Growth Reaction for Plants Sensor that The Several Plant Planted on Pb Pollution Soil

Yuichi SUGANO[1)], Shiro WAKUI[2)], Shigeo MORINAGA[2)]
Toshimitsu ASAI[3)], Shuzo TOROBU[4)], Susumu YOKOTSUKA[4)]
Satoshi NAITO[4)] and Kentaro IIJIMA[2)]

(2011 年 3 月 15 日　受理)

Abstract

It resulted in inhibition of leaf numbers and stem length in all the plants, except for mugwort, in the Pb section, compared to the Cont. section of the contaminated soil.Furthermore, Colorimeter has captured the conversion in the leaf color, showing a shift towards yellow and brightness in chenopodium album var. centrorubrum, transition to red-blue in Polygonum thunbergii, and decreased brightness in Iris pseudocorus Artemisia indica var. maximowiczii, on the other hand, has barely shown influence of Pb in aspects of leaf growth and color, indicating the possibility of resistance towards Pb contamination.However, there were evidence of its adsorption and absorption according to the content analysis.Others with growth sufferation also showed evidence of adsorption and absorption. We will lead our investigation to further speculation of specifics of the mechanism in the aspect of plant physiology in the future.

Keywords — Pb, Soil contamination, Phytoremediation, Plants Sensor

1. Introduction

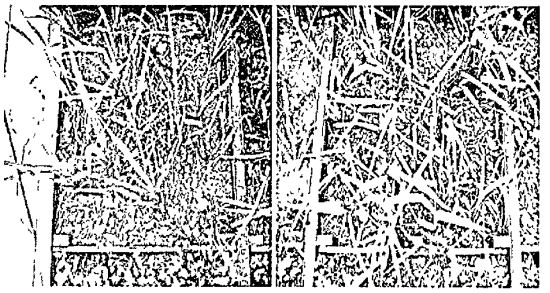
Recently, the soil pollution measures are often requested on the redevelopment plan ground. The heavy-metal contamination in the soil is expected of the system that does the absorption removal by the plant. On the other hand, the plant shows a variety of growth reactions by the influence of the soil environment. Cd is mainly experimented on as a cace about the plant for the effect of absorption removal of the heavy metal.[1,2,3)] In the study, it aimed to search for the growth reaction for Plants sensor that the several plant planted in the Pb contaminated soil.

2. Materials and Method

Our experimental object includes *Chenopodium album var. centrorubrum* (Chenopodium), *Iris pseudocorus* (Yellow Iris), *Polygonum thunbergii* (Water Pepper) and *Artemisia indica var. maximowiczii* (Mugwort), while contaminated soil were adjusted to 1mg / kg-wet soil. Growth reaction was measured by the number of leaf, and

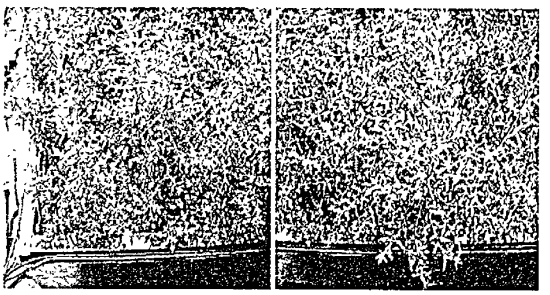
[1)] Graduate School of Biomedical Engineering, Toin University of Yokohama
[2)] Faculty of Engineering, Toin University of Yokohama, 1614 Kurogane-cho, Aoba-ku, Yokohama, Japan 225-8503
[3)] Faculty of Regional Environmental Science, Tokyo University of Agriculture
[4)] KUMAGAI GUMI Co.,Ltd.

