

カラマツ当年生枝の成分に関する研究 VIII

フェノール性成分の存在部位

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短 報

Studies on the Constituents of the Annual Shoots of *Larix leptolepis* GORDON (VIII) Localization of Phenolic Compounds*

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I. Introduction

In previous papers (1, 2), the relationship between the amount of the phenolic compounds in the annual shoots of Karamatsu, Japanese larch (*Larix leptolepis* GORDON) and the differences in resistance to the shoot blight disease were examined. The results suggested the presence of a resistant mechanism to the disease by larger amounts of the phenolic compounds. Nevertheless, there is no direct evidence that these phenolic compounds localize in the tissues which the pathogen invades and in which it develops.

ZINNO and CHIBA(4, 5) studied the process of invasion and the development of the pathogen in the annual shoots. They determined that the pathogen invades from wounds in the epidermis and develops in the cortex of the annual shoots. Therefore, phenolic compounds must be present principally in the cortex of the annual shoots if they are a bactericide to the pathogen. The study described in this paper examines the location of these phenolic compounds in the annual shoots.

II. Materials and Methods

The annual shoots used in this experiment were collected on September 1, 1977 from 4-year-old larch planted in the Tomakomai clone test field (305th compartment of Tomakomai working unit of the National Forest, Hokkaido). They were the same clones used in the previous experiment(2) and two trees for each clone were chosen for the test. Two grams (fresh weight) of annual shoots were separated into cortex, xylem, and winter bud, and each part was weighed separately. The phenolic compounds of each part were extracted with methanol, followed by separation with ethylacetate. Then they were analyzed by gas liquid chromatography after trimethylsilylation by the same methods described in the previous paper(1).

III. Results and Discussion

Table 1 shows the weight of each part and the content of phenolic compounds separated from two

grams (fresh weight) of the annual shoots of each clone. The cortex weight of each clone showed little difference from each other. This suggests that the thickness of the cortex has no connection with the difference in resistance to the disease. Phenolic compounds found in each part were the same as described in previous papers(1, 2) and inter-clonal differences of phenolic compounds in quality was found only for taxifolin-3'-O-glucoside. The amount of each phenolic compound and the total amount in each clone were approximately the same as those in previous experiments(1, 2). Generally, localization of phenolic compounds in quality was not found in this experiment. The absence of taxifolin-3'-O-glucoside in the xylems of TO-5 and TA-4 is thought to be the result of the decrease of the compounds from spring to autumn(1).

Figure 1 shows comparison by clones of the contents of phenolic compounds in the three parts of annual shoots. Most of phenolic compounds of the annual shoots were present in the cortices, and the inter-clonal differences in quantity of these phenolic compounds in the annual shoots was attributable mainly to the inter-clonal differences in the cortices. In all clones, the amount of phenolics in the xylems was very small, although the weight of the xylems was about a quarter of that of the annual shoots. Furthermore, winter buds contained concentrations of phenolics as high as those of the cortices. These facts are very interesting when they are considered as a growth regulator(3). As mentioned above, the results of this experiment support the hypothesis that greater amounts of phenolic compounds in the annual shoots act as a bactericide to the pathogen. Nevertheless, further investigation of other factors must be conducted to explain the mechanism of resistance because resistant clones of larch do not always contain greater amounts of phenolic compounds than susceptible clones.

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Table 1. The weight of three parts and their content of phenolic compounds separated from two grams (fresh weight) of the annual shoots of each clone

