

Table 1 Tree name, density, and AARW of each test piece.

Serial numbers		Tree name	Scientific name	Production area	Density (g/cm ³)	AARW (mm)	Correlation coefficient between density and AARW
1	Conifers	Akamatsu	<i>Pinus densiflora</i>	Japan	0.49	0.80	-0.0462
2		Kaya	<i>Torreya nucifera</i>	Japan	0.46	5.09	
3		Ichou*	<i>Ginkgo biloba</i>	Japan	0.48	3.05	
4		Sawara	<i>Chamaecyparis pisifera</i>	Japan	0.34	3.11	
5		Momi	<i>Abies firma</i>	Japan	0.41	4.41	
6		Togasawara	<i>Pseudotsuga japonica</i>	Japan	0.46	3.27	
7		Karamatsu	<i>Larix kaempferi</i>	Japan	0.50	2.10	
8		Hinoki	<i>Chamaecyparis obtusa</i>	Japan	0.51	1.08	
9		Sugi	<i>Cryptomeria japonica</i>	Japan	0.46	3.32	
10		Ezomatsu	<i>Picea jezoensis</i>	Japan	0.43	0.80	
11		Todomatsu	<i>Abies sachalinensis</i>	Japan	0.49	4.18	
12		Mizuki	<i>Cornus controversa</i>	Japan	0.61	3.43	
13		Yakusugi	<i>Cryptomeria japonica</i>	Japan	0.40	0.39	
14		Aomori hiba	<i>Thujopsis dolabrata</i>	Japan	0.50	0.71	
15		Himekomatsu	<i>Pinus parviflora</i>	Japan	0.39	2.72	
16		Noto hiba	<i>Thujopsis dolabrata</i>	Japan	0.45	3.27	
17		Agathis	<i>Agathis</i> sp.	Southeast Asia	0.47	1.81	
18		Western redceder	<i>Thuja plicata</i>	North America	0.35	1.21	
19		Douglas fir	<i>Pseudotsuga menziesii</i>	North America	0.57	0.50	
20		Taiwan cypress	<i>Chamaecyparis taiwanensis</i>	Taiwan	0.54	1.02	
21		Spruce	<i>Picea sitchensis</i>	North America	0.51	0.58	
22		Southern yellow pine	<i>Pinus</i> sp.	North America	0.60	4.65	
23		Western hemlock	<i>Tsuga heterophylla</i>	North America	0.47	0.42	
24		Merkus pine	<i>Pinus merkusii</i>	Laos	0.75	3.33	
25		Hard cypress	<i>Callitris columellaris</i>	Australia	0.69	0.56	
26		Yellow cedar	<i>Chamaecyparis nootkatensis</i>	North America	0.45	0.95	
27		Sequoia	<i>Sequoia sempervirens</i>	California	0.44	4.42	
28		Sosna	<i>Pinus sylvestris</i>	Europe	0.49	1.32	
29		Korean pine	<i>Pinus koraiensis</i>	Russia	0.44	2.22	
30		Fujian cypress	<i>Fokienia hodginsii</i>	Laos	0.54	0.62	
31	Broadleaf trees	Udaikanmba	<i>Betula maximowicziana</i>	Japan	0.78	0.75	-0.657**
32		Katsura	<i>Cercidiphyllum japonicum</i>	Japan	0.46	3.82	
33		Kiri	<i>Paulownia tomentosa</i>	Japan	0.27	7.11	
34		Sen	<i>Kalopanax pictus</i>	Japan	0.65	1.63	
35		Buna	<i>Fagus crenata</i>	Japan	0.74	2.42	
36		Doronoki	<i>Populus maximowiczii</i>	Japan	0.42	9.66	
37		Shirakaba	<i>Betula platyphylla</i>	Japan	0.56	1.73	
38		Shirakashi	<i>Quercus myrsinaefolia</i>	Japan	0.92	2.98	
39		Yachidamo	<i>Fraxinus mandshurica</i>	Japan	0.64	1.70	
40		Kuri	<i>Castanea crenata</i>	Japan	0.60	2.29	
41		Hoonoki	<i>Magnolia obovate</i>	Japan	0.51	1.89	
42		Keyaki	<i>Zelkova serrata</i>	Japan	0.55	1.64	
43		Onigurumi	<i>Juglans mandshurica</i>	Japan	0.44	1.72	
44		Kusunoki	<i>Cinnamomum camphora</i>	Japan	0.52	4.30	
45		Popura	<i>Populus nigra</i>	Japan	0.41	4.68	
46		Balsa	<i>Ochroma lagopus</i>	Latin America	0.14	11.68	
47		White ash	<i>Fraxinus americana</i>	North America	0.77	1.84	
48		Teak	<i>Tectona grandis</i>	Myanmar	0.72	1.35	
49		Aspen	<i>Populus tremuloides</i>	North America	0.46	4.51	
50		Alder	<i>Alnus rubra</i>	North America	0.52	4.68	
51		White oak	<i>Quercus alba</i>	North America	0.73	1.30	
52		Jelutong	<i>Dyera costulata</i>	Southeast Asia	0.44	1.65	
53		Hard maple	<i>Acer saccharum</i>	North America	0.77	3.41	
54		Assamela	<i>Pericopsis elata</i>	Africa	0.71	3.83	
55		Soft maple	<i>Acer rubrum</i>	China	0.48	2.33	
56		Hackberry	<i>Celtis Occidentalis</i>	North America	0.64	2.40	
57		Surian	<i>Toona sureni</i>	Southeast Asia	0.35	5.24	
58		Coffee tree	<i>Coffea arabica</i>	North America	0.69	3.07	
59		Mersawa	<i>Anisoptera</i> sp.	Southeast Asia	0.60	2.67	
60		Black cherry	<i>Prunus serotina</i>	North America	0.75	3.48	
Correlation coefficient between density and AARW in all trees					-0.376**		

