REDUCING STRESS AND ACCELERATING GROWTH OF LANDSCAPE PLANTS

by Carl E. Whitcomb

Research findings and new technology are slow to be incorporated into nursery and landscape practices. Tradition is important and has a distinct place in our society, however, blind allegiance to tradition stymies progress. In 1968, I innocently began a study to determine the "optimum" amount of soil amendments to use in the planting hole since recommendations varied from 5 to 50% by volume. The optimum amount was none. These findings were met with the statement, "I won't ask about apple pie or motherhood" by the meeting moderator at the Nursery Research Workers Conference in Atlanta in 1971. The findings regarding soil amendments were such a contrast to tradition, the question arose, "If tradition was in error regarding soil amendments, what about other practices?" This has led to numerous studies relative to reducing stress and accelerating growth of landscape plants. The following is a summary of the new technology in landscape plant establishment including the supporting research:

A. Match the requirements of the plant with the conditions on the site carefully; consider the size and the shape of a tree, color of bloom, growth requirements. For example, wet or dry site, exposed or somewhat shaded by buildings or other trees. Matching the conditions on a planting site with a plant that will tolerate those conditions is the single most important factor influencing plant success (1).

B. The condition of the plant at time of digging and planting plays a key roll in transplant success. New root growth is dependent on stored food reserves and conditions inside the plant; without sufficient reserves, all of the subsequent steps will be of little benefit (2).

C. Dig the planting hole as large as is practical, but at least 18-24" larger than the root ball, but only slightly deeper to prevent unwanted settling and a dish effect. If in doubt, plant slightly shallow. Below 12-14" deep, oxygen levels are too low to encourage the rapid root growth needed for establishment (3).

D. If the plant has been dug balled in burlap, remove plastic cover, if any, and the burlap from the sides of the ball after placement in the planting hole. If container grown, remove container exposing the root ball as little as possible to air. The white growing root tips are the key to rapid establishment in the landscape, but are killed or injured by even brief exposure to air.

E. Trees dug with a tree spade *should not* be planted into a tree spade dug hole. The development of new roots at the face of the root ball and into the surrounding soil require considerable oxygen, thus the need for a larger planting hole with a well-aerated soil (3,4).

F. Fill the hole around the root ball with the soil backfill in most cases. *Good topsoil* is the only alternative if soils are extremely poor and the expense can be justified. However, you must match soil types as backfilling with a good sandy loam in a heavy clay will serve as a collection point for water and the roots will suffocate. Soil amendments do not assist plant establishment and growth (5,6). It is better to use the amendments as a mulch. Water thoroughly while backfilling to avoid leaving air pockets. Do not pack soil excessively yet firm the soil so the plant is adequately supported. Make certain that any burlap, or if container grown, the top of the root ball is covered by approximately 1" of topsoil, but do not "bury" the plant as oxygen is a key ingredient in active root growth.

G. Mound the remaining soil into a dike or berm to hold water around the tree where soils are fair to good. With heavy soils it is advisable to break the dike to avoid excess water and suffocation of roots during wet weather, yet the dikes can readily be repaired to facilitate watering during dry weather. On the other hand, in areas of frequent rainfall and heavy soils, it is better to plant shallow or create berms to drain excess water away and avoid root suffocation (6).

H. Plants container grown with good nutrition

and planted in the fall, while the soil is warm, establish roots very rapidly. The following summer the plants have many more roots to support the plant and reduce moisture stress. This technique has worked extremely well in Oklahoma, however, how far north fall planting can be done remains to be determined (7).

I. Following planting of bare root, balled and burlap or container grown trees, remove only damaged branches or to aid branch spacing and development and appearance. Do not shear or prune branches indiscriminately. Evaluate branching carefully, consider spacing around the stem and vertical spacing and appearance. Remove branches that have very narrow forks as these will become particularly subject to wind or ice damage as they grow larger. These suggestions also apply to shrubs. There is no advantage to indiscriminately pruning ⅓ of the top of the plant as has long been recommended (8).

J. There is no benefit to the tree from painting pruning wounds. The tree will wall off or compartmentalize decay if it is healthy (9). If pruning is done, do not cut too close to the main stem and disturb the branch collar (10).

K. Several hours after planting, re-water thoroughly to assist soil in settling around the root ball and eliminate air pockets.

L. Water thoroughly once each 7-10 days during the first 2 growing seasons when Mother Nature does not cooperate. However, *do not drown the roots!*

M. Keep grass and weeds away from the young tree (11). It is best to clear a 5-7 foot diameter circle around the tree and mulch heavily (3-4") but do not bury the base of the trunk so that bark suffocation occurs. This will aid in keeping out grass and weeds and will conserve soil moisture and protect the root ball from drying out and keep the soil cooler in summer and warmer in winter. Remember, too much of a good thing is generally undesirable, 3-4 in. of mulch is about right. River gravel, pinebark, leaves, redwood nuggets, etc., may be used as a mulch, but do not bury the above ground stem with mulch. Leave a depression in the mulch around the stem. *Do not* place black plastic below the mulch as it restricts oxygen reaching the roots and do not use limestone rock as a mulch due to the pH factor (12).

