# THE EFFECT OF SELECTED PRE-EMERGENCE HERBICIDES ON TREE SEED GERMINATION

Earl *W.* Belcher, *Jr.*, U. S. Forest Service
Macon, Georgia

Whether to apply a pre-emergence herbicide at the time of sowing tree seed *is* a decision for the nursery manager. In making this decision, he must know what herbicides can be applied when the seed are sown without damage to the seed.

Cooperating with the Georgia Forestry Commission, the Eastern Tree Seed Laboratory made a study to test the effect of selected pre-emergence herbicides on tree seed germination. This study included tests with seven selected herbicides on five species of tree seed at three rates. The rates were less, the same, and greater than that recommended for cotton seed.

## MATERIALS AND METHODS

Each chemical (table 1) was prepared as an aqueous solution. The amount of the desired concentrate was added to 250 milliliters of distilled water. This was sprayed on the seed and testing medium immediately following sowing. Species used were: Eastern white (Pinus strobus), slash (P. elliottii), and loblolly (P. taeda) pines; redbud (Cercis canadensis) and Arizona cypress (Cupressus arizonica).

Table 1.--Pre-emergence herbicides used in this study

| Chemicals | Rates used | Manufacturer | Chemical formulation | Active ingredient |
|---|---|---|---|---|
| | Per acre | | | Percent |
| Vegadex CDEC | 2-4-6 qt. | Monsanto | chloroally diethyldithio-carbamate | 46.4 |
| Vernam 6E | 2-3-4 lb. | Stauffer | s-propyl dipropylthio-carbamate | 75.9 |
| Treflan E.C. | 1-1½-2 pt. | Elanco | trifluralin (a,a,a-trifluoro-2, 6-dinitro-N, N, dipropyl-p-toluidine) | 44.5 |
| Herban W-75 | 1-1½-3 lb. | Hercules Powder | Norea (3-hexahydro-4, 7-methanoindon-5-yl)-1, 1 dimethylurea) | 76.0 |
| Dacthal W-75 | 5-10-15 lb. | Diamond Alkali | Dimethyl ester of tetrachloro-terephthalic acid | 75.0 |
| Dymid 80W | 2½-3½-5 lb. | Elanco | diphenamid (N,N-dimethyl-2, 2-diphenylacetamide) | 80.0 |
| Atrazine 80W | 1½-3-5 lb. | Geigy | atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine) | 80.0 |

Each treatment was replicated four times and each species twice. Only the control was given an equal amount of water. Each test consisted of four dishes of 100 seeds each on a medium of sterilized sand and perlite (50-50 by volume). Following treatment, the seed were germinated at 72°F. with 16 hours of 160 foot-candles of light. Germination was recorded twice a week. Seed that did not germinate after 28 days were cut and germination was computed on a full seed basis.

Normal full seed germination percent at 28 days (redbud at 34 days) was transformed to arcsin and subjected to an analysis of variance. Differences were tested for significance at the 1 percent level of probability.

RESULTS

A summary of germination percentage is graphically shown for each species in figures 1 through 5.

