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A STUDY ON THE FOLIAGE ARRANGEMENT OF BARNYARDGRASS AND RICE PLANT

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INTRODUCTION

Barnyardgrass, the primary weed of paddy field in japan, was thought to be a plant mimetic to rice (Kasahara 1968, Yabuno 1975). The plant type, the forms of leaves and stems resemble rice, and we can hardly find out barnyardgrass in paddy fields at the vegetative growth stage. Tsunoda (1960) described that the rice plant has two types of foliage arrangement, one is sparse and another is dense arrangement. The former is a low fertilizer-response variety and the latter is high fertilizer-response variety. It is interesting that what kind of foliage arrangement barnyardgrass has in comparison with rice plant. In this study, the cover degree of these foliage arrangement was measured and compared.

MATERIALS AND METHODS

Rice (*Oryza sativa* L. Akebono) and barnyardgrass (*Echinochloa oryzicola* Vasing. and *Echinochloa crus-galli* Beauv. var. *formosensis* Ohwi) were studied. Seedllings of these plants were transplanted separately one per hill at 28×30cm intervals in each 9m² plot of the paddy field in our institute in June 25, 1983. These seedlings were 15 cm high and had five leaves. They grew from July to August and attained a height of 70～80cm at the end of August.

The overhead view of the plants was photographed on August 28. Cover degree of one typical plant each was measured by the following method. The paper that six concentric circles having equal size were described which further divided into twenty-four equal angles and each section have equal size of 0.32 cm^2 was put upon the overhead view of the photograph (7.5 × 11.0 cm) of each plant. Then the center of the circle and overhead view of the primary stem were overlapped (Fig. 1). Cover degree of the plant in every section was measured, those of each section were added and those of each plant were calculated.

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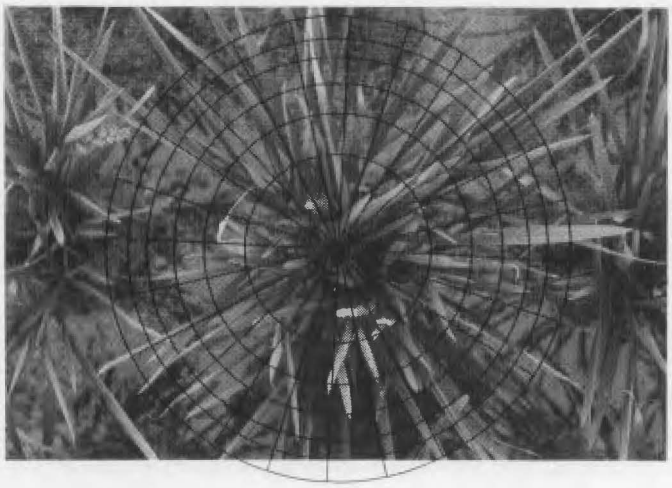

FIG. 1. Overlapping of plant (overhead) and the paper of concentric circles

RESULTS AND DISCUSSION

Fig. 2 shows the overhead view of the populations and individuals (rice and two species of barnyardgrass). In the populations and individuals, the form of leaves of rice plant and *E. oryzicola* resembled each other. The tip of the rice leaves are sharper than *E. oryzicola* and the central part of the latter is closed in with leaves, but *E. crus-galli* var. *formosensis* has much more space among their leaves than the other two species.

Fig. 3 shows the distribution of cover degree in every concentric circle around the primary stem with three species. In the central circle (19 cm diameter) of the plant, the cover degree of *E. oryzicola* and rice plant are 80 and 65%, respectively and that of *E. crus-galli* var. *formosensis* is 49%. Especially that of *E. crus-galli* var. *formosensis* is less than 50% and this means that it has much space around the main stem. In the second circle, this order did not change.

The cover degree of *E. oryzicola* is larger than that of the other two species in all circles. Thus, it is thought that *E. oryzicola*, a mimetic plant of rice, has dense foliage arrangement around the center of plant. On the contrary, *E. crus-galli* var. *formosensis* has sparse foliage arrangement around the center. The sparse foliage arrangement of this species was observed also in the population in Fig. 2. Both plants are the primary weeds of paddy fields in Japan, but their foliage arrangement is different as described above.

Nishi (1984) measured the angle of lamina inclination of rice plant and barnyardgrass, and showed that a proportional correlation is found

