Analysis of Sugar Components in Each Botanical Species and Estimation of Bioethanol Potential in Reed Communities around Lake Biwa

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1. Background and Objectives

Following the globalization, alien species issue becomes more serious. In many cases, alien plant species grow well and they have some impacts on the human activities and the local ecosystems around lakes. Thus, those alien species are often removed. However, most of removed plants are burned and it is important to make use of them. On the other side, because of the shortage of fossil fuels or global environmental problems, the need for biomass is increasing. Those removed crops have much advantage because they don't compete with agricultural production. However, the components of reed plant species are not revealed enough. To make use of those removed crops, it is essential to investigate the biomass quantity. Objectives of this study are (1)To investigate the components for each botanical species and (2)To estimate bioethanol potential for each botanical species, each areas in reed communities around Lake Biwa.

2. Material and Methods

Portable GPS Vegetation Surveys had been carried on 118 ha of 53 reed areas on Lake Biwa shore from 2008 to 2011. In order to investigate dry weight per unit for each species, Standing Crops Survey was carried during Sep. to Oct. 2012. 64 samples of each coverage levels of 10 species were sampled and their dry weight was measured. Three kinds of experiments were carried out on these 10 botanical species, *Phragmites australis* and some alien plant species as follows.

(1) Analysis of components: Cellulose, hemicelluloses, lignin and sugars contents were determined followed by Wood Science Experiments Method[1] and NREL method[2].

(2) AO treatment: AO treatment using NaOH : 2%, H_2O_2 : 1% solution was carried out under 60 ℃ for 24 h.

(3) Sacchalification by emzyme: Sacchalification using 5%(w/v) enzyme solution was carried out under 50 ℃, 100 rpm, for 72 h. Then quantitative analysis by HPLC was carried out.

3. Results and Discussions

1) Analysis of sugar components in each botanical species

Total concentration of cellulose, hemicelluloses and lignin was the highest in *Phragmites australis*, which was 83.6 g/100 g-biomass. That of other species (except for *Alternanthera philoxeroides*) were range from 60～70 g/100 g-biomass. The rate of total sugars in *Phragmites australis* was 56.6 g/100 g-biomass and that of *Paspalum distichum* was 60.4 g/100 g-biomass, which was the highest.

2) Investigation on sacchalification efficiency by enzyme

Sugar production rate of *Phragmites australis* was 43.2 g/100 g-biomass and that of *Paspalum distichum* was 41.1 g/100 g-biomass, which was a little lower than that of *Phragmites australis*. Sacchalification efficiency was highest in *Bidens frondosa* (85.9%), and the second highest in *Phragmites australis* (76.3%).

3) Estimation on Bioethanol Potential

The bioethanol potential of different species around Lake Biwa was 155 kL, 14 kL and 5.1 kL for *Phragmites australis*, *Paspalum distichum* and *Solidago Canadensis* respectively. There were 3.4 kL ethanol potential from *Paspalum distichum* and 1.6 kL ethanol potential from *Solidago Canadensis* in the area where standing crops for each species were the highest among 53 areas.

4. Conclusion

As a result of this study, sugar components of each alien plant species were showed. Then, bioethanol potential of *Phragmites australis* and alien plant species was showed in each 53 areas.

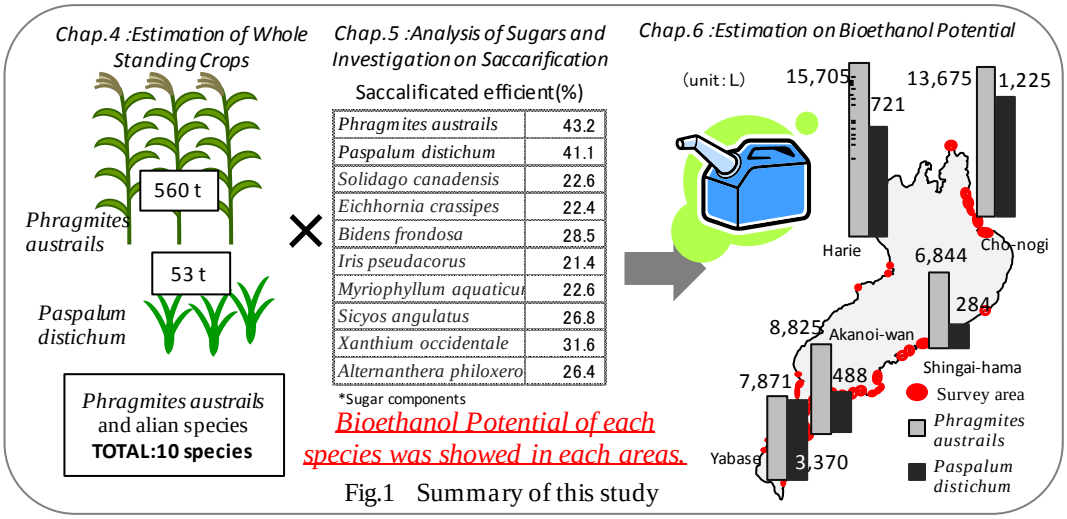

Fig.1 Summary of this study