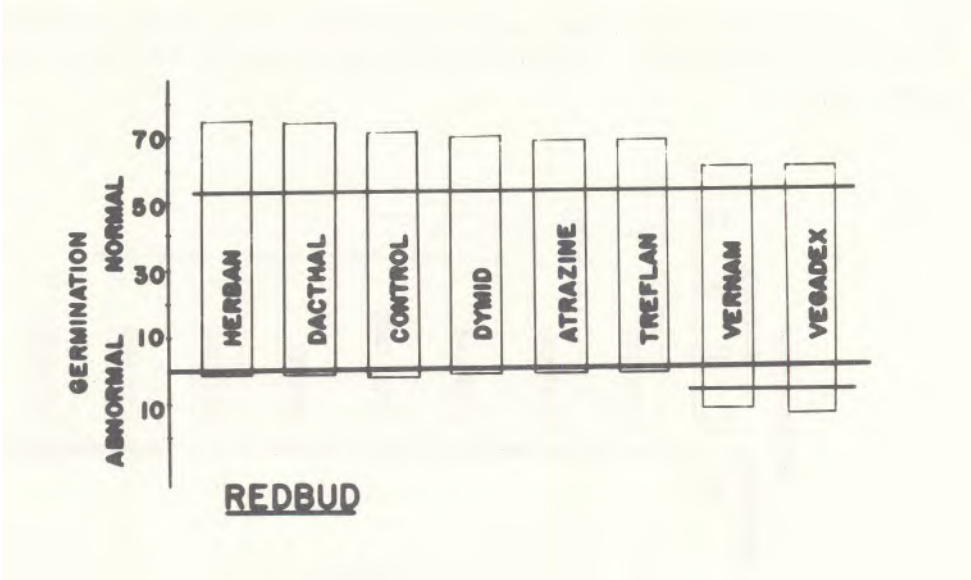


Figure 1.--Redbud germination.

There was no significant effect on normal full seed germination over that of the control. Vegadex and Vernam did cause an increase in abnormal germination.

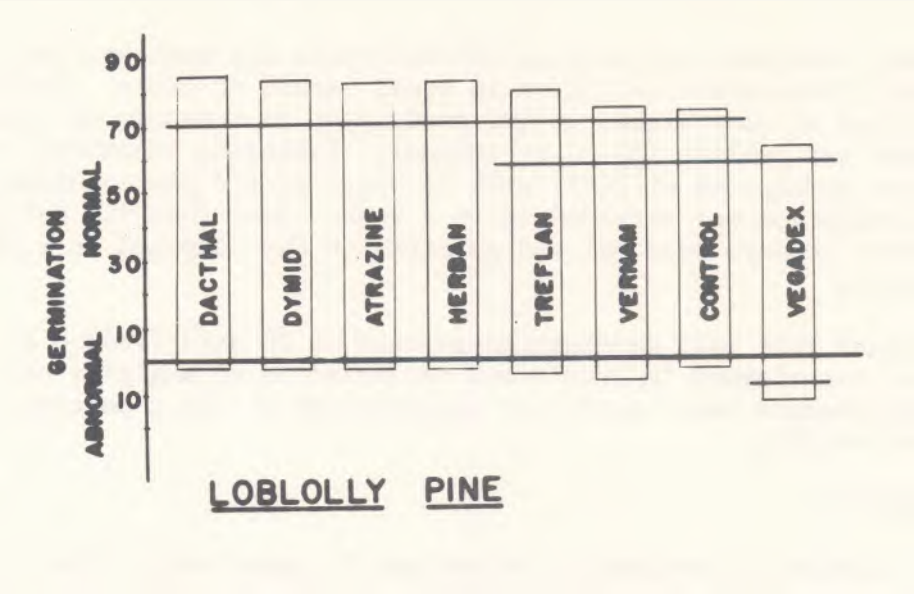


Figure 2.--Loblolly pine germination.

No significant effect was noted on normal full seed germination over- that of the control. Vegadex did significantly increase abnormal germination.

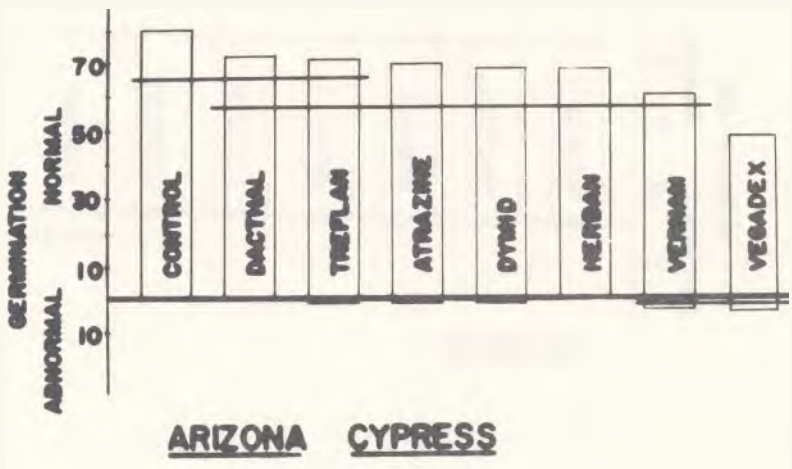


Figure 3.--Arizona cypress germination.

