Results

The first cone yielded 44 immature seeds, and the second produced 66. X-rays taken before sowing revealed fully developed embryos. The last cone yielded 52 seeds of which 10 germinated within 10 days; no ohter seeds germinated. The seedlings all had four cotyledons rather than the five to seven normal for shortleaf pine, a possible result of the small seed size.

The total time from pollination to maturity was slightly over 1 year, about 7 months less than the time required in nature. The early development was probably stimulated by the changes in temperature and the shortened day lengths.

The maturation period might possibly be reduced by another 2 to 3 months. If a winter grafting could be accomplished while the strobili are still in the bud stage (stage 1), the development of the female strobili to the receptive stage (stage 5) might be accelerated in the greenhouse, and pollination might then be accomplished in January or February instead of in April. Grafting arid massive conelet abortions might be avoided by developing stock that can produce cones at age 4 or 5, when the trees are small enough for potting and indoor handling.

Abstract

A wind-pollinated shortleaf pine conelet was subjected to varying temperatures and shortened day length to simulate abbreviated seasons and induce early development. The conelet produced viable seed in slightly less than 13 months.

Key words: Pinus echinata, conelet, development, maturation, germination.

Zusammenfassung

Durch Pfropfung von frei abgeblühten Reisern von ***Pinus echinata*** MILL. auf ***Pinus elliottii*** ENGELM. kurz nach der Bestäubung im April 1974 und anschließende Behandlung durch Veränderung der Tageslänge und Temperatur sowie mit fluoreszierendem Licht konnten in einem Fall innerhalb von 13 Monaten reife Zapfen mit keimfähigen Samen erzielt werden.

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Some results on changes of leaf characters and readiness to flower in Chamaecyparis pisifera

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By its polymorphism of the foliage ***Chamaecyparis pisifera*** is a well known ornamental garden species in many parts of the world. Especially gardeners defined two different form~:The "juvenile" squarrosa type and the "adult" squamosa type with scale formed foliage (BEISSNER 1879, DALLIMORE and JACKSON 1966). Normally the type of foliage changes from squarrosa to squamosa type after a few years after sowing. The retention of the juvenile squarrosa type in older plants is genetically fixed, which is demonstrated by LANGNER (1964). He analysed a selfed progeny showing a segregation in squarrosa and squamosa types. Both types can be distributed widely commercially by their vegetative propagation.

In a progeny of a ***Chamaecyparis pisifera*** Plumosa Aurea which originated with a high probability from selfing we observed four types of seedlings 6 years after seed-

the squarrosa type (sr)

a mixed squarrosa-plumosa type in which branches or branch parts showed the needle and the plurnosa character (sp),

a plumosa type with scaly leaves grown together with the branch in their basal parts and in the apical part tapering in a point (p) and

the squamosa type with shapes with rounded off apical parts and laid on the branches in its whole length (sm); (LANGNER and MELCHIOR 1968).

The broad variation of morphological and physiological characters between and within leaf types were described by the same authors.

In the following some results on (1) the changes of these leaf characters and (2) the influence of gibberellic acid (GA_3) on the strobili production of some selected clones of this progeny are presented and more detailed elsewhere (MELCHIOR, in print).

Considering the topic (1) the seedlings from seed to an age of some 80 months have been assessed concerning their leaf character: As already mentioned by LANGNER (1964) ***Chamaecyparis pisifera*** within the relatively short time of two years changes the needle type from the sr to the sm type. This happened in the observed progeny (86 clones) of the genetically fixed sm-types during the 2nd growing season within some 3 to 5 months. In the same period two more clones changed into the p- and the sp-type. Most of the clones changed within an age of 2 to 4 years into the p-type, 8 changed at an age of 4 to 6 years into the mixed sp-type and more than a quarter of the clones left un-

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changed conserving the sr-type of foliage. Beyond them only a few clones have changed their type up to 1975.

