

Short Note: Time of GA4/7 application may affect the sex of Scots pine flowers initiated

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Summary

May and June treatments with GA4/7 mixture significantly increased male flowering while the July and August application resulted in significant increase of female flowering of Scots pine grafts. The relation between time of GA4/7 application and stage of seasonal development of bud structures is shortly discussed.

Key words: Flower induction, GA4/7, *Pinus sylvestris* L.

Zusammenfassung

Bei *Pinus sylvestris* L. erhöhten Behandlungen mit einer GA4/7 Mischung im Mai und Juni signifikant die Bildung männlicher Blüten, während eine Behandlung im Juli oder August eine signifikante Erhöhung der Anzahl weiblicher Blüten nach sich zog. Eine Beziehung zwischen dem Zeitpunkt der GA4/7 Anwendung und dem Stadium der saisonalen Entwicklung der Knospenstrukturen wird kurz diskutiert.

Introduction

The differential action of GA's on stimulation of flowers of different sex is well known for some species of the *Pinaceae* family. The listing of data available so far suggested that GA4/7 applied in the first part of growing season influenced male flower initiation while the extension of the time of treatment to the latter part of growing season resulted in female flower initiation (CHALUPKA 1980). Some further observations (Ross *et al.* 1981, CHALUPKA 1981) substantiated this regularity, which was also the case with an experiment on GA4/7 application during various parts of the same growing season.

Materials and Methods

The experiment was conducted in 1981 on five clones of Scots pine growing in a seed orchard at Kórnik and each of the clones was represented by twelve 20-year-old grafts.

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Two branches were selected in the middle part of each crown and one of them was treated with GA4/7 while the second one was a control. The treatments were done at four time variants: (1) May—June (spraying on May 21 and 27, June 3, 9 and 19), (2) July—August (spraying on July 9, 16, 23 and 30, August 6), (3) May—August (spraying on May 27, June 10, July 9 and 23, August 6), and (4) control (spraying on May 20, June 3 and 19, July 16 and 30). GA4/7 mixture was applied in a water solution of 200 mg/l containing 0,05% Aromox C surfactant. Control branches were sprayed with water and the surfactant. The experiment was replicated thrice.

In Spring 1982 the number of shoots flowering male, number of shoots flowering female and total number of female flowers were counted (Table 1), and evaluated by an analysis of variance.

Results

Spraying of branches with the GA4/7 mixture during May and June compared to those sprayed later or not at all (May—June + May—August vs July—August + control) significantly increased the percentage of shoots flowering male from 13,2% to 29,3% while the July and August spraying compared to the earlier period of spraying or control (July—August + May—August vs May—June + control) significantly improved female flowering (Table 2). Percentage of shoots with female flowers and the number of female flowers per 100 shoots increased from 0,5% to 3,4% and from 2,3 to 5,6 respectively. The interclonal variation both in male and female flowering was also statistically confirmed.

Discussion

The results obtained support an earlier suggestion about the relation between the time of GA4/7 application and the sex of Scots pine flowers initiated (CHALUPKA 1980). The

Table 1. — Results of flowering observations.

Treatment periods	Replicates	% of shoots flowering male					% of shoots flowering female					No. of female flowers per 100 shoots				
		C l o n e s														
		01-22	01-82	01-84	01-85	07-04	01-22	01-82	01-84	01-85	07-04	01-22	01-84	01-85	01-85	07-04
Control	I	46,0	28,2	11,9	0	0	0	0	28,6	3,0	0	0	0	33,3	6,1	0
	II	41,5	14,0	14,3	0	57,9	0	2,0	1,4	0	2,6	0	2,0	1,4	0	2,6
	III	83,6	0	26,3	0	12,2	0	0	0	0	0	0	0	0	0	0
May-June	I	77,3	36,4	41,2	4,3	32,7	2,3	0	8,8	0	1,7	2,3	0	13,2	0	1,7
	II	66,1	39,2	53,6	0	62,8	1,8	0	0	1,1	0	1,8	0	0	1,1	0
	III	80,9	3,9	15,8	11,1	14,6	0	1,3	1,3	0	0	0	1,3	1,3	0	0
July-August	I	17,3	36,6	17,4	0	0	3,7	12,2	4,3	0	2,6	3,7	12,2	4,3	0	2,6
	II	13,3	34,8	76,5	0	0	0	6,5	0	0	0	0	6,5	0	0	0
	III	43,5	19,2	13,0	0	0	6,4	11,0	15,2	5,4	7,1	6,4	13,7	15,2	5,4	8,3
May-August	I	75,3	3,7	57,1	0	15,1	2,2	3,7	0	0	0	2,2	3,7	0	0	0
	II	71,8	37,5	15,7	0	19,6	1,2	12,5	13,7	13,8	0	1,2	12,5	17,6	13,8	0
	III	79,8	26,3	59,6	11,1	5,8	1,1	15,8	8,5	5,5	5,8	1,1	15,8	10,6	5,5	5,8

