Effect of Standing Water and Cultivation on Emergence of *Echinochloa glabrescens*

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Echinochloa glabrescens 發芽에 대한 湛水深과 耕耘의 影響

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ABSTRACT

The effects of standing water and cultivation frequency on emergence of *Echinochloa glabrescens* Munro ex. Hook were determined at varied seeding methods under simulated field conditions for 4 months. In soil-incorporated seeding method total emergence for 4 months was highest in saturated condition followed by 4, 2, and 8cm standing water, whereas total emergence of seeds sown at the soil surface was highest at 2cm standing water followed by 4cm, saturated soil, and 8cm standing water. Within 2 weeks the emergence was highest at 4cm and lowest at 2cm standing water with the soil-incorporated seeding, but the seeds sown at the soil surface with 2cm standing water resulted in the highest emergence. Ratio of emergence within 2 weeks over total emergence during 4 months was lowest at 2cm standing water in the soil incorporation, indication that 2cm standing water would be the critical water level for *E. glabrescens*. Since most of the seedling was emerged within 2 weeks just before cultivation, the emergence pattern was little affected by cultivation at each standing water level.

Key words : Emergence pattern, *Echinochloa glabrescens*.

INTRODUCTION

Cultivated soils frequently contain tens of millions of weed seeds per hectare which are distributed throughout the working depth and may be composed of more than 50 species (Roberts, 1958).

The weed seed population of the soil is influenced by cropping history (Brenchley, 1918), cultivation practices (Brenchley and Warington, 1930), and dormancy of weed seeds (Roberts and Feast, 1972).

Cultivation changes the soil environment exposing seeds to a range of interplaying factors of light, moisture, temperature, and gaseous regimes which influence their germination (Lewis, 1973). Pareja and Staniforth (1985) reported that tillage operations can change the size distribution of soil aggregates into which weed seeds get incorporated. It can also modify the type, number, and characteristics of seed-soil microsites. Chancellor (1964) identified three types of weed seed responses in cultivation namely : arable weed response, inverse response, and intermediate response. Water management and flooding depth can be used to control weeds and regulate the composition of weed populations (De Datta et al., 1976 ; De Datta, 1981).

At a depth of 7.5cm, grasses and broadleaf

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weeds predominate and a few sedges were present. When 15cm of standing water was maintained, grasses and sedges were nearly eliminated and only broadleaf weeds remained (De Datta et al., 1976).

In this study, the effect of cultivation frequency and standing water on emergence of *E. glabrescens* were determined at varied seeding methods under simulated field condition.

MATERIALS AND METHODS

Upland soil which was free of *E. glabrescens* was collected from the upland field at University of Philippines at Los Banos (UPLB). Chemical properties of the soil is shown in Table 1.

Mature seess of *E. glabrescens* were collected from the lowland rice fields of UPLB during the first week of November 1985. Seeds were airdried, cleaned, ridded of immature seeds, placed in paper envelopes and kept in a laboratory locker.

The treatments were set-up in split-split plot randomized complete block design with four replications. Standing water depth consisted of saturated moisture; 2, 4, and 8cm depth served as the main plot; depth of seed incorporation (7.5 and 15cm) as subplot; and frequency of cultivation zero, once (2 months after seeding), four times (every month), and eight times (every 2 weeks) as sub-subplot.

Table 1. Chemical and physical properties of the soil used.

PROPERTY	AMOUNT
Particle size (%)	
Clay	41.0
Silt	38.0
Sand	20.5
pH 1 : 1 (soil : water)	7.3
Organic C (%)	0.939
Total N (%)	0.089
Exchangeable cations	
Phosphorus	13.0
Potassium	1.36
Cation exchange capacity (meq/100g)	33.0

Fifty seeds were incorporated into the 15 and 7.5cm soil depth in the pots.

The number of emerged weed was counted every two weeks for 4 months.

