COMPARING DRY VS. LIQUID FERTILIZER - PESTICIDE APPLICATIONS ON TURF

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The use of liquid fertilizer and fertilizer-pesticide solutions has increased dramatically within the last few years. The advantages of liquid materials to agriculture cannot be denied - considerable savings in terms of material, handling, and application cost. Use of liquid fertilizer-pesticide mixtures by many companies in the rapidly expanding lawn service industry has raised legitimate questions regarding the desirability of liquid vs. dry applications on turf. Fertilizers, and in many cases pesticides, traditionally have been applied to turf in the dry form.

One can find very few references in the turf literature regarding liquid fertilizer applications on turf. Where liquid applications have been made in the past, they have been made as either (a) soil drenches, where large quantities of water are applied along with or immediately following fertilizer application, or (b) light, frequent applications applied by injection into the irrigation system (fertigation). Most lawn service companies today utilizing liquid applications are doing neither of these. Generally, high rates of fertilizer (sometimes up to 1.5 lb of water-soluble N/1000 ft^2) are applied in relatively small quantities of water (3-8 gal/1000 ft^2). In most cases, irrigation does not follow application.

The advantages and disadvantages of liquid vs. dry fertilizer-pesticide applications on turf are not clear cut. Occasions arise where each method has definite advantages over the other. Several points in question are considered below.

I. OPERATIONAL CONSIDERATIONS

A. Materials Cost - Liquid fertilizer programs are less expensive than dry only if materials are purchased as concentrated liquids. This is true due to the higher analysis of fertilizer materials and lower transportation costs. Of course, considerable investment must be made initially for liquid fertilizer storage facilities. A liquid program offers no advantage over a dry program in terms of material cost if all fertilizers are purchased dry and then put into solution in the spray tank.

Purchasing fertilizer materials individually and mixing yourself in the spray tank is also less expensive than purchasing complete fertilizers (containing N-P-K). Dry, blended fertilizer-pesticide combinations also are used extensively today. A combination of this sort would be considerably more expensive than purchasing the two materials separately.

B. Handling and Application - When preparing for a days work, any lawn care operator would quickly agree to the advantages of metering liquid fertilizers into a tank compared to loading and unloading a truck with heavy fertilizer bags. Where liquid programs are used and spray tanks are filled with dry fertilizer from bags, there may be no advantage to a liquid over a dry program during the initial materials handling stage.

During application, liquid mixtures offer the advantages of one pass over the lawn. The dry operator who uses a rotary spreader and fertilizer-pesticide

blends perhaps can make an application as fast, or faster than a liquid operator. However, dry programs fall short where fertilizer and/or pesticide applications must be made separately by several passes over the same lawn. On a large lawn, this might involve several trips to the truck to refill the spreader with fertilizer, only to then have to empty excess fertilizer out of the spreader prior to filling with insecticide/herbicide materials.

Liquids offer another advantage on small properties and in hard-to-get-at places. Dry applications are best wuited to large, open turf areas, with relatively few obstacles such as trees and flower beds. Considerable waste and overlap takes place when the spreader has to be directed around trees and along narrow strips of turf, as between the street and sidewalk.

C. Flexibility in Application - Liquid programs offer the advantage of flexibility at the time the spray tank is filled. Any analysis or ratio of N-P-K which is desired can be made. Pesticides or other additives (surfactants, micronutrients) can be added as required. The big disadvantage here, of course, is that once the spray tank is filled, every lawn sprayed from that tank will receive exactly the same treatment. Program changes can be made from day to day, but not from lawn to lawn utilizing the same spray tank. Liquid application technology hopefully will soon reach the point where several tanks will be utilized on one truck. Metering devices will then allow the operator to select any combination of N/P/K/herbicide/fungicide desired on a particular lawn.

Dry operations are at a disadvantage in that they often must purchase a limited number of complete fertilizers. As a result, they lose the flexibility to change fertilizer ratios. If separate fertilizer-pesticide applications are being made on the same lawn, an advantage exists here for the dry operator since he can select any material on hand or any rate on an individual lawn basis. Corrective nutrient or supplemental pesticide applications are very easily made. The change from one lawn to another can be based upon soil test results or previous history of particular pest problems (i.e., crabgrass pressure).

D. Safety - Safety of application must be viewed from two standpoints -- (1) the turf and (2) non-target plants such as trees, shrubs, and flower beds.

Potential for turf damage by fertilizer burn is slightly higher from liquid applications. However, both liquid and dry applications of water-soluble fertilizer can cause considerable burn when applied during hot weather even at moderate rates. Liquid applicators must be extremely careful during the summer months to avoid high rates of water-soluble N.