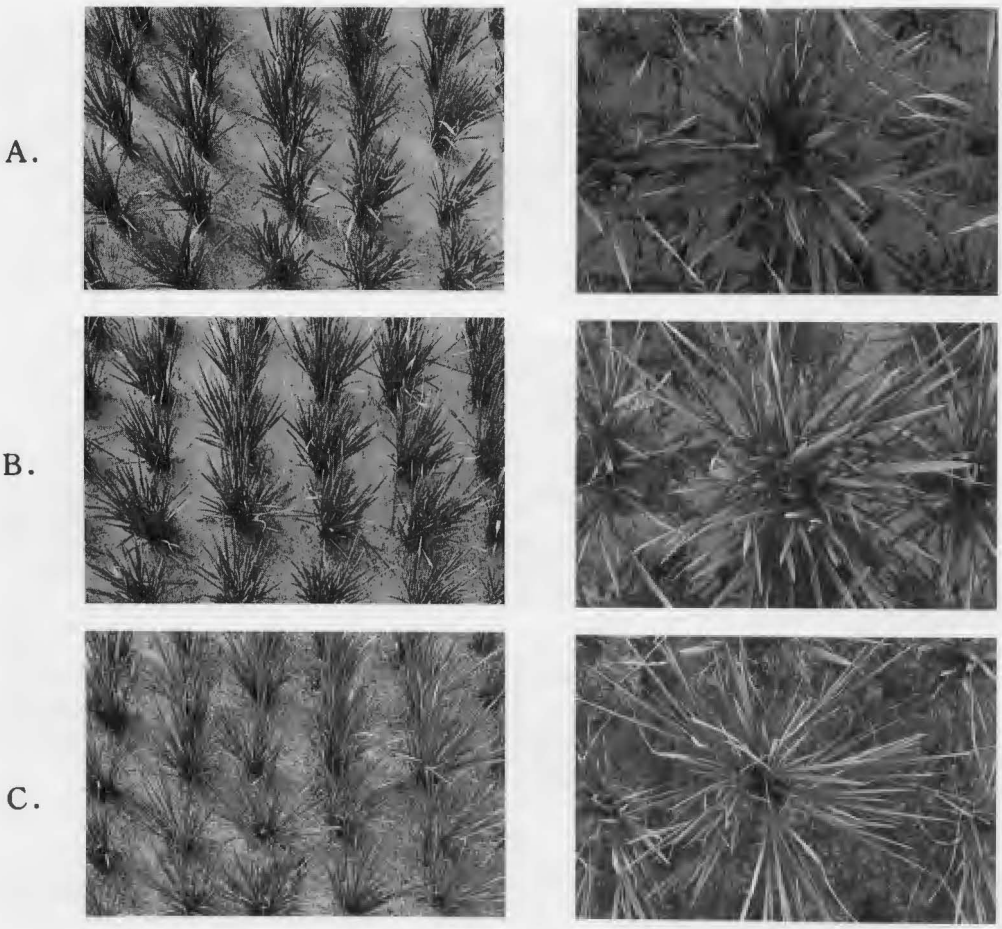

FIG. 2. Overhead view of the population and the individuals of rice plant and barnyardgrass
A. *Oryza sativa* L. Akebono
B. *Echinochloa oryzicola* Vasing.
C. *Echinochloa crua-galli* Beauv. var. *formosensis* Ohwi
right : individuals
left : population

between the base of lamina height of rice plant and *E. oryzicola* from their land surface and angle of lamina inclination. However, *E. crus-galli* var. *formosensis* is different from these. The angle of lamina inclination is large and is independent of the base of lamina height from land surface. It shows that *E. crus-galli* var. *formosensis* has a close straight line of lamina

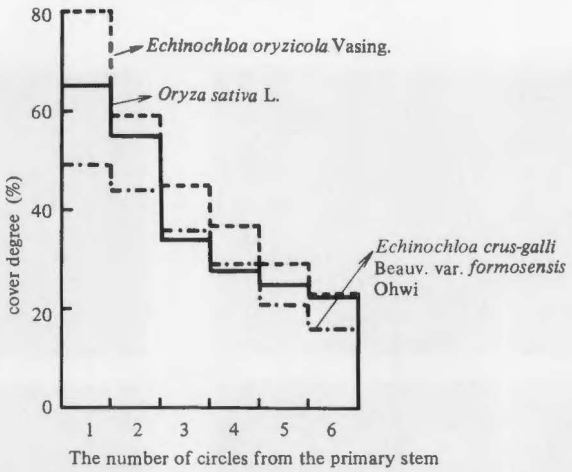

FIG. 3. Distribution of cover degree in every concentric circle around the primary stem

and leaf sheath. These characters were seen in prostrate type of barnyardgrass, *E. crus-galli* Beauv. var. *crus-galli* which grows in upland and paddy fields. Thus, the character of sparse foliage arrangement is considered to be connected with the straight line construction of lamina and leaf sheath. However, plant type of this species is erect different from other varieties of *E. crus-galli* sp. distributed in upland and paddy fields (Yabuno T. 1975). Therefore, *E. crus-galli* var. *formosensis* is thought to be an intermediate to paddy field type (erect) from upland field type (prostrate) of *E. crus-galli* sp.

SUMMARY

The foliage arrangement of two species of barnyardgrass growing in only paddy field and rice plants in the vegetative growth stage was investigated and their cover degrees were compared. One barnyardgrass, *E. oryzicola*, has more cover degree than rice, suggesting that it is a closed-leaved type around the center of the plant, with dense foliage arrangement but another barnyardgrass, *E. crus-galli* var. *formosensis* is different from the former and has the sparse foliage arrangement which is a character of *E. crus-galli* sp.

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