.

Another method is to wrap the trunk of the young tree with aluminum foil, burlap, or tree-wrapping paper. Wrappings should be removed in the spring.

Chemical rodent repellents may also be used, which, to be effective, should be used according to manufacturers' directions on the container label.