Liquid applications do offer the advantage of direct placement. When dry applications are made with a rotary spreader, it is extremely difficult to avoid throwing material under shrubs and into flower and vegetable gardens. This is not only wasteful, but if done with pesticides considerable damage can occur. For example, a preemergent herbicide thrown into a flower garden or bed of ground cover in early spring could affect rooting in those areas for the entire growing season.

Direct placement can be a problem for both application techniques on a windy day. Dry applications made with a rotary spreader are vulnerable to blowing, creating a problem in terms of uniform distribution. Drift is a serious problem with liquid applications on windy days. Many liquid lawn service companies today are utilizing anti-drift adjuvants to reduce the drifting problem.

II. AGRONOMIC CONSIDERATIONS

A. Placement - Liquid applications utilizing small quantities of water tend to leave the majority of the applied material to dry on the upper portion of the

turf canopy, whereas dry materials will fall down into the thatch or onto soil. Depending upon the time of year, and what materials are applied, both methods have advantages.

If fertilizer alone is applied, either method may be suitable. When water-soluble N is used, liquid applications may give a slightly quicker response, and dry materials may give a slightly longer residual. During hot weather dry applications are also less likely to cause burn. More serious problems arise when pesticides are added to the solution mixture.

Suppose a fertilizer/herbicide mixture is being used. Fertilizers ideally should be watered in as soon as possible. Broadleaf herbicides, on the other hand, should remain on the foliage as long as possible, whereas preemergent herbicides should be lightly watered in.

Liquid herbicide/insecticide applications offer more of a problem. The herbicides should remain on the foliage. Liquid insecticides, especially if applied for grubs, must be watered in to achieve maximum control. Their efficiency is reduced somewhat if allowed to dry on the leaf surface. In addition, granular insecticides have been shown to have a longer residual than liquids, even when watered in immediately after application. Liquid programs are at a disadvantage in this area.

B. Fertilizer Sources Available - Almost all lawn service companies today utilize some form of water-insoluble N. Many excellent materials are available: ureaformaldehyde (UF), IBDU, sulfur coated urea and various other forms of plastic coated urea. Liquid applications have a definite restriction in that most of these water-insoluble N sources cannot be applied in the liquid form. UF can be placed in suspension with constant agitation and numerous additives. Thus far, no differences have been observed between liquid and dry UF applications.

C. Homogeneity - Liquid applications have the advantage of every drop of material being uniform in composition of fertilizer and pesticide. Dry applications generally consist of a blended complete fertilizer, and many times a pesticide has also been blended in. Uniform distribution of these blends has been shown to be a problem from two standpoints. First, segregation very often takes place with the fertilizer bag. Vibration during handling and hauling often leads to segregation of the different components due to different pellet sizes, shapes, and densities. In other words, what you pour out of a bag at first may not be the same as what comes out last. Second, distribution is a problem, especially if spread with a rotary spreader. The larger, denser pellets will tend to be thrown further than the smaller, light ones. This could lead to serious problems. Suppose a preemergent herbicide on a light, vermiculite carrier was blended with urea. The herbicide would not be thrown as far as the urea, and would be more subject to wind activity. As a result, strips of untreated turf may appear later in the growing season.

D. Efficiency (Fertilizer and Pesticide Loss) - Volatilization would generally be lower from dry applications compared to liquid. This may be important as far as fertilizer and pesticide efficiency is concerned, and also in terms of damage caused to ornamental shrubs, flowers and vegetable plants.

Volatilization of ammonia from urea applications can be significant in either the dry or liquid form. Research has shown that 30-40% of the N applied as urea can be lost as ammonia under certain conditions. If urea is applied as a liquid, solution pH should be adjusted below 7 since alkaline conditions will enhance loss due to ammonia volatilization.

Volatile loss of pesticides, especially phenoxy herbicides, can be a serious problem also. Low volatile forms of herbicides (for example, 2,4-D amine instead of 2,4-D ester) should always be used in and around ornamental plantings. Some pesticides are subject to photodecomposition (chemical changes when exposed to light). Among the preemergent herbicides commonly used on turf, Balan is subject to photodecomposition. Betasan will photodecompose slowly over a period of days, while Dacthal is not subject to photodecomposition. Dry applications would offer an advantage where these herbicides are used since the material will tend to fall beneath the turf canopy.

Both application techniques have strong advantages and disadvantages. The desirability of one application method over the other depends upon the numerous factors outlined above. It should be noted, however, that both techniques are being used successfully today within the lawn care industry.