

Deterioration rates of wooden dam during natural weathering

Tokyo University of Agriculture and Technology

○Quoc Dung DANG

Yoshiharu ISHIKAWA

1. Introduction

Wood instead of concrete and steel has been used to build small wooden check dams. For the environmental and landscape protection purposes, wood is renewable, ecosystem-friendly, and low cost while concrete and steel cause the environmental loading. Using of wood is also considered to promote the thinning program (Photo.1). However, unlike the concrete, wood material deteriorate due to natural weathering. For the maintenance and design of wooden dams, the deterioration rate needs to be researched in detail.



Photo.1 Wooden dam built in field

2. Research method

In order to investigate the deterioration rate of wooden dams, the in-field sampling has been carried out from 6 to 9 years at the seven wooden dams: Kuta, Oe, Keihoku1, Keihoku2, Tango, Maizuru1, and Maizuru2, in Kyoto Prefecture. The deteriorated thicknesses of wooden members were measured using the “Resistograph” apparatus (Photo.2). The deterioration rates of wooden dams were estimated from these deterioration thicknesses. Further, the deterioration rates of Sugi and Hinoki were also tested to compare the durability between them.



Photo.2 Sampling at the Oe dam

3. Result and discussion

The average deterioration rates of seven wooden dams were calculated from the distributions of deteriorated thicknesses and shown in the Table 1. The graphs of deterioration rates of the whole dam, dam wing and dam body in the Oe dam, were shown in the Figure.1 and Figure.2. Besides that, the difference of deterioration rates between Sugi and Hinoki in the Kuta dam was described in the Figure.3. The deterioration rate of Sugi in the Kuta dam is similar to that of Hinoki and equals 1.6mm/year. It was confirmed that the deterioration rate of the whole dam is different from

Table. 1 Deterioration rates of the wooden dams

Dam	Kuta	Oe	Keihoku1	Keihoku2	Tango	Maizuru1	Maizuru2
Whole dam (mm/year)	1.6**	1.2**	1.3**	1.2**	1.6*	3.2**	1.9*
Dam wing (mm/year)	1.5**	1.1**	1.7**	1.9**	3.0*	5.0*	3.8*
Dam body (mm/year)	1.6**	1.3**	0.9**	0.7**	0.6**	1.8 ^{ns}	0.8**

** : significant at 0.01 level, * : significant at 0.05 level; ns: not significant

each other. In addition, there was also the difference in the deterioration rates between dam wing and dam body. This difference probably originated from the variation in the weather condition. We found that the water level at the overflow depth of dam contributed to this difference. Moreover, it is necessary to examine the influence of humidity and temperature at the dam site on the deterioration rate. Therefore, in the next research, we will consider the influence of weather factors on the deterioration rate of wooden dams.

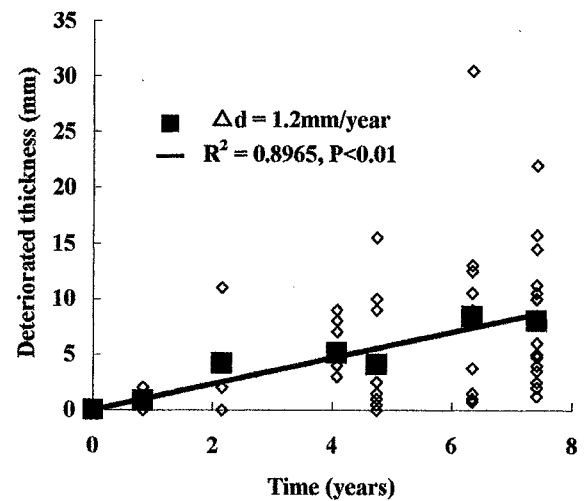


Fig.1 Deterioration rate of the whole dam in the Oe dam

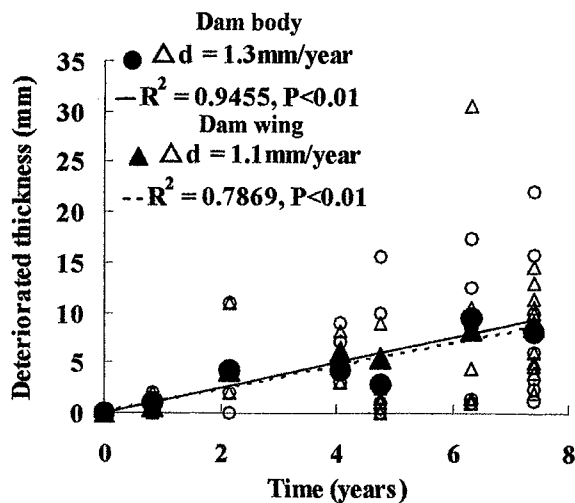


Fig.2 Deterioration rate of dam wing and dam body in Oe dam

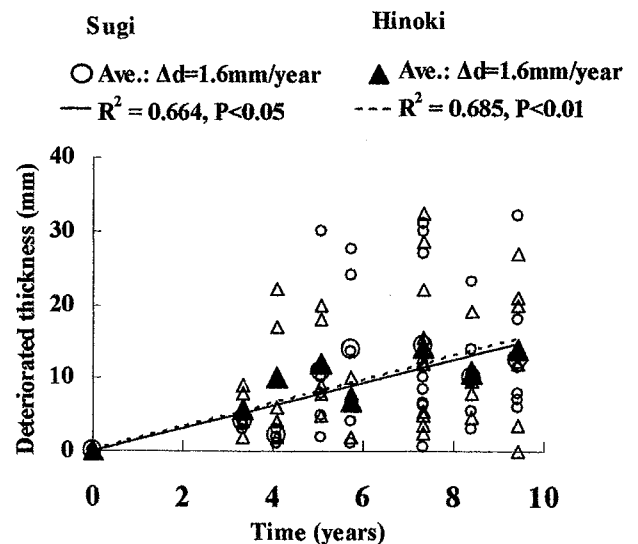


Fig.3 Deterioration rate of Sugi and Hinoki in the Kuta dam