Name of clone	Name of part	Weight (g)	Content of each phenolic compound (mg)					Total of four compound
			Epiafzelechin	Catechin	Taxifolin	Taxifolin-3'-O-glucoside	Total of four compounds	Weight of each part (mg/g)
TO-5 (R)	Bud	0.31	0.14	0.98	0.77	0.51	2.40	4.86
	Xylem	0.49	+	0.87	+	0	0.87	7.74
	Cortex	1.19	0.71	2.16	10.66	+	13.53	1.78
	Total	1.99	0.85	4.01	11.43	0.51	16.80	11.37
	Bud	0.24	0.12	0.92	0.56	0.41	2.01	8.38
	Xylem	0.42	+	0.86	0.25	+	1.11	2.64
	Cortex	1.33	0.68	3.26	9.00	1.12	14.06	10.57
	Total	1.99	0.80	5.04	9.81	1.53	17.18	8.63
TO-6 (R)	Bud	0.35	0.11	1.59	+	0	1.70	4.86
	Xylem	0.52	0.06	1.43	+	0	1.49	2.87
	Cortex	1.13	0.85	2.19	0.06	0	3.10	2.74
	Total	2.00	1.02	5.21	0.06	0	6.29	3.15
	Bud	0.32	0.15	1.18	0.09	0	1.42	4.44
	Xylem	0.57	+	0.68	+	0	0.68	1.19
	Cortex	1.10	1.25	2.59	0.10	0	3.94	3.58
	Total	1.99	1.40	4.45	0.19	0	6.04	3.04
TO-17 (S)	Bud	0.29	0.15	0.70	0.14	0	0.99	3.41
	Xylem	0.53	+	0.76	+	0	0.76	1.43
	Cortex	1.17	1.93	2.01	0.10	0	4.04	3.45
	Total	1.99	2.08	3.47	0.24	0	5.79	2.91
	Bud	0.32	0.15	0.78	0.23	0	1.16	3.63
	Xylem	0.49	+	0.68	+	0	0.68	1.39
	Cortex	1.18	2.15	2.21	0.23	0	4.59	3.89
	Total	1.99	2.30	3.67	0.46	0	6.43	3.23
TO-19 (S)	Bud	0.31	0.15	0.96	0.33	0	1.44	4.65
	Xylem	0.47	+	0.55	+	0	0.55	1.17
	Cortex	1.19	1.51	1.94	0.20	0	3.65	3.07
	Total	1.97	1.66	3.45	0.53	0	5.64	2.86
	Bud	0.31	0.14	1.05	0.15	0	1.34	4.32
	Xylem	0.44	+	0.27	+	0	0.27	0.61
	Cortex	1.24	1.59	2.26	0.25	0	4.10	3.31
	Total	1.99	1.73	3.58	0.40	0	5.71	2.87
TA-2 (R)	Bud	0.27	0.34	0.83	0.18	0	1.35	5.00
	Xylem	0.55	0.19	0.78	+	0	0.97	1.76
	Cortex	1.16	4.56	2.69	2.62	0	9.87	8.51
	Total	1.98	5.09	4.30	2.80	0	12.19	6.16
	Bud	0.28	0.36	1.25	0.20	0	1.81	6.46
	Xylem	0.47	0.06	0.63	+	0	0.69	1.47
	Cortex	1.25	4.06	3.72	3.03	0	10.81	8.65
	Total	2.00	4.48	5.60	3.23	0	13.32	6.66
TA-4 (R)	Bud	0.34	0.20	0.96	0.83	0.41	2.40	7.06
	Xylem	0.49	0.10	1.15	0.18	+	1.43	2.92
	Cortex	1.16	2.70	2.68	4.75	0.40	10.53	9.08
	Total	1.99	3.00	4.79	5.76	0.81	14.36	7.22
	Bud	0.30	0.20	0.82	0.59	0.45	2.06	6.87
	Xylem	0.52	0.07	1.53	+	0	1.60	3.08
	Cortex	1.17	2.54	3.15	3.98	0.27	9.94	8.50
	Total	1.99	2.81	5.50	4.57	0.72	13.60	6.83
TA-6 (S)	Bud	0.36	0.22	1.11	0.08	0	1.41	3.92
	Xylem	0.46	0.18	0.68	+	0	0.86	1.87
	Cortex	1.18	1.61	1.88	0.14	0	3.63	3.08
	Total	2.00	2.01	3.67	0.22	0	5.90	2.95
	Bud	0.31	0.20	1.00	0.08	0	1.28	4.13
	Xylem	0.49	+	0.59	+	0	0.59	1.20
	Cortex	1.18	1.72	1.66	0.15	0	3.53	2.99
	Total	1.98	1.92	3.25	0.23	0	5.40	2.73

R: Resistant, S: Susceptible, +: trace

Note: The content of each phenolic compound was calculated by the calibration curve of trimethylsilylated phenolic compound(1).

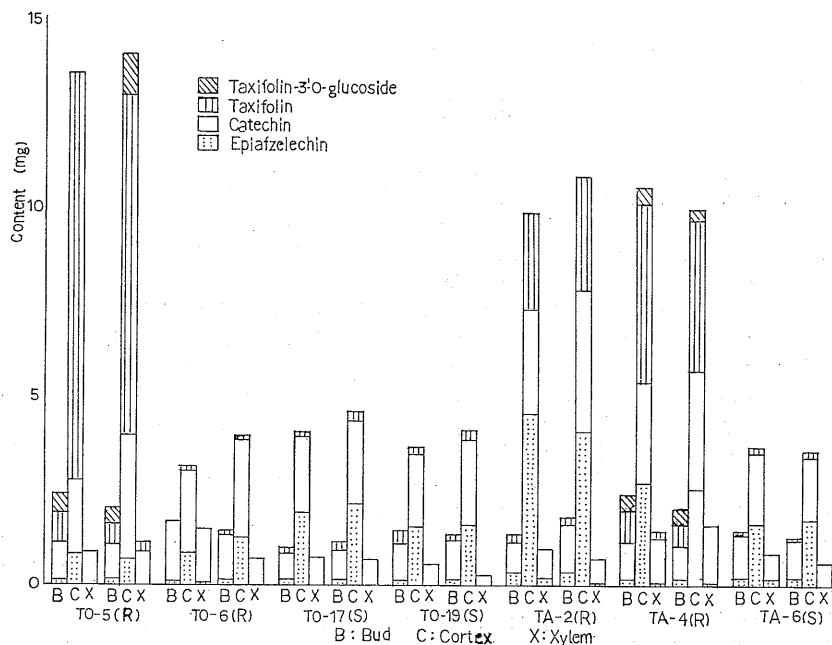


Fig. 1. Comparison by clones of the contents of phenolic compounds in the three parts of two grams (fresh weight) of the annual shoots

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- The titles in parentheses are tentative translation from the original Japanese titles by the author of this paper.

* Japanese with English summary

** Only in Japanese

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