All herbicides, except Dacthal and Treflan, significantly reduced germination from that of the controls. A significant increase in abnormal germination was noted with Vegadex and Vernam.

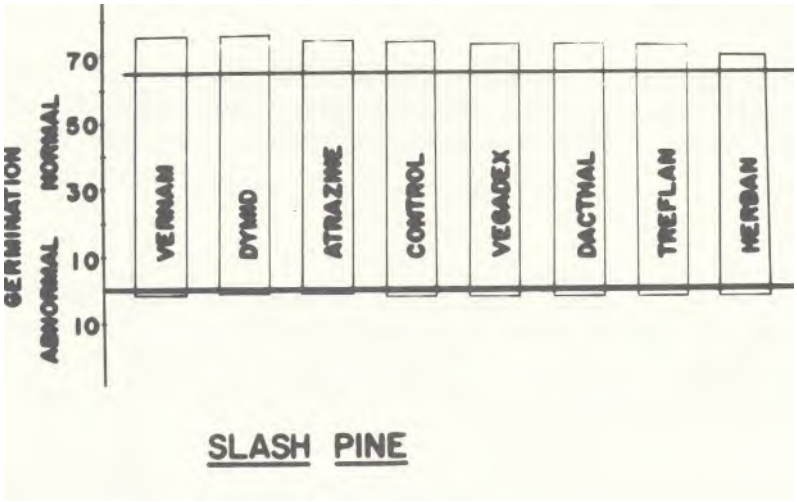


Figure L'.--Slash pine germination.

No significant differences in germination were noted.

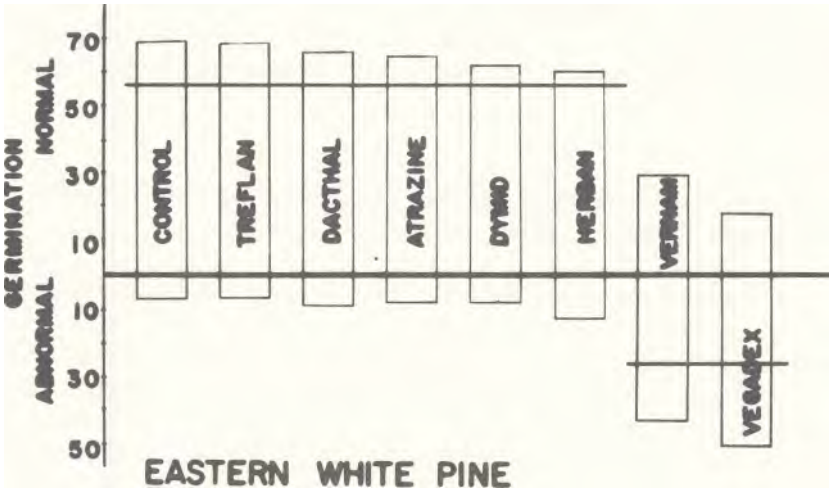


Figure 5.--Eastern white pine germination.

Vegadex and Vernam significantly reduced germination from that of the controls. They also increased abnormal germination.

## MISCELLANEOUS NOTE

A side effect was noted on all species with the use of Treflan. Seedlings appeared larger in diameter than the controls and had thicker cotyledons. This was most noticeable on slash pine seedlings (fig. 6).

## CONCLUSIONS

The results of this study show that the effect of an herbicide on seed germination varies with species. Where slash pine seed germination was not affected by any of the herbicides used at any of the rates used, Arizona cypress germination was reduced by most chemicals at the lowest rate.

Vegadex and Vernam were most detrimental to seed germination, while Dacthal and Treflan seemed to have the least effect. Treflan also increased the size of hypocotyls and thickened cotyledons. This was most likely due to a hormonal effect of some chemical in the Treflan formulation.

Limited field trials were prepared. Although not for statistical evaluation, they did illustrate that laboratory tests with herbicides don't necessarily indicate what can be expected in the field. This may be attributed to the fact that environmental influences can change or modify chemicals in the field. Therefore, these laboratory tests serve only as a guideline for the effect these herbicides have on germination and must be moderated by environmental influences.

