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BRIEF COMMUNICATION

Changes in the content of indole-3-acetic acid in the needles of dwarf pine in the course of year

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Abstract

The changes in the content of indole-3-acetic acid (IAA) were investigated in the youngest needles of *Pinus mugo* in the course of year. In newly formed needles, the content of IAA increased, starting from July and reaching its maximum in August to October. The IAA content decreased with a decline in the intensity of apical dominance during dormancy but no changes were observed in budbreak (May and June).

Key words: budbreak, dormancy, *Pinus mugo*

In the course of the year, the tree species of the temperate zone undergo the period of growth and the period of dormancy. Dormancy originated during the phylogenetic development of plants as a protection of plants against regularly repeating period of climatically unfavourable conditions. Plant hormones play very inportant role in the dormancy of plants. They secure realization of the genetic information and simultaneously the plant response to the external enviroment (for review see Saunders 1978). Auxin is transported basipetally from apical part and from the assimilatory apparatus and inhibits the growth of lateral and axillary buds (for review see Goldsmith 1977). Later the correlative inhibition of these buds pass into dormancy.

Seasonal changes in auxin-like substances have been investigated most frequently in needles of the *Pinus sylvestris*. The lowest levels were observed during dormancy. The highest values were recorded at budbreak in April to June (Kopczewicz 1970, Lanner 1976, Sandberg and Ericsson 1987). When investigating extracts from

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needles of the same species, IAA was observed in the period of the growth of annual shoots. On the contrary, IAA was not detected during dormancy in the winter season (Alden 1971). Likewise, a low IAA level in needles was estimated during dormancy of *Pseudotsuga menziesii* (DeYoe and Zaerr 1976) or *Picea abies* (Ivonis *et al.* 1983, Psota *et al.* 1992).

Similar changes in IAA were observed in the investigated species *Pinus mugo*. For the experiments, 40-year-old *Pinus mugo* Turra trees situated at an altitude of 1180 m on Smrk mountain (Čeladná Forest Production Centre, compartment 404 B3) were used. Samples were taken monthly from October 1992 to September 1993. Indole-3-acetic acid (IAA) was determined in the youngest needles from the apical part of annual shoots. Purifying procedures were performed according to Knegt and Bruinsma (1973). IAA content was determined using the fluorimetric method (Knegt and Bruinsma 1973, Mousdale *et al.* 1978) on an *RF-540* spectrofluoriphotometer (*Shimadzu*, Kyoto, Japan). Each measurement was repeated four times.

The highest content of endogenous IAA was recorded from August to October when needles were taken from growing annual shoots (Table 1). A decrease in IAA level was observed during November, probably in connection with the onset of dormancy and decrease in the intensity of apical dominance associated with it. The conspicuous increase in the content of endogenous IAA in the period of budbreak in May and June, reported in the literature, was not observed in one-year-old needles of *Pinus mugo* (Table 1).

Table 1. Changes in the content of endogenous IAA in the needles of *Pinus mugo* in the course of year (mean of 4 replications ± S.E.)

Month	IAA [mg g^{-1}(f.m.)]	Statistical significance of differences											
		10	11	12	01	02	03	04	05	06	07	08	09
10	8.3 ± 3.22	-											
11	2.0 ± 0.63	**	-										
12	2.5 ± 1.16	*	0	-									
01	2.7 ± 0.37	**	0	0	-								
02	2.0 ± 0.54	**	0	0	0	-							
03	1.7 ± 0.26	**	0	0	**	0	-						
04	2.3 ± 0.16	**	0	0	0	0	**	-					
05	2.3 ± 0.91	**	0	0	0	0	0	0	-				
06	1.2 ± 0.29	**	0	0	**	*	*	**	0	-			
07	2.3 ± 0.70	*	0	0	0	0	0	0	0	*	-		
08	6.7 ± 0.70	0	**	**	**	**	**	**	**	**	**	-	
09	5.3 ± 1.01	0	**	**	**	**	**	**	**	**	**	0	-

** - differences statistically significant at $P = 0.01$, * - differences significant at $P = 0.05$,
0 - insignificant differences

The high level of auxin in buds and/or in annual shoots during budbreak is considered as the result of increased activity of the apex (Lavender and Salim 1987) and not the reason for it. The low level during the phase of dormancy is suggested to be the result of a low activity of the apex. The intensive growth of annual shoots is

correlated with high auxin levels in the plant (Allen 1960) which is also confirmed by the results obtained in the present paper.

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