Chenopodium album var. centrorubrum (2009/8/13)



Iris pseudacorus (2009/8/13)

Polygonum thunbergii (2009/8/13)



Artemisia indica var. maximowiczii (2009/8/13)

Cont. Section Pb Section

Photo.1 Growth reaction of several plants on cont. zone and Pb zone

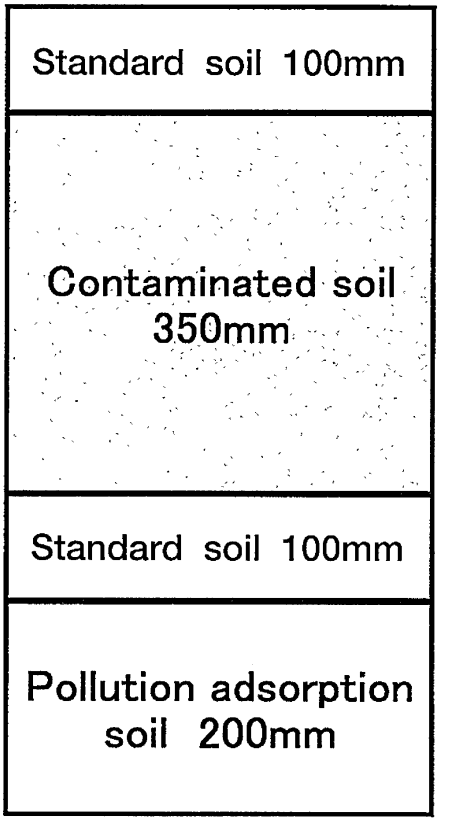


Fig.1 Cross section of experiment container

stem length. And Colormeter (CR-400) was used to measure leaf color.

3. Results and Discussion

The growth situation of summer was shown in Photo 1. Fig.2~9 showed the change in the number of leaves and stem length. Fig.10~11 showed the comparison between the Cont. and Pb, in the color degree and color tone. Table 1 showed the Pb absorbed amount of each part of the plant.

① Chenopodium album var. centrorubrum : Increased stem growth and very paler tone change, effecting the growth in the Pb section when compared to the cont. section. Furthermore, the root showed tripled lead