## SUMMARY

Seven herbicides were sprayed on seed of five tree species at three rates to study their affect on germination.

In the laboratory tests, Vegadex and Vernam significantly reduced germination of white pine and Arizona cypress and increased abnormal germination of redbud, Arizona cypress and white pine. Only slash pine was not affected by the herbicides used. Herban, Dymid, and Atrazine also reduced the germination of Arizona cypress and Vegadex also increased abnormal germination with loblolly pine seed.

Limited field trials showed few trends, but did indicate that laboratory tests did not necessarily indicate results which might be expected in the field.

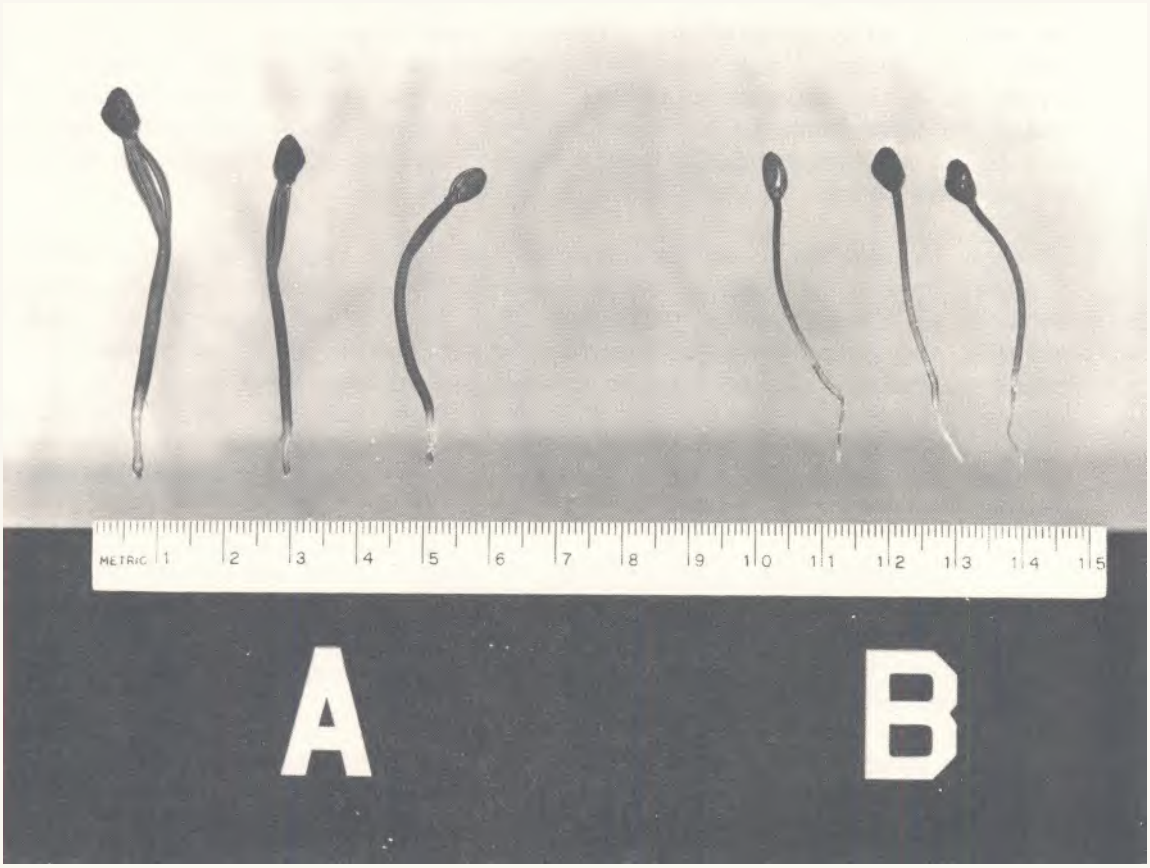


Figure 6.--Slash pine seedlings germinated on a sand-perlite medium sprayed with Treflan (A) or distilled water (B).