N. Stake only when necessary. On certain soils, on windy sites or when trees or shrubs are quite large, staking may be required to hold the young plant upright until it becomes established. Two stakes should be placed on either side of the plant and as low as possible (generally 12-18" above the soil). Attach stake to stem using an eye screw or eye bolt of a size proportionate to the plant (this does little harm to the tree). Do not wrap wire or rope around the stem. That frequently causes damage to the stem or may ultimately cause girdling. Remove stakes after the second growing season in most cases. If eye screws cannot be readily removed, leave them in place (13,14).

O. Fertilize the plant, on the soil surface, immediately after planting (spring or fall) or use slow release fertilzier in the planting hole. Fertilize at the rate of about 1 lb. of nitrogen/1000 sq. ft. of soil surface area. Spread the fertilizer over the area which has been kept clean of weeds and grass and mulched. Repeat fertilization procedure 2-3 times during the growing season but especially in the fall when soils are warm and roots are especially active (14, 15).

Literature Cited

1. Whitcomb, Carl E. 1976. Know It and Grow It: A guide to the identification and use of landscape plants in the southern states. Whitcomb publications, Stillwater, OK 74074. 500 pages.
2. Whitcomb, Carl E. 1982. Why Large Trees are difficult to Transplant. Research Report P-829 of the Okla. Agri. Exp. Sta.
3. Bridel, Robert and Carl E. Whitcomb. 1982. Improving performance of Tree Spade dug Trees. Research Report P-829 of the Okla. Agri. Exp. Sta.
4. Preaus, Kenneth and Carl E. Whitcomb. 1980. *Transplanting landscape trees.* J. Arboric. 6(8): 221-223.
5. Schulte, Joseph and Carl E. Whitcomb. 1975. *Effects of soil amendments and fertilizer levels on the establishment of silver maple.* J. Arboric. 1: 192-195.
6. Whitcomb, Carl E., Robert L. Byrnes, Joseph R. Schulte and James D. Ward. 1976. What is a $5 planting hole? Am. Nurseryman 144(5): 16, 111, 112, 114, 115.
7. Dickinson, Sancho M. and Carl E. Whitcomb. 1977. *The effects of spring vs. fall planting on establishment of landscape plants.* S.N.A. Nursery Research Journal 4(1): 9-19.
8. Whitcomb, Carl E. 1981. *Effects of pruning and fertilizer on the establishment of bareroot decidiuous trees.* J. Arboric. 7: 155-157.
9. Shigo, Alex L. 1977. Compartmentalization of Decay in Trees. U.S.D.A. Bulletin #405. 73 pages.
10. Shigo, Alex L. 1980. *Branches.* J. Arboric. 6:300-304.

11. Whitcomb, Carl E. 1981. *Response of woody landscape plants to Bermudagrass competition and fertility.* J. Arboric. 7: 191-194.
12. Whitcomb, Carl E. 1980. *Effects of black plastic and mulches on growth and survival of landscape plants.* J. Arboric. 6: 10-12.
13. Nell, P.L. 1969. *Growth factors in trunk development of young trees.* Proc. Int. Shade-Tree Conf. 45: 46-59.
14. Whitcomb, Carl E. 1979. *Factors affecting the establishment of urban trees.* J. Arboric. 5(10): 217-220.
15. Whitcomb, Carl E. 1978. Effects of Spring Versus Fall Fertilization on the Growth and Cold Tolerance of Woody Plants in the Landscape. Research Report P-777. Okla. Agri. Exp. Sta. Oklahoma State University, Stillwater, OK pp. 11-12.

Professor of Horticulture
Oklahoma State University
Stillwater, Oklahoma 74078

CONTRIBUTED ABSTRACT

PHYTOTOXICITY OF POST-EMERGENCE GRASS HERBICIDES TO ORNAMENTAL TREES, SHRUBS, VINES, AND GROUNDCOVERS

Purpose: To determine whether Fusilade, Poast, and CGA 24275, can be safely used as over-the-top treatments in ornamentals to control weedy grasses

Procedure: Plants were grown in containers and sprayed with herbicides at approximately 1 month intervals with a hand held small plot sprayer at 30 psi in a volume of 36 gallons/acre. Plants were assessed visually 1 month after each application using a scale of 0-10 where 1 equals no injury and 10 equals death.