More knowledge on the role of GA_3 in Cupressaceae will be helpful to transmit the often spectacular success obtained in Cupressaceae in the commercially more important Pinaceae (*e. g.* BLEYMÜLLER 1976). This was the reason to control the effect of GA_3 and treatment with different red light quantities given as supplemental light on 17 months old cuttings.

Light treatments given as supplemental light have stimulating effects on height growth. There existed significant differences between light treatments with higher red light ratios in comparison with the control. GA_3 treatment did not cause any effect on height growth. But GA_3 sprays caused considerable results concerning the strobili production, which is correlated with the varying concentrations between 0 and 200 ppm (MELCHIOR 1976).

a) An increase of the number of male strobili by increasing concentrations.
b) The increase of the number of male strobili with higher concentration was more rapid in the sp-type than in the sr-type.
c) A significant difference between treated sr- and sp-types. The latter produced more male and female strobili when treated with the same GA_3 concentration.
d) No formation of female strobili in the sr-type.
e) A slight increase of the number of female strobili with increasing concentrations in the sp-types.
f) No changes of the leaf type till the last date of inspection (June 1968).

Light quality influenced height growth and strobili production significantly at the 5% level with one to three percent of the total variation. For the production of male strobili GA_3 treatment covers about 60% in the sr- and about 75% in the sp-types of the total variation. Differences between the two leaf types sr and sp are significant at the 5 or 1% level concerning the GA_3 concentration. In the sp-type the production of female strobili is significantly influenced by the GA_3 concentration applied.

Considering the results we must suppose a high heterozygozity for the mother tree of which the progeny originated. Each leaf type of this progeny follows its own way from seedling state to readiness-to-flower-state according to its genetical assessment. Consequently the terms "juvenile" and "adult" should be used not so much for a leaf type as for the corresponding phase towards the readiness-to-flower-state especially in these various *Chamaecyparis* types. In relation to the leaf types the terms sr, sp etc. seem to be more appropriate.

The correlation of many unfavourable properties such as low frost hardiness, high branch density, yellowish-brown needle colour with the sr-type might reduce the chance of such types considerably to survive under natural conditions. Therefore it is supposed that very likely rather gardeners than nature might have been responsible for the preservation of this gene resource.

It is possible to terminate the juvenility period of certain *Chamaecyparis pisifera* types under influence of GA_3. Even-aged sr and sp cuttings react differently on various concentrations of GA_3 in relation to the production of male and female strobili. They do not react in leaf characters, so, there must be supposed a different velocity of the process towards readiness-to-flower between sr- and sp-type. Additionally the morphogenetic processes related to leaf characters must be independent from the process towards readiness-to-flower. But there exists no doubt that the role of plant hormones and plant inhibitors in precocious flowering needs more evaluation especially in relation to the economically important Pinaceae (*e. g.* PHARIS 1974). BLEYMÜLLER's (1976) first successful results on *Picea abies* might be a considerable contribution to future investigations.

Key words: *Chamaecyparis pisifera*, phase change, leaf characters, gibberellic acid, flower induction.

Zusammenfassung

An 6jährigen Sämlingen einer Selbstungsnachkommenschaft von *Chamaecyparis pisifera plumosa aurea* wurden vier verschiedene Nadelformtypen gefunden: squarrosa, squarrosa-plumosa, plumosa und squamosa. Die meisten Sämlinge änderten ihren Nadelformtyp bereits innerhalb von 2 bis 4 Jahren und etwas mehr als ein Viertel behielten die sog. Jugendform (squarrosa). Die Behandlung von Stecklingen, die von ausgewählten Sämlingen gewonnen wurden, mit Gibberellinsäure GA_3 und zusätzlichem Rotlicht hatte verschiedene Wirkung auf die Klone: Zunahme der männlichen Blüten mit steigender GA_3 Konzentration, dieser Effect war deutlicher im squarrosa-plumosa Typ als im squarrosa Typ. Weibliche Blüten konnten nur im squarrosa-plumosa Typ, nicht im squarrosa Typ induziert werden. Rotlicht hat im Gegensatz zu GA_3 einen stimulierenden Effekt auf das Höhenwachstum.

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