RESULT AND DISCUSSION

The percentage of emergence as affected by standing water and methods of seeding is shown

Table 2. The comparison of mean percentage of *Echinochloa glabrescens* emergence as affected by standing water and methods of seeding between emergence after 14 days of seeding and total emergence during 4 months.

Standing Water (cm)	Methods of Seeding	Emergence Within 2 weeks (%)	Total Emergence During 4 Months (%)	Ratio (%)
0	1	34 c	60 b	57
	2	42 b	70 ab	60
	3	63 a	78 a	81
2	1	17 b	45 b	38
	2	19 b	56 b	34
	3	76 a	87 a	88
4	1	43 b	58 b	74
	2	50 b	66 ab	76
	3	72 a	78 a	92
8	1	26 b	39 b	67
	2	20 b	46 b	43
	3	60 a	67 a	90

[a]1 and 2=seeds incorporated at 15 and 7.5 cm soil depth, respectively, and 3=seeds sown on the soil surface. Means having the same letter are not statistically different at the 5% level.

in Table 2. Total emergence at 4 months was highest in the saturated condition followed by 4, 2, and 8cm standing water ranging from 60 to 39% at 15cm incorporation. The same trends were shown at 7.5cm soil depth ranging from 70 to 46%. However, total emergence of seeds sown at the soil surface was highest at 2cm standing water followed by 4cm, saturated soil, and 8cm standing water, in that order. These data evidently showed that emergence of *E. glabrescens* was highly suppressed by 8cm standing water and the effects of standing water on emergence were varied depending on location of seeds in the soil.

The effects of standing water on emergence within 2 weeks were different from total emergence during 4 months. Emergence at 4cm standing water was highest followed by saturated soil, 8 and 2cm standing water ranging from 43 to 17% at 15cm incorporation and from 50 to 19% at 7.5cm. However, seed emergence sown at the soil surface, following the same trends in the total emergence, was highest at 2cm and lowest at 8cm standing water.

With 2cm standing water, emergence of seeds incorporated into the soil showed the lowest percentage regardless of soil depth while emer-

