Friday Afternoon December 5, 1975

The afternoon session was moderated by Mr. Charlie Parkerson.

EVALUATION OF EIGHT HERBICIDES IN CONTAINER NURSERY STOCK

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Abstract. Eight herbicides were evaluated for their effectiveness in reducing weed growth in 32 plant cultivars of containerized nursery stock. Oxadiazon at 4 and 8 lb. ai/A (active ingredients per acre) gave excellent weed control with only slight phytotoxicity. Oryzalin at 4 and 8 lb. gave excellent weed control but exhibited sever phytotoxicity. The combination of alachlor at 8 lb. and simazine at 2 lb. gave good weed control and were only slighty phytotoxic. Alachlor at 8 lb. gave fair to good weed control and was slightly phytotoxic. Profluralin at 4 and 8 lb. gave fair weed control and damaged the nursery stock the least of any of the herbicides tested. Napropamide at 4 and 8 lb. gave fair weed control and was slightly phytotoxic. Simazine at 1 and 2 lb. gave fair weed control and was slightly phytotoxic. Trifluralin at 4 and 8 lb. gave the poorest weed control of all the materials evaluated, but since most of the weed population were broadleaf weeds this result was not surprising. Trifluralin was only slightly phytotoxic. Pronamide at 2 and at 4 lb. gave poor control of weeds and was the second most phytotoxic.

With the increasing competitiveness in producing container nursery stock and the recession we have just experienced, it became evident that there was a need to decrease the production cost of a containerized plant. Therefore, we began to look for areas to save money while simultaneously improving the quality of our nursery stock. Fretz (6) demonstrated the adverse effect of weeds on Japanese holly 'Convexa' due to reduction in the dry wt of the plant, reducing fullness and quality.

In 1974, we spent $19,286 in Texas in hand weeding 21.2 A of containerized nursery stock. This translates to a cost of $910/A. Until this time herbicides had not been employed inside the containers. Several tests were begun in the summer and fall of 1974 to gain insight and experience in using herbicides in containers. Alachlor, oxadiazon, DCPA, trifluralin, profluralin, and Destun were evaluated. It was decided to talk with as many professionals within herbicide research as possible so that an extensive test could be conducted in the spring of 1975. After those discussions and a review of literature comparing the effects of various individual preemergent herbicides, and evaluation of the herbicides in Table 2 was conducted. DCPA (Dacthal) was eliminated because of its high cost per application ($432.00/A), relatively poor effectiveness, and short length of weed control. Destun was eliminated due to some severe phytotoxic symptoms on plant material.

MATERIALS AND METHODS

The test was established on May 8, 1975. The 32 kinds of plants listed in Table 1 were used in the study. There were 228 plants of each type selected by uniformity of growth from one of our standard beds of 1206 plants. These plants had been planted in 1-gal polyethylene nursery containers and allowed to establish for a minimum of 4 weeks. Each of the herbicides and the combination of alachlor + simazine were evaluated using 12 plants x 32 varieties x 2 rates, bringing each test block to a total of 384 test plants per herbicide rate x the 2 rates. All rates given are in active ingredients per acre. The total experiment contained 7,296 1-gal plants.

The plants were grown in a high organic mix consisting predominantly of screened pine bark. The granular herbicides were applied with a Gandy herbicide applicator which was carefully calibrated before each application. The wettable powder formulations were applied with a 1-gal CO_2 constant pressure sprayer calibrated to deliver a 6½' band at a volume of 30 gal/A. The treatments were completed on May 9, 1975, and the containers irrigated with 1/4" of water with overhead sprinklers to incorporate the herbicides. Each container was fertilized prior to the herbicide treatments with one teaspoon of 18-9-13 Osmocote. They also received supplemental overhead fertilization when test results indicated a need for fertilizer.

Weed control and phytotoxicity symptoms were evaluated on July 22, 1975, 75 days after the herbicide applications. Actual weed counts were made and those results are in Table 2. The predominant weeds encountered were: bittercress, (*Cardamine hirsuta*), weeping woodsorrel, (*Oxalis corniculata*), barnyard grass, (*Echinochloa crus-galli*), and sowthistle (*Sonchus oleraceus*). Each plant variety was given a phytotoxicity rating of 0 to 10, with 0 representing no physical damage and 10 representing death of every plant within the variety tested.