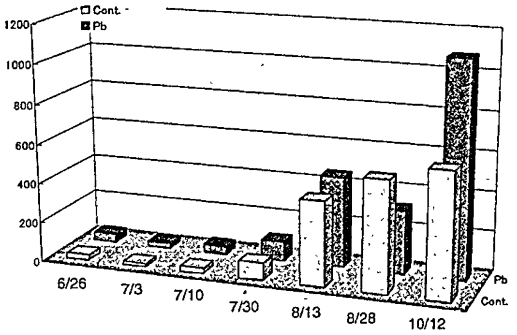


Fig.2 Chenopodium album var. centrorubrum Leaf number

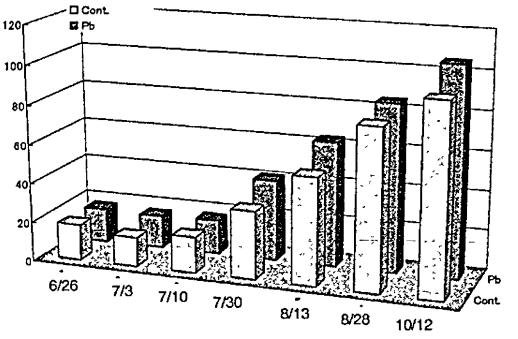


Fig.3 Chenopodium album var. centrorubrum Stem length

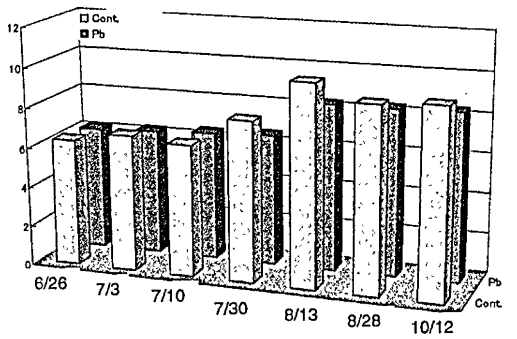


Fig.4 Iris pseudacorus Leaf number

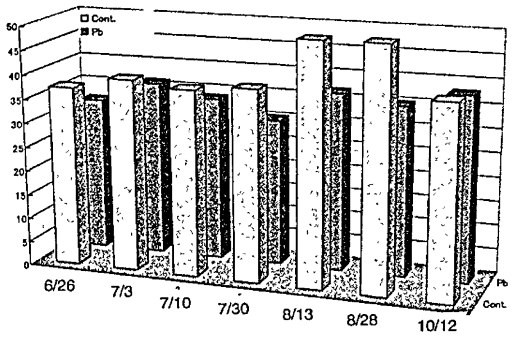


Fig.5 Iris pseudacorus Stem length

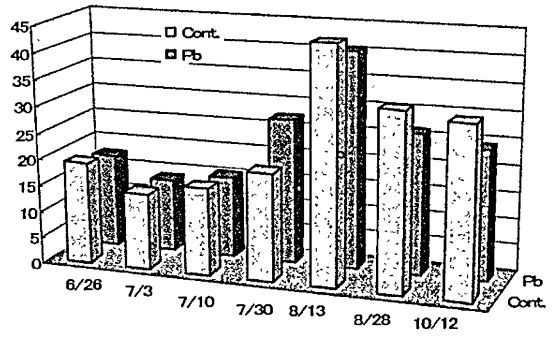


Fig.6 Artemisia indica var. maximowiczii Leaf number

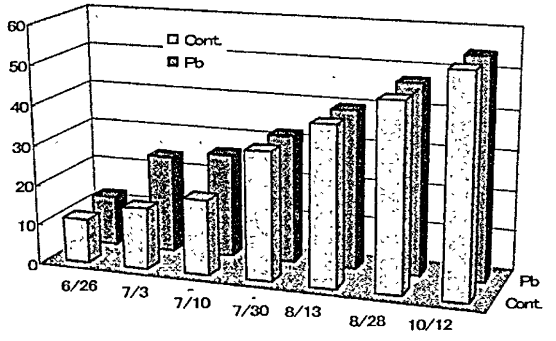


Fig.7 Artemisia indica var. maximowiczii Stem length

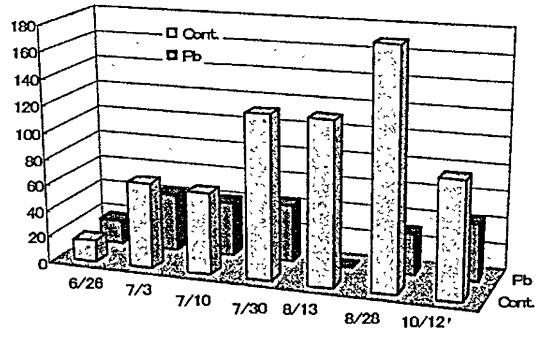


Fig.8 Polygonum thnbergii Leaf number

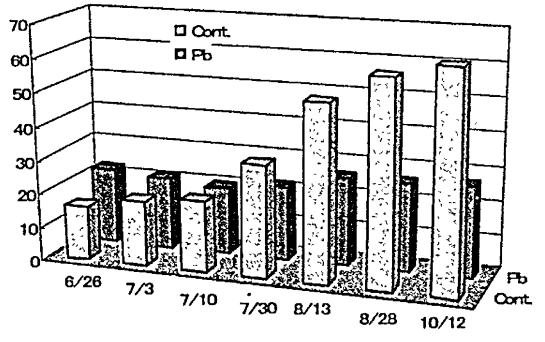


Fig.9 Polygonum thnbergii Stem length

Table 1 Pb absorbed amount of each part of the plant (μg/g・Plant)

		Chenopodium album	*Polygonum thunbergii*	*Iris pseudacorus*	*Artemisia indica*
Leaf	9/25	—	1.973	0.89	2.147
	11/27	0.289	0.242	0.254	0.047
Stem	9/25	—	1.368	—	1.425
	11/27	0.083	0.485	—	—
Loot	9/25	—	—	0.101	1.603
	11/27	—	—	0.052	—