Table 2. — Results of analysis of variance. Calculated values of F: ** - significant at 0,01 level, * - significant at 0,05 level.

Source of variance	Df	% of shoots flowering male	% of shoots flowering female	No. of female flowers per 100 shoots
Total	59			
Treatment periods /T/	3	4,69 **	3,41 **	1,75
May - June	1	12,88 **	0,00	0,06
July - August	1	1,19	10,14 **	4,64 **
May - August	1	0,00	0,08	0,54
Clones /C/	4	22,05 **	2,05	2,68 **
T x C	12	1,54	0,77	0,70
Residual	40			

differential effect of GA4/7 on the sex of flowers is probably connected with the stage of development of Scots pine buds during the growing season. The pattern of seasonal development of Scots pine buds in grafts is well known owing to detailed studies done by HEJNOWICZ (1982).

The shoot formed in the previous year begins elongation at the turn of March and April and the process is continued during May and June. Early May initials of the new embryonic shoot are observed and the initiation of dwarf shoot cataphylls begins at the end of that month. In late June in the axils of cataphylls the initiation of dwarf shoot primordia begins which are homologous with male strobili initials in the generative bud.

The newly formed embryonic shoot slowly ends its development at the turn of August and September. In late July the new cataphylls of long shoot buds start to initiate. The phase of cataphylls initiation takes almost three weeks. In mid August the initiation of lateral bud primordia begins which are homologous with female strobili initials in the generative bud.

It is possible that the application of GA4/7 during May and June or during July and August modifies the development of newly formed primordia and promotes their sexual differentiation, male from dwarf shoots and female from lateral buds.

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Literature

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Short Note: A Commercially Feasible Micropropagation Method for Aspen

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Abstract

A relatively simple two-step method for the rapid clonal propagation of mature elite aspen clones (*Populus tremula*, *Populus tremuloides* and their hybrids) is described. Meristematic explants from buds were cultured on a modified Woody Plant Medium, here designated Aspen Culture Medium (ACM), supplemented with low levels of a cytokinin and an auxin. Following shoot differentiation/proliferation on the bud explants of the responsive aspen clones, the microshoots are rooted in soil-free potting mixture. A few thousand plantlets from a large number of mature selected aspen clones have been regenerated by this two-step micropropagation method.

Kew words: Aspen (*Populus*), micropropagation, bud meristems culture, microshoots, plantlets.

Zusammenfassung

Es wird eine verhältnismäßig einfache Zweischnittmethode für eine schnelle Vermehrung von Aspenklonen (*Populus tremula*, *Populus tremuloides* und deren Hybriden), ausgehend von adulten Elitebäumen, beschrieben. Dabei werden Meristemexplantate von Knospen auf einem modifizierten "Woody Plant Medium" kultiviert, das hier als "Aspen Culture Medium (ACM)" bezeichnet wird, welches mit geringen Konzentrationen eines Cytokinins und eines Auxins ergänzt wurde. Nachdem sich Mikrotriebe auf den Knospenexplantaten der reagierenden Klone differenziert und gestreckt haben, werden diese in einem Torf-Perlite Substrat bewurzelt. Einige tausend solcher Pflanzen aus einer großen Zahl von selektierten adulten Aspenklonen konnten mit dieser Zweischnittmethode vermehrt werden.