RESULTS AND DISCUSSION

Oxadiazon (Ronstar 2G) gave excellent weed control at 4 and 8 lb., however it was slightly phytotoxic to several of the plant varieties tested, particularly to *Yucca aloifolia*. This damage was due to the granules being trapped in the leaf blade axis. The granules dissolved slowly with overhead irrigation and this greatly increased the phytotoxicity symptoms due to enhanced foliar absorption. All of the yucca recovered, however, their growth was stunted. For this reason it would be much better to use a liquid spray application to prevent the granules from lodging in the leaf axis on plant materials that have this leaf arrangement. Other plant varieties also exhibited damage when evaluations

were made on May 23, 1975, 14 days after treatment. They were *Chamaerops excelsa; Ilex cornuta* 'Rotunda', *Ligustrum japonicum* 'Lusterleaf' (syn. *L. texanum*), *Ligustrum x vicaryi, Photinia fraseri, Trachelospermum asiaticum* (syn. *Rhynchospermum a.*) and *Viburnum supensum*. This damage can best be described as small purple spots on the upper leaf surfaces, as though the herbicide granules dissolved at this location. Neel (7) described similar damage on *Ligustrum japonicum* 'Recurvifolia'. The plants, although exhibiting foliar damage initially, recovered quite remarkably. At the end of the test, July 22, 1975, it was difficult, if not impossible, to notice any undesirable effects. Oxadiazon was still maintaining excellent weed control at the conclusion of the test, and it is showing considerable promise for container use. Since it gave such good weed control, we plan to evaluate it at lower rates and explore the possiblity of liquid applications to lessen the phytotoxicity problems.

The combination of alachlor (Lasso 15G) and simazine (Princep 4G) at 8 and 2 lb. respectively, gave good weed control as did the lower rate of 4 and 1 lb. Only slight phytotoxicity symtoms were noted, mainly in the form of slight stunting. Weed control was 6 to 8 weeks in duration. Dean et al. (2) has reported severe damage to plant materials with the second application of simazine. Therefore, in next year's test we plan to follow up the initial application at six-week intervals with alachlor to see if this would give longer and better weed control.

Alachlor at 8 lb. gave much better weed control than when applied at 4 lb. with no appreciable difference in chemical damage to plant materials. Alachlor is still a standard for other chemicals to be measured against. Because of its relatively short duration of weed control (only 6 to 8 weeks) it must be reapplied at those intervals to give desirable weed control.

Profluralin (Tolban 2G) at 4 and 8 lb. gave fair weed control and exhibited the least amount of phytotoxicity of all the herbicides tested. Profluralin reduced bittercress (*Cardamine hirsuta*) by 75% when compared with the control.

Napropamide (Devrinol 5G) at 4 and at 8 lb. gave fair overall weed control and excellent control of bittercress. It exhibited slight phytotoxic properties but shows some promise and will be evaluated in further studies.

Simazine at 2 lb. gave better weed control than when applied at 1 lb. The reverse was true when phytotoxicity was considered. As mentioned previously, only one application of simazine should be applied.

Trifluralin (Treflan 5G) gave very poor weed control of bittercress at 4 lb. and was only slightly better at 8 lb. Since broadleaf weeds predominantly give us more problems than grasses, triflura-

lin rated very low in our evaluation. Fretz (5), in a similar type test, reported poor overall broadleaf weed control but excellent control of grass weeds at 4 lb.

Pronamide (Kerb 50W) exhibited poor weed control at 2 and 4 lb. Pronamide was also the second most phytotoxic chemical of the herbicides tested. Only oryzalin (Surflan 75W) was more phytotoxic. Several weeks after the tests were completed a heavy infestation of postrate spurge (*Euphorbis prostrata*) was noted at both rates. Since pronamide's strength is in controlling grasses rather than broadleaf weeds, these results could be expected.

The results of oryzalin were disappointing. Both Elmore (3) and Skimina (9) had made favorable reports when they evaluated oryzalin. Excellent weed control was obtained at 4 and at 8 lb. but oryzalin was extremely phytotoxic at both rates. At 8 lb. oryzalin severely damaged 17 of the 32 plant varieties tested. The plants damaged most severely were the *Ilex cornuta* cultivars, in fact, most of the hollies were killed with 8 lb. Other plants severely stunted were *Gardenia jasminoides* and its cultivars 'August Beauty' and 'Mystery', 'Silver King' euonymus and oleander. Elmore (3) reported that he was able to apply a maximum of 8 lb. of oryzalin without injury on *Ilex cornuta* 'Rotunda', oleander and euonymus, however, in this study, oryzalin proved to be quite phytotoxic. This, of course, could be due to differences in growing media, weather conditions, or possibly other factors. In order for oryzalin to be acceptable, extensive phytotoxicity tests would have to be conducted at much lower rates.