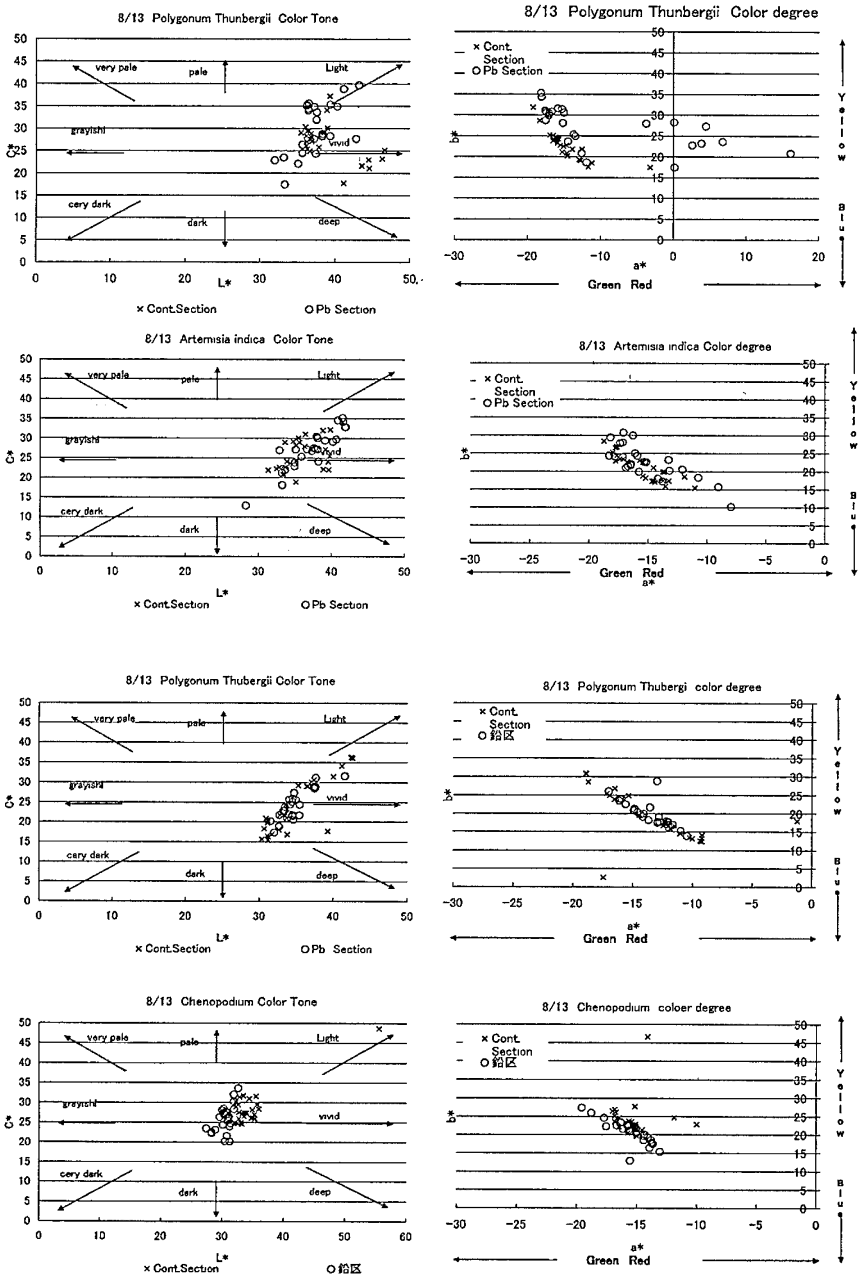


Fig.10 Data of color degree

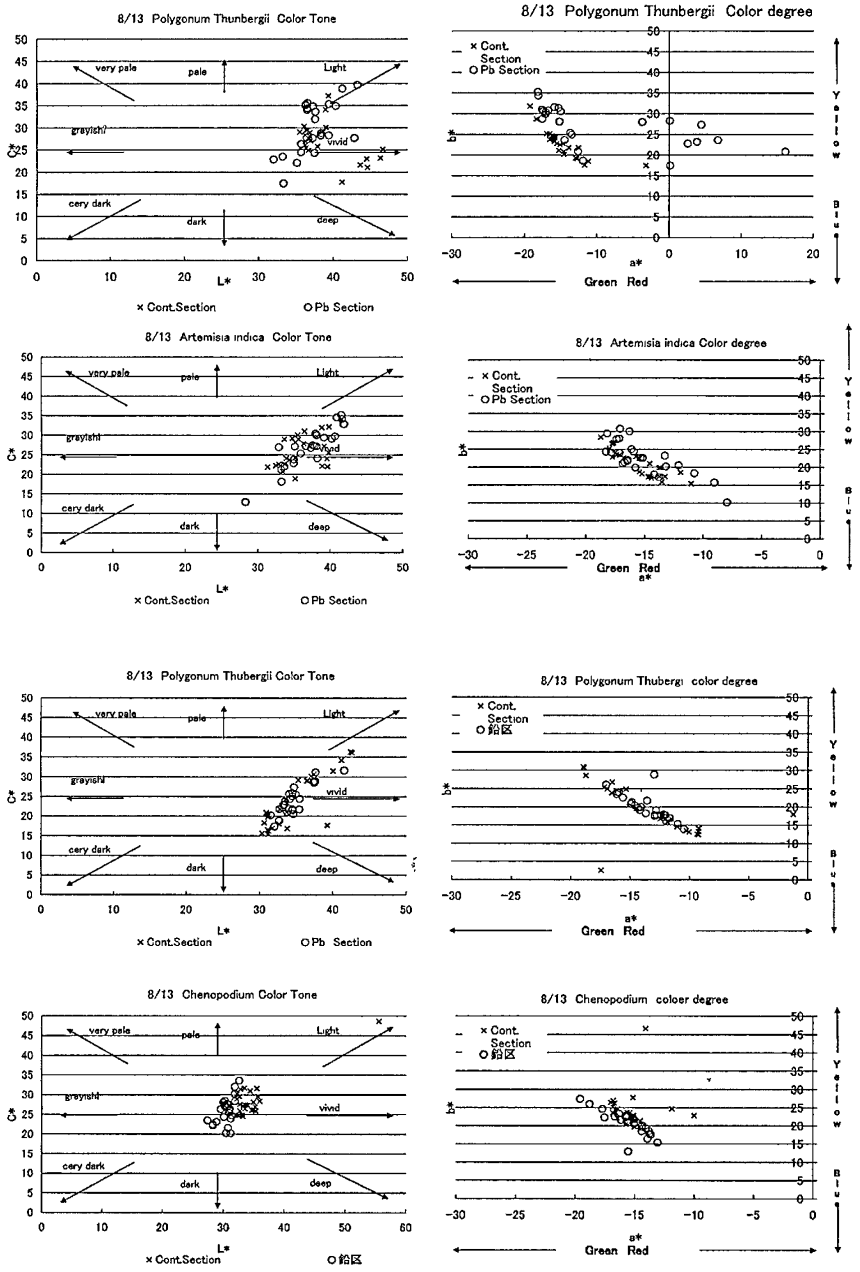


Fig.11 Data of color tone

absorption compared to the stem, indicating the possible absorption of lead especially in this specific area.

② Iris pseudacorus : Decreased leaf length and leaf numbers were seen in the Pb. section compared to the cont. section . In addition, there was a major shift towards grayishl in the leaf color. Lead absorption was seen in the root.

③ Polygonum thunbergii : Both leaf numbers and stem length diminished greatly in the Pb. section compared to the cont. section of . Moreover, there were transition towards red and tone shift towards grayishl in the leaf color. Ability of lead absorption was seen in both leaf and stem. (Fig.6,7)

④ Artemisia indica var. maximowiczii : There were no alteration in both leaf color and stem length in Pb. and cont. section. However, a tone shift towards grayishl was seen in its leaf. This plants showed the highest absorption ability of all the samples we have tested. (Fig.8,9)

4. Conclusion

In this experiment Plant that tests supply to Pb district. Pb of the Pb district was higher than that of the Cont district.

In chenopodium, Iris, Thunbergii in the plant in the Pb district. The tendency that growth decreases compared with the Cont district was seen.

From the above-mentioned Detection of contaminated soil that uses plantThe possibility to be able to-do was suggested.

However, details of the influence that Pb gave the plant are research topics when the future.

References

1) Toshimitsu ASAI, Yoshikazu TAKAHASHI, Chizuko MIZUNIWA, Mitsuo KONDO (2005) : A study of Phytoaccumulation for Cd. in Hydroponicaly Cultured by Ajuga reptans L., Japan Institute of Landscape Architects, 68(5), pp. 537-540

2) Toshimitsu ASAI, Fumi SATO, Chizuko MIZUNIWA, Mitsuko KONDO (2007) : A study of Phytoaccumulation for Cd using Perennial ryegrass and Tall fescue, Journal of Japanese Society of Turfgrass Science, 36(1), pp. 20-25

3) Toshimitsu ASAI, Miyamoto REII, Chizuko MIZUNIWA, Mitsuo.KONDO (2006) : A study of Phytoaccumulation for Cd. by Iris, Japan Institute of Landscape Architects, 69(5), pp. 451-454