AARW average of annual ring width

A comment on Tree name * "Ichou" is not a conifer, but is listed here for convenience.

Significance test results of correlation coefficient ** $p < 0.01$

Table 2 Average values of density and AARW in Table 1.

	Density (g/cm ³)		AARW (mm)	
	Average	S.D.	Average	S.D.
Conifers	* 0.490	0.088	* 2.178	1.479
Broadleaf trees	0.575	0.168	3.391	2.410
All trees	0.532	0.141	2.784	2.088

Unpaired *t* test results of differences between conifers and broadleaf trees

* $p < 0.05$

Table 3 Measured lightness L^* and hue/saturation (a^* , b^*) in $L^* a^* b^*$ color space

Serial numbers		End grain			Edge grain			Bark side			Pith side		
		L^*	a^*	b^*	L^*	a^*	b^*	L^*	a^*	b^*	L^*	a^*	b^*
1	Conifers	56.70	10.21	23.39	68.17	9.33	31.44	67.06	10.20	35.60	65.07	12.02	32.12
2		76.95	5.50	30.22	80.62	3.96	34.90	80.12	4.36	34.90	79.49	4.65	35.31
3		64.76	6.89	23.98	71.54	6.85	32.12	75.32	3.27	28.18	67.95	7.84	32.65
4		64.26	8.06	23.91	74.08	6.97	29.67	73.12	7.35	30.78	75.30	6.88	27.92
5		71.30	6.62	22.84	78.77	3.92	23.36	72.17	6.60	25.02	74.28	5.71	28.47
6		56.75	13.33	26.61	71.40	9.07	26.28	64.43	13.22	28.67	69.37	9.79	28.84
7		66.05	7.30	20.86	73.68	8.12	28.49	69.41	9.69	30.88	70.82	10.08	28.84
8		66.32	5.55	19.90	77.68	3.99	25.36	78.63	2.95	25.06	77.46	3.67	26.96
9		58.70	9.46	25.52	72.63	6.13	26.11	74.49	3.48	25.14	60.41	14.47	23.78
10		69.90	7.81	27.24	81.21	3.06	26.48	83.75	2.07	26.99	76.44	5.38	28.54
11		65.86	7.69	25.12	78.68	2.98	26.02	77.05	3.27	28.80	75.80	3.36	28.40
12		71.10	4.33	23.83	82.11	1.64	22.32	77.25	2.45	22.25	76.33	3.20	24.08
13		49.98	8.89	17.40	60.96	11.27	25.83	57.98	13.19	27.88	62.09	10.48	26.17
14		57.14	4.46	18.65	69.17	5.32	32.58	71.07	4.75	31.04	72.16	5.53	29.17
15		73.60	6.12	23.85	80.73	4.20	30.26	78.29	4.12	32.65	81.72	2.39	31.00
16		67.09	5.52	21.40	81.09	2.11	26.13	78.62	1.77	29.76	75.04	5.42	27.79
17		49.56	6.12	17.66	59.42	8.85	28.61	63.96	8.81	28.35	63.58	8.23	28.01
18		48.45	5.42	19.18	50.77	7.04	22.48	45.71	7.53	21.31	44.78	7.57	21.09
19		55.51	11.72	23.39	69.71	10.99	29.56	72.77	8.98	28.42	72.26	8.97	30.95
20		57.42	9.40	23.23	72.68	8.48	34.17	70.14	7.95	34.69	70.15	9.43	34.64
21		50.14	12.90	22.48	68.73	9.09	30.16	69.54	8.87	28.59	69.06	8.23	26.43
22		57.50	10.82	24.72	75.18	4.16	32.20	78.78	3.05	31.35	72.45	4.95	31.67
23		63.28	6.58	20.38	71.70	6.85	25.63	73.83	6.06	27.54	70.86	7.15	28.81
24		48.37	8.09	17.78	60.12	13.28	27.76	55.41	12.00	23.80	65.31	11.38	28.15
25		47.02	9.01	18.43	56.97	12.00	26.72	60.45	10.80	28.82	54.20	10.61	27.11
