

TEN YEARS OF WEED CONTROL WORK IN A FOREST NURSERY

By

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This work was started in the spring of 1955 at the General Andrews Forest Nursery at Willow River, Minnesota, under a cooperative agreement between the Division of Plant Industry of the Minnesota Department of Agriculture and the Division of Forestry of the Minnesota Conservation Department.

When approaching the problem of weed control in nursery seedling beds, a perusal of the literature at that time (1955) showed that very little in the way of applicable reports could be found. Consequently, we had to start practically "from scratch" and follow a broad program of trial and error in the application of many of the herbicides existing at that time. The first year we tried several chemicals and various formulations of these chemicals such as the phenoxy acetics and propionics, the benzoics, butyrics, MCP, etc. The results were, naturally, quite variable both in regard to weed control and the interaction of the herbicide and the coniferous seedlings, but, without going into the specifics of each, let me say that generally none of these were satisfactory from either or both standpoints.

In the 1956 season we tried several other chemicals, among them amino triazole. This chemical gave us good weed control and very little injury to the seedlings of white and black spruce and red pine at rates up to 2 lb/A. Red pine appeared to be the most susceptible of the three species. Here, then, appeared to be our first good possibility in two years of testing and we decided to concentrate on this chemical the next year (1957).

In 1957 we wished to find the most adviseable rate of this chemical-- in other words "how much?" Amino triazole at rates of 1, 2 and 3 lb/A active was applied on duplicate one-half square rod bed areas, to three species of coniferous seedlings, approximately 30 days after emergence. Species used were black spruce, white spruce and red pine, inasmuch as they constitute more than 90% of the trees grown at this installation. Observations were taken at two-week intervals for two months following application. The final results showed that the one-pound rate produced no injury on any of the three species. The two-pound rate produced no injury on black spruce or white spruce, but produced extensive injury on red pine. The three-pound rate produced less than 5% injury to white spruce but severe damage to the other species, with subsequent necrosis of the terminal growth areas. Annual grass and broadleaf weed control was good at the one-pound rate, and excellent at the two and three pound rates. The results, then, on this and other concurrent trials, and past trials, pointed to the one-pound level as the most adviseable rate for the three species under consideration but again showed the spruce to be much more tolerant than the pine.

In 1958 we wished to take under consideration the well-known fact that tolerance of the plant to a herbicide varies with its period (s) of physiological activity. In other words, to answer the question "When is the best time to apply the herbicide and be able to expect no injury or the least amount of injury?" Rates of 1 and 2 lb/A active were applied on separate weekly plots starting with one week after emergence and continuing through the twelfth week. Percent of injury, if any, was evaluated for each plot and graphs were made plotting time applied against percent of injury for each rate. The slides to be shown show the seedlings of all three species to be most tolerant during the period of from one through six weeks after emergence. Here again, though, the spruce show considerable more tolerance than does the red pine, but in all species the small amount of injury does not add up to a significant economic loss which would preclude the application of the chemical in the presence of a weed problem of some degree of severity.

In view of the fact that different weeds germinate and appear at different times during the first part of the growing season, and, in view of the time limit of six weeks of high tolerance of the conifer seedlings, the question now arises "how many one-pound applications will the seedlings tolerate during the six-week high tolerance period?" In 1959 we set out to try to find the answer to this question. We first assumed that the seedlings could tolerate no more than three weekly applications, since the previously high level in our trials was the 3-lb. rate, and this showed degrees of injury varying with the species under consideration. Consequently, twenty plots were set up for triple application with various weekly combinations (all possible combinations of 1, 2, 3, 4, 5, 6), 15 plots for double application, and, as a repeat and possible verification, six single applications. Rate for all plots was 1 lb/A active. Results showed that only one species, white spruce, would tolerate triple application in all time combinations; black spruce would tolerate only at two-week intervals (1, 3, 5 and 2, 4, 6) while red pine was not tolerant. In the double applications white spruce was entirely tolerant in all combinations, black spruce only of the 1, 5 and 1, 6 intervals and red pine not tolerant. All species were again entirely tolerant of single applications during any of the six weeks. Annual weed control (and some perennials) was excellent on the plots receiving trip and double applications and fair to good on the single application plots.

And so, the questions have been answered, at least in regard to the practical application of one chemical. I would, however, be the first to say that all the questions pertaining to one subject are never answered, but future observations concurrent with continued use will bring to light more and more information.

At this point you may be wondering about those chemicals which have come along during and since the time of these trials. Let me say that we have worked with most of these also, together with our work on amino triazole. We have worked with all of the triazine compounds from the time of their inception; with the substituted ureas, and with the modified benzoics and with some of the later preemergence chemicals. Without going into a large amount of details, let me say that we have never been able to obtain consistently good results with the triazines and the substituted ureas and we have made literally hundreds of applications over a four-year period. In regard to the triazines we have found, however, that the pines are apparently much more tolerant of these chemicals than are the spruce species, but none seem tolerant enough to withstand a rate adequate for good weed control.

In regard to preemergence chemicals, we have tried quite a large number in 1960, 1961 and 1962 and out of these two have been what we consider very consistently good. These are amiben and zytron with which we have obtained 60-90% season-long control of annual grassy and broadleaf weeds. We are now using amiben on many of the seedling beds in the nursery and results are good. A recent application appears to be giving 78% control as compared with several check beds.

In conclusion, let me just say a few words on the economics of this work. We have been able, through the use of these various chemicals, to obtain adequate weed control for prices ranging from \$5-30 per acre, depending upon the severity of the weed infestation and the chemicals and the rates used. This is compared with several hundred dollars per acre cost with combined cultural practices and hand weeding. This economic aspect, together with the bits and pieces of knowledge that we have extracted, is adequate reward for ten years of investigation.