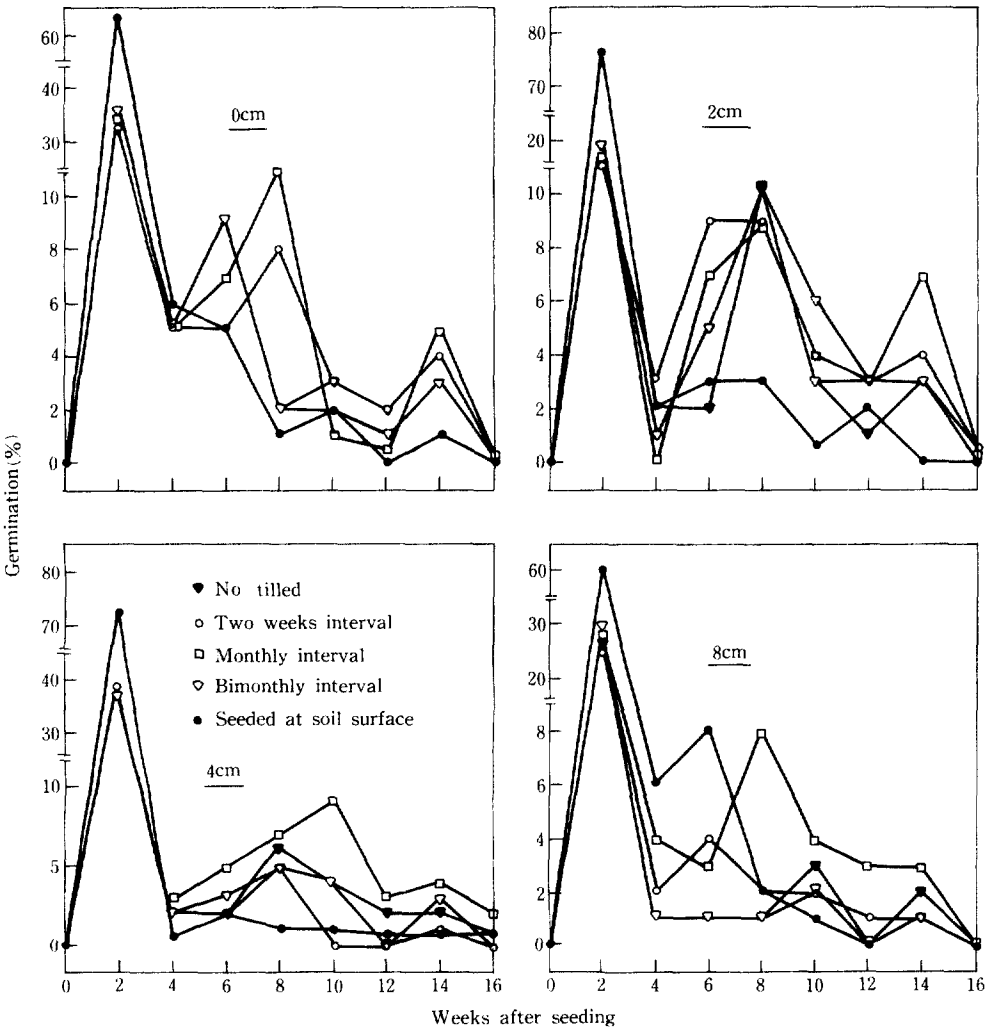

Fig. 1. The emergence patterns of *Echinochloa glabrescens* seeds sown at 15 cm soil depth and subjected to varying depths of standing water and cultivated at different frequencies.

gence of seeds sown at the soil surface was the highest indication that 2cm standing water was the critical water level for *E. glabrescens* in the soil. Therefore, emergence of *E. glabrescens* increased at levels below or above 2cm standing water, regardless of depth of incorporation.

The ratio of emergence within 2 weeks over total emergence during 4 months was correlated with emergence within 2 weeks. The ratio at 4cm standing water was the highest and 2cm standing water, the lowest, indicating that seed germinability in the soil may not be activated at 2cm standing water. From the practical point of view, the trials on preemergence herbicides should not be recommended at 2cm standing water for *E. glabrescens*.

Since most of the seedlings emerged within 2 weeks just before cultivation, the emergence pattern was little affected by cultivation at each standing water level in both 15 and 7.5cm incorporation depths. Less than 10% of the seedlings that emerged every 2 weeks were without a clear emergence pattern in either 15 and 7.5cm incorporating soil depth and cultivated at varied times (Figs. 1 and 2). However, the minor peak emergence at 2cm stadning water

