낙동강하구 갈대군락의 성장에서 지상부제거에 따른 영향

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Effects of Cutting on the Growth Response of Common Reed, *Phragmites australis*, Community in the Nakdong River Estuary, S. Korea

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Ⅰ. INTRODUCTION

Phragmites australis (Cav.) Trin. ex Steudel, was a widely distributed plant in the world. *Phragmites austrlis* grows on level ground in tidal and non tidal marshes, lakes, swales, and backwater areas of rivers, and streams. It grows on most soil textures from fine clays to sandy loams and is somewhat tolerant of saline or alkaline conditions. Disturbances or stresses such as pollution, alteration of the natural hydrologic regime, dredging, and increased sedimentation favor invasion and continued spread of *Phragmites* (Roman et al. 1984).

Phragmites can be considered a wetland management problem due to its ability to survive anthropogenic changes and rapidly colonize and dominate disturbed soils. In the capacity it is capable of invading adjacent areas and crowding out other wetland plant species, reducing the overall plant diversity of the affected system (Weisser & Parsons, 1981; Szczepanska & Szczepanski, 1982; Galinato & van der Valk, 1986; Marks et al., 1994). *P. australis* can be a troublesome weed invading various cultures, e.g. rice or cane (Izatt, 1979). Dense *Phragmites* stands decrease migrating waders and waterfowl species (Thompson and Shay, 1989; Jamison, 1994; Marks et al., 1994; Chambers, 1997; Meyerson *et al.*, 2000). *Phragmites australis* invasion alters the structure and function of

diverse marsh ecosystems (Benoit and Askins, 1999; Meyerson et al., 2000). It is true that the invasion of the common reed has some problems, but it is also true that the common reed is economically and ecologically important plants.

To conserve and control the common reed, removal of above ground such as cutting and burning, and application of the herbicide, rhizome cutting, dig-up-rhizomes and mowing are studied (Kiana *et al.*, 1989; Neil and Ceri, 1989; Hellings and Gallagher, 1992; John and Susan, 2002).

In this paper, we compared growth dynamics of the common reed in the freshwater and the brackish sites in the Nakdong River Estuary. We evaluated the effects of the cutting in the spring on the growth of *Phragmites* beds in freshwater and brackish sites. Growth responses of the plant were evaluated at two different sites (non tidal and tidal area) in a brackish site. In addition, in the brackish site, we evaluated impact of two cutting practices in the spring and summer.

Ⅱ. MATERIALS and METHODS

1. Study Sites

The estuary of the Nakdong River is located between 35.03° and 35.13°N, and 128.48° and 129.00°E. The estuary had peculiar and diverse habitats formed by well-developed deltas, tidal flats, and estuarine wetlands. The estuarine area acts as a buffer between fresh and salt water, and contains the largest nesting grounds for migratory birds in eastern countries due to the abundance of phytoplankton and zooplankton, mollusks, seaweeds and aquatic plants.

2. Sampling Design

The study was carried out in Nakdong River Estuary, S. Korea. We selected a total of 7 sites (2 sites in freshwater zone, 5 sites in brackish zoney) to evaluate and compare the growth dynamics of the *Phragmites australis* in freshwater and brackish environment. From randomly selected sites in both freshwater and brackish sites,

above-ground organs and materials within 50×50cm quadrat for *P.australis* were clear-cutted and collected at the sediment surface and separated into the live and dead components. The collected materials were washed and oven-dried to a constant weight at 80℃ and 72hr. Three quadrats were taken in each stand.

We selected a total of 2 sites (1site in freshwater, 1 sites in brackish) to evaluate the effect of cutting above ground of the plant. In a brackish site, cutting experiment was conducted at two sites with different tidal range (one non-tidal site and 20 to 50cm inundated site). One stand at each site was cut (5m x 5m) in March.

Ⅲ. RESULTS

1. Comparison of growth in freshwater and brackish

The shoot length, diameter and above-ground biomass of *Phragmites australis* in the freshwater sites were higher than that of brackish sites. The average of shoots length and basal diameter of the reeds in the freshwater zone is 259±7cm, 7.3±0.7mm (*n=6*). The average of shoots length and basal diameter of the reeds in the brackish sites was 161±48cm, 4.7±0.5 mm (*n=15*). The biomass of the reeds in the October was 559±287 $gDWTm^{-2}$ (*n=15*) in the brackish sites, 957±165$gDWTm^{-2}$ (*n=6*) in the fresh water sites. At the end of the growing season, a significant difference of growth was observed at freshwater and brackish sites ($P>0.05$). When put the results showed by the reed growth dynamics and by its biomass together, the reeds may be stressed by the salinity.

2. Effect of cutting

Toward to the end of growing season (30 September), shoot length in uncut reedbeds (145±6cm) was higher than that of cut reedbeds (70±8/cm) in tidal brackish. Above-ground biomass of the cut reed stand cut in tidal brackish and uncut reed stand uncut in tidal brackish sites were 412±15 $gDWTm^{-2}$, 90±6 $gDWTm^{-2}$ (*n=3, p<0.001*) respectively. Above ground biomass of reed in tidal brackish sites was 5 times higher

than that of cut tidal brackish.

Ⅳ. Conclusion

Expansion of *Phragmites australis* community often causes problems in management of wetland. The effect of salinity and cutting of at the above ground biomass on the growth response of *Phragmites australis* were evaluated freshwater and brackish beds in the Nakdong River Estuary, S. Korea. In freshwater site, the number of shoots emerged from uncut plant stands were markedly lower than that of cut stands. However, in the tidal brackish, the number, length and above ground biomass of shoots emerged from uncut reedbeds were significantly higher than that of cut stands. Toward to the end of growing season (September), shoot density in uncut reedbeds was higher than that of cut reedbeds in tidal brackish. Above ground biomass of reed in brackish sites was 17 times higher than that of cut brackish. This study showed that reed growing in the freshwater sites is showed a better growth pattern (shoot length, biomass). The growth was severely retarded by cutting combined with salinity. For a better management of *P. australis* stands in Nakdong River Estuary. Detailed study should address the effects of timing of cutting and tidal range.

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