STREET TREES AND HERBICIDES

by John A. Meade [1]

Street trees, as pointed out by many people, are in a vulnerable position in regard to injury from several sources. One of the sources is the practices of people (homeowner, municipal worker or contract applicator) who apply chemicals near these trees. Some of these chemicals are herbicides. Herbicides are designed to act upon a plant's metabolism and, therefore, the expression of this action, or injury symptom, if you will, quite often resembles the result of some other factor such as disease, drought, air pollution or mechanical injury acting on a plant. In order to better understand the potential of this class of injury, an understanding of herbicides currently in use is essential.

Preemergence crabgrass preventers

This is the least harmful group and no injury has been attributed to them. The ones currently recommended by the college are:

1. DCPA (DACTHAL)
2. Siduron (TUPERSAN)
3. Benefin (BALAN)
4. Bensulide (BETASAN)

They are available in several formulations but are usually sold as granulars or in fertilizer combinations. Both formulations of all four are safe near and under shade trees.

Postemergence crabgrass herbicides

These materials are also quite safe for use around and under shade trees. They all have a common base (methane arsonate) and appear to be equally effective.

If sprayed directly on tree foliage, burn would be evident but drift or volatility of the methane arsonates do not cause injury. Toxicity to humans is low and their use has been well accepted. They are available in dry and spray forms. Evidence indicates that the spray form is more effective. These materials are tied up on soil particles rather quickly and do not move in the soil. They are also very slowly translocated in plants and hence if a tree were inadvertently sprayed, only the treated leaves would die and refoliation would occur rapidly in most instances.

Broadleaf herbicides

Herbicides can be classified in general as those acting as hormones and those not. The chemistry of the hormonal type herbicides closely resembles natural plant hormones such as Indoleacetic acid. This category includes 2, 4-D, 2,4,5-TP (silvex, MCPP, and 2,4-DP. Picloram and dicamba, while of different chemistry, produce symptoms similiar to the previous group.

The injury symptoms caused by any herbicide vary a great deal. This expression of injury is dependent on several factors, including rate of application, species of plant, stage of growth, temperature and formulation of the herbicide.

Herbicides have been known to enter plants by root absorption from the soil and through the foliage from either the liquid or gaseous phase, or in the case of granules, as a solid on the leaves.

The symptoms of the hormonal type, however, are the same whether the entry was through the roots or the leaves since the herbicide is translocated in the nutrient flow and hence moves to the growing points of the plant. Here the new growth is modified by the herbicide to form the twisted petioles, swollen stems and strap-shaped leaves typical of this type of herbicide. Death of the plant may follow or not, depending on the amount of herbicide. If the rate of application is extremely high, burning will occur and local necrosis will occur without translocation.

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Desirable plants often show the low dosage symptoms described above since the herbicide is usually applied elsewhere and moves to the desirable plant either as "drift" in the form of fine droplets or as "volatility" in the form of vapor. The plant can absorb and react to both.

The first five — 2, 4-D, 2,4,5-T, silvex, MCPP, and 2, 4-DP - are all closely related and differ mainly in the list of susceptible species and injury potential to grasses. Dicamba (Banvel-D) belongs to a different chemical family and hence has some different characteristics. Its ability to control weeds such as knotweed and sheep sorrel (red sorrel), as well as many other broadleaved weeds makes this a very valuable material in the weed control field.

It does, however, have some characteristics different from 2, 4-D which must be understood and taken into consideration in its use.

These are:

1. Length of life in soil. In one trial, 2, 4-D broke down and disappeared from the soil completely in 20 days. Dicamba was very much in evidence after 80 days. In another test, 2, 4-D was gone in two weeks while dicamba was still present in twelve weeks. These time would not hold for all soils under all conditions but the relationship would be about the same.
2. Movement in the soil. It appears that dicamba will move downward in soils just behind the water front. This, coupled with its longer life, increases the probability of being absorbed by tree roots. Downward movement is evidently faster when water is applied in several increments (as lawn watering) than when large amounts of water are added. Also, breakdown of dicamba is slower in dry soils than in wet ones.

The only serious problem with dicamba is in its misuse. If used properly and according to *manufacturer's* (as contrasted to formulâtors) directions, it is a safe compound to use since there is a precaution to avoid use under or near trees or shrubs.