Experimental Design: Completely randomized with 3 replications

Applications: 11 May 1983 — sunny, 70 F, soil dry, wind less than 5 mph
18 June 1983 — foggy, 65 F, soil dry, wind 5 mph

Treatments:
1. Control (Con)
2. Fusilade .5 #ai/A + .25% X77 (Fus. 5)

Continued

3. Fusilade 2.0 #ai/A + .25% X77 (Fus. 2)
4. Poast 1.0 #ai/A + oil* (Po 1)
5. Poast 2.0 #ai/A + oil* (Po 2)
6. CGA 24275 1 #ai/A + oil* (CGA 1)
7. CGA 24275 2 #ai/A + oil* (CGA 2)

* 1 quart/100 gallons

Injury Ratings*

Species	June 13, 1983							July 15, 1983						
		Fus		Po		CGA			Fus		Po		CGA	
	Con	0.5	2.0	1	2	1	2	Con	0.5	2.0	1	2	1	2
Ajuga reptans	1.7	1.0	0.0	0.3	0.3	0.3	0.3	0.7	0.3	0.3	0.7	0.3	0.0	0.7
Arbutus unedo	1.0	0.7	0.3	0.0	0.3	1.0	0.7	1.3	0.7	0.3	0.7	1.0	1.0	0.7
Arenaria verna	2.3	5.0	2.0	2.3	0.0	2.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Asparagus densiflorus 'sprengeri'	0.0	0.3	0.7	0.7	0.7	0.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Campanula carpatica	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	—	0.0	0.0	0.0
Cerastium tomentosum	5.3	3.7	5.0	6.0	6.3	5.7	5.0	6.3	5.7	5.7	7.0	6.7	6.7	6.3
Eucalyptus citriodora	0.7	0.0	0.0	0.3	0.7	0.7	0.3	0.0	0.0	0.7	1.0	1.0	2.0	0.0
Eucalyptus nicholii	—	—	—	—	—	—	—	0.3	2.3	—	1.0	2.7	1.0	0.0
Euryops pectinatus	0.3	—	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.3	0.0	2.7	0.0	0.0
Gazania ringens 'leucoleana'	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.0	0.3	0.3	0.5	0.3	0.0
Geijera parviflora	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.3	0.0
Hedera helix	0.3	0.0	0.0	0.3	0.7	0.7	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3
Herniaria glabra	0.0	0.7	1.0	1.0	0.7	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Juniperus chinensis 'Hetzi'	0.0	1.0	1.7	0.3	0.3	0.7	0.5	0.0	0.0	1.0	0.0	0.0	0.0	1.7
Juniperus horizontalis 'Bar Harbor'	0.7	1.3	3.0	0.3	0.7	2.0	5.0	0.7	5.3	7.7	1.7	0.0	5.7	7.7
Juniperus scopulorum 'Witchita Blue'	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0
Juniperus wiltonii	0.0	0.0	1.0	0.3	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leptospermum laevigatum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.7	0.0	0.0	0.0
Ligustrum japonicum	1.3	0.7	1.3	2.3	0.7	1.0	1.0	7.5	1.3	5.3	8.0	3.7	4.7	5.0
Liquidambar styraciflua	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lonicera japonica	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.0	0.7	0.0	0.3	0.7	0.3
Lysimachia nummularia	0.0	0.0	0.0	0.7	0.0	0.0	0.3	0.0	0.0	0.3	0.3	0.0	0.0	0.0
Metrosideros excelsus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nandina domestica	0.3	0.7	1.3	1.0	0.7	1.0	1.7	0.0	0.7	0.3	0.7	0.3	0.0	0.7
Nerium oleander	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	1.0
Ophiopogon japonicus	0.0	0.0	1.0	0.0	0.3	—	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pelargonium domesticum	0.3	0.3	0.7	0.0	0.7	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Photinia fraseri	0.3	0.0	0.3	0.0	0.3	0.3	0.3	0.7	0.0	0.3	0.0	0.0	0.7	0.0
Polygonum capitatum	3.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.5	1.5	2.0	2.0	1.5
Potentilla verna	0.7	3.0	2.0	2.7	1.7	3.0	1.0	0.7	1.0	1.0	1.3	0.7	1.0	1.0
Salix matsudana 'tortuosa'	1.0	1.3	1.0	1.3	1.5	0.3	0.7	0.0	0.0	0.7	0.0	0.0	0.0	0.3
Sedum × rubrotinctum 'Christmas cheer'	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.7	0.5
Spirea Vanhouteii	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.5	1.0	0.0	0.7	0.5	2.0	0.0
Syzgium paniculatum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.7	0.0
Vinca minor	0.3	1.3	1.0	0.7	1.0	1.0	0.7	0.7	0.7	0.3	0.7	0.3	0.7	1.0

* 0 = no injury, 10 = death

Robert P. Rice, Jr.
Ornamental Horticulture Department
California Polytechnic State University
San Luis Obispo, California