Cone Production Stimulus Related to Transplanting in Red Pine

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Early flowering and seed production is important to forest genetics and tree improvement programs. The many methods used in the past to promote precocious flowering in forest tree species and the controversial results have been reviewed at length by NIENSTAEDT (1961). Current standard horticultural practices to induce precocious flowering are injury or fertilization or both.

Our first experience with moving red pine (Pinus resinosa D. DON) was in 1966 when ten trees were transplanted into plastic tubs. Nine of these trees were placed in the ground in their tubs; one was replanted into the soil at the same site. The tree not constrained in a tub produced no cones the year following transplant, whereas those still in the plastic tubs in the ground have continued to produce cones yearly.

In 1970, 71, and 72, numerous red pine trees were moved into large wooden tubs for special studies. Herein are tabulated some interesting observations made on these constrained trees in regard to early cone production related to transplanting. The root pruning technique used here differs from that of others (HOEKSTRA & MERGEN, 1957, and STEPHENS, 1964) in that the trees, with intact soil profile, are lifted into constraining tubs, pruning all roots rather than just severing the lateral feeders.

Materials and Methods

In 1970, 100 ten-year-old trees and in 1971, 70 six-year-old trees and in 1972, 30 seven-year-old trees were transplanted by machine into redwood tubs (34 X 34 X 31 inches; capacity 2/3 cubic yard). Trees were obtained from two separate but adjacent plantations in the northeast corner of Iowa County, Wisconsin, on the old Wisconsin River floodplain. The tree transplant machine removed trees into the tubs retaining the soil profile.

Soil samples taken at depths to 12 inches from the first two groups of 170 tubbed trees were submitted for analysis[2]) in June of 1971. Following the soils analysis, potassium nitrate (KNO_3) and ammonium orthophosphate ($NH_4H_2PO_4$) were added to each tub in sufficient quantity to bring subsequent analysis values up to 90 lbs/Acre for P and 125 lbs/Acre for K which is more in keeping with normal fertility levels recommended for good red pine sites in Wisconsin (WILDE et al., 1965). This single application of fertilizer was made on June 22, 1971, prior to bud set for the subsequent year's growth. Current year height flush had been terminated, but needle elongation was just beginning. The 30 trees transplanted in 1972 followed the same format as for 1971.

Trees were examined to determine the production of strobili which were first noticed in early June of 1970 following their April 1970 transplant. Each subsequent year the trees were examined for strobili production.

Results and Discussion

Staminate Strobili

The first 100 trees that were moved in April of 1970 did not produce staminate strobili the same season they were transplanted. The following year, however, staminate strobili were produced throughout the lower crown half in extreme profusion on all 100 trees. In their second year following transplant, only two trees produced scattered staminate strobili on single side branches of the tree. The same pattern of staminate strobili production was evident for the 70 trees transplanted in 1971 and seems to be the case with the 30 transplanted the spring of 1972.

Ovulate Strobili

The sequence of ovulate strobili production on the first 100 trees transplanted in 1970 is as follows. Thirty-five of the one hundred trees produced an average of 3 ovulate strobili per tree the same season as transplanted. Because the buds are formed the previous year, this small number of strobili could be expected since the same approximate number was produced throughout the plantation on the undisturbed trees. The next season, 1971, these 100 trees produced an average of 29 ovulate strobili (range 5—49) per tree. The second year following transplant, 1972, these trees produced an average of 108 ovulate strobili (range 28—184) per tree. The same pattern of ovulate strobili production and similar counts are evident for the trees transplanted in 1971, and in 1972. None of the undisturbed trees in the plantation have produced more than the previously observed three strobili per tree, over the same observational period.

Comparing values on the number of ovulate cones on fertilized vs. unfertilized trees the first year following transplant (30 vs. 28 respectively) (table 1) indicate no effect due to fertilization. However, no comparison data are available for fertilizer effect on strobili production of the 100 trees for 1972. Since these are observational data on trees dug for other purposes and not a designed study on cone production, it should be pointed out that for obvious reasons, no control trees in the undisturbed state in the plantation were fertilized either.

In summary, the direct stimulus given the trees was the severe and complete root pruning plus confinement. This is apparently followed by high strobili productivity while the trees are constrained in their containers.

Abstract

The technique of transplanting trees into tubs (completely pruning roots), plus confinement, results in high cone productivity as long as the trees are constrained in their containers.

Key words: Red pine, transplanting, fertilizer levels, strobili, root pruning, cone production.

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[2]) Acknowledgement is made to Dr. S. A. WILDE and associates from the U.W. Soils Department who performed the soil analyses.

Table 1. — Summary of staminate and ovulate strobili production following transplant

Transplant group		Year of transplant		Year following transplant		Second year following transplant	
		♀	♂	♀	♂	♀	♂
By year							
1970 (100 trees)	Average number of strobili per tree	3	0	28	profuse	108	0
	Percent of trees producing strobili	35	0	100	100*)	100	2
1971 (70 trees)	Average number of strobili per tree	3	0	30	profuse		
	Percent of trees producing strobili	35	0*)	100	100		
1972 (30 trees)	Average number of strobili per tree	3	0				
	Percent of trees producing strobili	47	0				

*) Indicates period where fertilizer was added to tubs.

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