26		67.26	9.78	30.44	78.62	5.18	32.46	76.63	5.46	33.51	77.62	5.84	34.06
27		53.43	12.72	18.54	67.14	12.38	22.09	65.65	12.74	26.41	65.28	12.73	24.63
28		65.22	10.41	25.35	79.70	3.85	24.63	78.90	3.62	27.82	78.28	3.98	29.43
29		61.42	11.68	24.18	77.11	6.56	25.97	71.77	8.20	30.24	77.65	6.50	27.36
30		50.05	6.13	14.71	66.66	7.62	27.96	64.85	6.70	28.87	64.59	7.20	27.96
31	Broadleaf trees	47.77	11.88	22.44	62.02	9.37	28.33	71.47	5.38	26.23	66.71	9.80	27.72
32		55.13	9.24	23.54	61.91	9.29	25.47	59.11	11.24	26.69	62.76	8.73	25.39
33		64.24	3.90	17.12	74.62	2.30	20.71	70.56	3.88	19.80	74.09	3.05	20.50
34		49.16	8.27	19.48	68.05	5.35	20.51	65.97	6.55	22.84	68.80	5.46	21.20
35		58.42	11.90	26.07	70.99	7.98	25.55	68.14	9.42	27.39	68.19	9.50	27.35
36		78.39	3.72	20.49	89.72	-1.43	19.87	83.65	-0.52	23.35	86.67	-1.32	22.04
37		61.08	7.39	18.88	76.99	3.59	22.58	81.79	2.34	22.89	78.93	3.89	21.73
38		54.75	6.52	21.15	63.19	5.57	25.11	67.65	4.86	24.46	62.13	5.65	26.24
39		49.97	9.72	22.27	67.47	7.22	25.02	62.69	8.48	25.32	65.83	7.33	26.14
40		61.72	4.94	20.59	74.67	3.24	23.43	74.58	2.94	23.92	75.24	2.60	23.61
41		42.63	2.32	14.79	56.87	3.26	21.48	53.93	4.07	20.35	49.35	3.45	21.36
42		50.41	10.13	26.19	69.41	6.37	27.42	63.14	7.60	28.04	69.03	6.68	26.40
43		49.67	7.37	16.41	66.42	7.59	20.91	61.83	8.46	24.95	64.36	7.23	25.02
44		59.41	7.81	23.23	71.32	6.74	28.24	69.03	5.45	25.40	71.60	5.17	27.56
45		67.08	5.72	20.85	76.12	3.69	21.88	74.52	4.11	24.31	78.31	2.43	24.00
46		73.45	3.38	24.09	83.49	1.37	18.18	83.05	0.33	17.55	81.46	1.06	18.43
47		56.39	8.39	24.08	74.74	4.31	24.63	78.92	2.59	28.49	72.09	4.67	25.12
48		39.41	5.47	16.48	47.10	6.96	22.47	48.97	6.49	24.06	45.67	7.21	22.71
49		72.34	7.55	31.02	84.24	-0.82	21.37	81.83	0.50	28.01	87.24	-1.21	23.91
50		55.77	8.44	20.28	65.27	8.12	26.39	67.63	8.12	24.57	65.74	8.10	23.87
51		50.67	7.12	20.21	62.89	6.50	26.01	65.40	6.34	24.44	61.79	6.92	25.26
52		62.25	9.40	26.80	70.54	7.28	31.45	72.09	5.37	30.71	72.59	5.25	32.20
53		59.67	11.00	26.09	76.34	4.92	23.30	77.72	4.99	25.60	76.62	5.57	24.64
54		42.45	6.37	16.21	58.77	8.99	27.91	53.85	9.18	26.22	53.22	8.30	23.28
55		55.66	10.11	19.92	73.51	8.37	22.48	74.72	5.69	17.38	70.46	9.32	25.53
56		62.50	8.88	27.27	79.75	3.50	25.10	75.27	3.47	27.73	73.70	3.95	26.37
57		40.30	12.56	20.94	52.97	15.06	25.15	49.40	15.11	27.65	47.54	15.38	26.53
58		49.15	13.76	22.90	77.89	6.53	23.93	74.32	8.40	27.08	69.35	8.36	29.68
59		63.22	7.23	25.81	72.34	6.52	31.37	72.20	6.53	31.63	65.64	8.21	28.19
60		47.62	11.85	19.46	60.86	13.86	28.53	56.17	14.81	29.72	59.55	14.31	27.09