In the past, dicamba was responsible for injuring many trees but it is no longer widely distributed as a component of "weed and feed" lawn fertilizers. There are very few instances of dicamba injury occurring now.

One thing we should clear up is the role of 2, 4-D in relation to shade trees. Except with certain species such as London plane, there are very few documented cases of injury to shade trees from 2, 4-D absorbed through the roots. In fact, many apple orchards are being treated with 2, 4-D for weed control. Most instances of injury from 2, 4-D can be traced to drift (in the case of liquid forms) or volatility (in the case of liquid and dry forms). Even with low volatile esters or amines, there is still some indication of volatility. The orchards treated with 2, 4-D are sprayed with non-volatile forms as "Weedone 638" an emulsifiable acid form of 2, 4-D, "Lithate," the lithium salt of 2, 4-D or an extremely low-volatile material, Dacamine 4D, a fatty acid amine of 2, 4-D. The use of one of these materials rules out the danger of injury from volatility.

The visible symptoms of 2, 4-D and dicamba are quite similar in that both cause twisted and curled leaf petioles and malformation of leaves. They seem to differ in that 2, 4-D causes leaves to become narrow and the edges turn downward. In most instances when dicamba is involved, the leaf edges turn upward. The appearance of symptoms should not always be taken to indicate death of the tree. Quite often recovery occurs the following year.

Two other herbicides of a non-hormonal type are translocated in the food stream. These cause foliar symptoms but their great utility is in controlling perennial weeds by moving to the underground storage roots or rhizomes and disturbing their metabolism to the point of death. Amino triazole or amizole in one of these. Its activity is unique in that the chemical prevents formation of chloroplasts and the plant turns pure white in most cases. If the dosage is very high, the plants will often turn brown without the white stage.

The other chemical in this group is a dalapon. When applied to grasses, the compound causes browning of the foliage and moves into the underground parts and causes death. If the dosage is low or if the compound drifts to adjoining areas, the injury symptoms appear as growth malformations. The leaves fail to unroll and have a wrinkled appearance. Dalapon seldom, if ever, affects trees.

Contact herbicides

These are designed to be sprayed on plants to cause a fast kill of the topgrowth. In general, these are not translocated to any extent and are not active on seeds or roots once in the soil. This group includes sodium arsenite, paraquat, and cacodylic acid (sometimes listed as dimethylarsinic acid or sodium cacodylate). Sodium arsenite has been removed from the market so its effect on plants will be minimal. The other compounds when applied directly to plants will cause burning and eventual death. If some of the spray drifts to adjacent plants, the injury will show as small brown spots. Total expression will depend on the amount received by the plant.

Soil sterilants

These break down most readily into two groups: temporary and semi-permanent.

The temporary group includes:

1. Vapam
2. Methyl bromide
3. Vorlex

These chemicals, not normally used near trees are not known to have been involved in tree injury.

The semi-permanent group includes:

1. Borate-chlorate mixtures
2. Bromacil (HYVAR)
3. Diuron (KARMEX)
4. Monuron (TELVAR)
5. Atrazine (AATREX)
6. Simazine (PRINCEP)
7. Prometryne (PRAMITOL)
8. Karbutilate (TANDEX)

Combinations of these materials are sold under various trade names. All of these, if used at soil sterilant rates, are capable of injury or killing most trees. They should be used with the utmost caution with special emphasis on direction of movement of surface water since most materials if not fixed by light rainfalls can be carried across the soil surface by a washing rain.

Symptoms from soil sterilants usually appear as yellowing of leaves and eventual browning. They are similar to symptoms caused by root injury of any type.

Diagnosis

Diagnosis of tree injury to determine if herbicides are responsible is difficult and requires considerable skill. If herbicide injury symptoms are present (twisted, distorted growth or yellowing or blackening of leaves) then one must look to find the source. The surrounding area should be surveyed to see if other trees are injured. Sources of herbicides include powerlines, railroads, commercial installations, highways and homeowners.

Quite often, the person who has applied the material is not aware that he is using a material that hurts trees and the container should be checked, if possible.

Close observation and shrewd questioning are necessary to successfully diagnose tree injury since many things can cause similar symptoms.