Table 1. Plants used in herbicide evaluation in spring, 1975.

1. *Buxus microphylla var. japonica*	Japanese boxwood
2. *Chamaerops excelsa*	Windmill palm
3. Eleagnus macrophylla 'Ebbengi'	Ebbengi eleagnus
4. *Euonymus japonica* 'Aureo-marginata'	Golden euonymus
5. *Euonymus japonica 'Aureo-variegata'*	*Gold spot euonymus*
6. *Euonymus japonica*	Japanese euonymus
7. *Euonymus japonica* 'microphylla'	Dwarf euonymus
8. *Euonymus japonica* 'Silver King'	Silver King euonymus
9. *Gardenia jasminoides* (syn. *G. radicans*)	Dwarf gardenia
10. *Gardenia jasminoides* 'August Beauty'	August Beauty gardenia
11. *Gardenia jasminoides* 'Mystery'	Mystery gardenia
12. *Gelsemium sepervirens*	Carolina jasmine
13. *Ilex cornuta* 'Burfordii'	Burford holly
14. *Ilex cornuta* 'Dwarf Burford'	Dwarf Burford holly
15. *Ilex cornuta* 'Carissa'	Carissa holly
16. *Ilex cornuta* 'Rotunda'	Dwarf Chinese holly
17. *Ilex crenata* 'Compacta'	Compact Japanese holly
18. *Ilex crenata* 'Hetzii'	Hetzi Japanese holly
19. *Ilex* hybrid 'Nellie R. Stevens'	Nellie R. Stevens holly
20. *Juniperus horizontalis* 'Wiltonii'	Blue rug juniper
21. *Lagerstroemia indica*	Red crapemyrtle

22. *Lig. jap.* 'Lusterleaf' (syn. *L.j.* 'Texanum')	Waxleaf ligustrum
23. *Ligustrum x vicaryi*	Golden privet
24. *Lonicera japonica* 'Purpurea'	Purple leaf honeysuckle
25. *Nerium oleander*	Red oleander
26. *Photinia x fraseri*	Fraser photinia
27. *Pittosporum tobira*	Green Pittosporum
28. *Pittosporum tobira* 'Variegata'	Variegated pittosporum
29. *Pyracantha koidzumii*, 'Victory'	Victory pyracantha
30. *Trachelospermum asiaticum* (syn. *Rhynchospermum a.*)	Asiatic jasmine
31. *Viburnum suspensum*	Sandankwa viburnum
32. *Yucca aloifolia*	Spanish dagger yucca

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Table 2. Counts of nine weed species made July 22, 1975, 75 days after herbicide application to 32 container-grown broadleaf ornamental shrubs in spring, 1975, at El Campo, Texas.

	Herbicide and rate applied in lb. ai/A																		
	Con-trol	Kerb		Lasso		Princep		Lasso Princep		Ronstar		Surflan		Tolban		Treflan		Devrinol	
Weed Species		2	4	4	8	1	2	4:1	8:2	4	8	4	8	4	8	4	8	4	8
Cardamine hirsuta (bittercress)	100	26	13	27		28	6	11	5			7	2	27	30	105	58	9	6
Cyperus esculenta (umbrella plant, chufa)	1	2	2											2		1			
Echinochloa crus-galli (barnyard grass)	2				3	2	4	1								2			1
Euphorbia prostrata (prostrate spurge)			4							1									
Gnaphalium pennsilvanicum (cudweed)			1																
Oxalis corniculata (weeping woodsorrel)	9	8	28	4	1	1	6									1		8	21
Salix humilis (prairie willow)			1																
Sesbania emerus (*S. macrocarpia*) (indigo weed)			1															1	1
Sonchus oleraceus (sowthistle)	1		3			1				1				1	1	1			
Total weeds per treatment	113	36	53	31	4	32	16	12	5	2	0	7	2	30	31	110	58	18	29