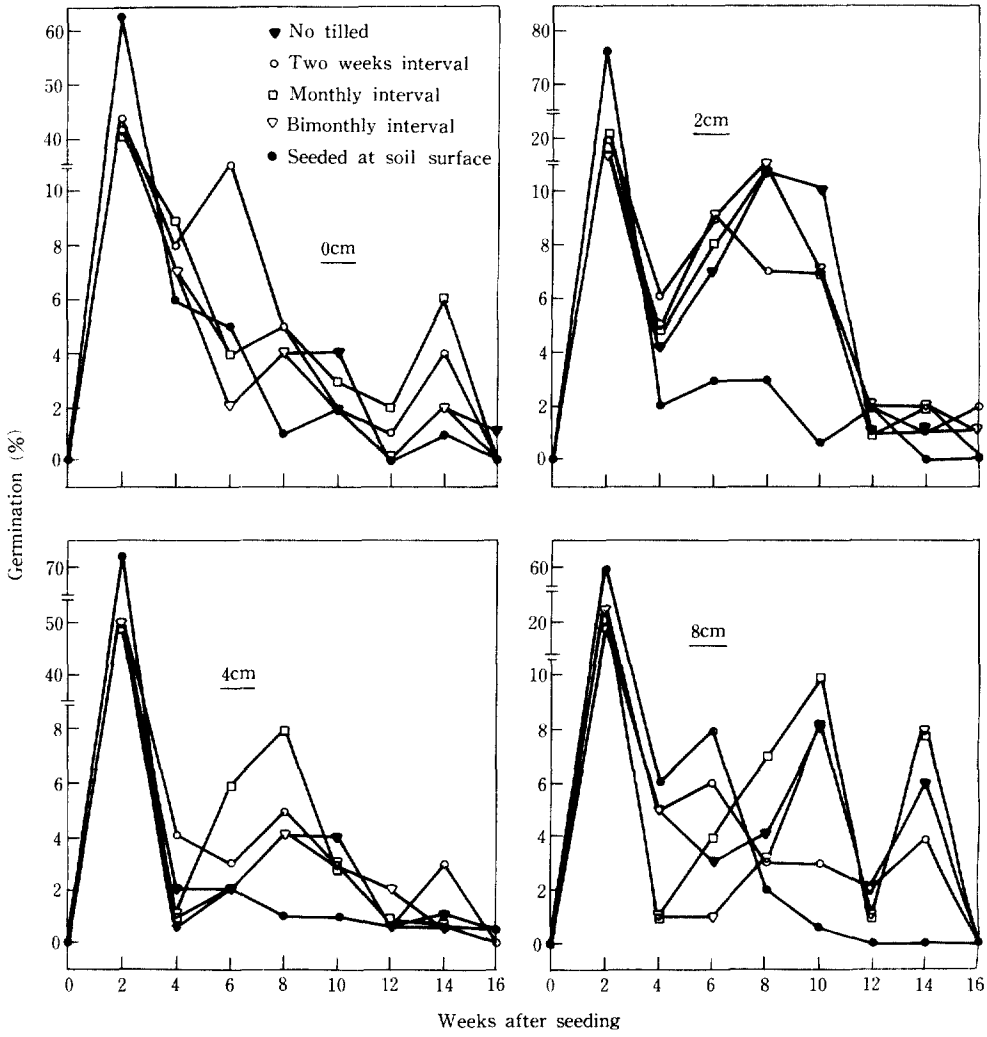

Fig. 2. The emergence patterens of *Echinochloa glabrescens* seeds sown at 7.5 cm soil depth and subjected to varying depths of standing water and cultivated at different frequencies.

occurred in both 15 and 7.5cm soil depth except for seedlings sown at the soil surface. Since the ratio of emergence within 2 weeks over total emergence during 4 months was the lowest at 2cm standing water the remaining seeds emerged periodically throughout the 4 months.

摘　　要

Echinochloa glabrescens 發芽에 대한 湛水深과 耕耘頻度의 影響을 논條件下에서 播種方法을 달리하여 4個月동안 調査하였다. 總發芽數는 種子의 土壤混和에서 飽和狀態가 가장 높았고, 다음으로 4, 2, 8 cm 順이었던 반면에 土壤表面에 播種한 條件에서는 2cm 湛水深에서 가장 높았고 다음으로 4cm, 飽和土壤, 8cm 湛水深의 順이었다. 播種後 2週 以內의 發芽는 種子土壤混和 條件에서는 4cm 湛水深에서 가장 높았고, 2 cm 湛水深에서 가장 낮았던 反面에, 土壤表面에 播種한 條件에서는 2cm 湛水深에서 가장 높았다. 4個月 동안의 總發芽에 대한 2週 以內에 發芽된 比率은 種子 土壤混和 條件에서는 2 cm 湛水深에서 가장 낮았는데 이것은 2cm 湛水深이 *E. glabrescens* 의 限界湛水深임을 나타내었다. 대부분의 種子가 耕耘前 2週 以內에 發芽되기 때문에 發芽樣狀은 모든 湛水深에서 耕耘의 影響을 받지 않았다.

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