The serial numbers are the same as in Table 1.

Table 4 Paired *t*-test results of differences between each measuring plane average on L^* in Fig. 4.
Significance level * $p < 0.05$, ** $p < 0.01$,
n.s. not significant

All trees

	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	*	**
Bark side	—	—	<i>n.s.</i>

Conifers

	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	<i>n.s.</i>	*
Bark side	—	—	<i>n.s.</i>

Broadleaf trees

	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	<i>n.s.</i>	*
Bark side	—	—	<i>n.s.</i>

Table 5 Paired *t*-test results of differences between each measuring plane on *a** and *b** in Fig. 5.
Significance level * $p < 0.05$, ** $p < 0.01$,
n.s. not significant

All trees

On <i>a</i> *	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	<i>n.s.</i>	<i>n.s.</i>
Bark side	—	—	<i>n.s.</i>
On <i>b</i> *	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	*	*
Bark side	—	—	<i>n.s.</i>

Conifers

On <i>a</i> *	Edge grain	Bark side	Pith side
End grain	*	*	<i>n.s.</i>
Edge grain	—	<i>n.s.</i>	<i>n.s.</i>
Bark side	—	—	<i>n.s.</i>
On <i>b</i> *	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	*	<i>n.s.</i>
Bark side	—	—	<i>n.s.</i>

Broadleaf trees

On <i>a</i> *	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	<i>n.s.</i>	<i>n.s.</i>
Bark side	—	—	<i>n.s.</i>
On <i>b</i> *	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	*	<i>n.s.</i>
Bark side	—	—	<i>n.s.</i>

Table 6 Paired *t*-test results of differences between each measuring plane on C^* , h in Fig. 6.

Significance level * $p < 0.05$, ** $p < 0.01$,
n.s. not significant

All trees

On C^*	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	*	**
Bark side	—	—	<i>n.s.</i>
On h	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	<i>n.s.</i>	<i>n.s.</i>
Bark side	—	—	<i>n.s.</i>

Conifers

On C^*	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	<i>n.s.</i>	*
Bark side	—	—	<i>n.s.</i>
On h	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	<i>n.s.</i>	<i>n.s.</i>
Bark side	—	—	<i>n.s.</i>

Broadleaf trees

On C^*	Edge grain	Bark side	Pith side
End grain	*	**	**
Edge grain	—	<i>n.s.</i>	<i>n.s.</i>
Bark side	—	—	<i>n.s.</i>
On h	Edge grain	Bark side	Pith side
End grain	**	**	**
Edge grain	—	<i>n.s.</i>	<i>n.s.</i>
Bark side	—	—	<i>n.s.</i>