

EFFECT OF CUTTING FREQUENCY AND FERTILIZER APPLICATION ON THE INVASION OF QUACKGRASS (*AGROPYRON REPENS*) INTO MEADOWS IN HOKKAIDO

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ABSTRACT

Invasion and increase of quackgrass, which is a naturalized weed carried with imported wheat, is a problem in meadows of Hokkaido. The objective of this study is to develop an ecological control for quackgrass invading meadows. The authors transplanted quackgrass on orchardgrass(OG) and timothy(TY) swards, and examined the effect of cutting frequency and fertilizer application on changes in botanical composition in both swards through 3yr.

The percentage of dry weight of quackgrass transplanted in OG sward decreased year by year, irrespective of cutting frequency and fertilizer application. On the contrary, the percentage of quackgrass transplanted in TY sward increased in all experimental plots in the third year. Results show that success in controlling quackgrass invading meadows depends on grass species at meadow establishment, irrespective of fertilizer application and cutting frequency.

KEYWORDS

Quackgrass, orchardgrass, timothy, meadow, weed control, cutting frequency, fertilizer application, ecological control

INTRODUCTION

Hokkaido is located in the northern part of Japan and belongs to the subfrigid zone. The area of grassland in Hokkaido totals approximately 500,000 hectares. Of this, meadow occupies approximately 85%. Principal meadow grasses are timothy (TY, *Phleum pratense* L.) and orchardgrass (OG, *Dactylis glomerata* L.). Included in legume mixed seeding are white clover, red clover and alfalfa. Quackgrass (*Agropyron repens*) is generally recognized as a naturalized weed which arrived with imported wheat at the turn of the century in Japan. This grass has recently increased and caused serious damage to meadows in Hokkaido, because of low palatability and nutritive values. After quackgrass spreads in meadow cover the control of it is very difficult, due to the large amount of stocks of rhizome growing in the soil. Thus its control has to done at the early stage of invasion. This study reports the effect of cutting frequency and fertilizer application on the growth of quackgrass transplanted in OG and TY swards.

METHODS

Clones of quackgrass were transplanted with a density of four clones m² in September, in OG and TY swards. From the next spring, the treatments, conducted with combinations of cutting frequency (main plots) and fertilizer application (sub-plots), were continued during three years (1993-95 or 1994-96) in both swards. Experimental plots were arranged by randomized block design with three replications. Dry matter yields of each grass species, harvested at 5 cm above ground, were measured in all the plots.

1. Main plots : yearly cutting frequency

	OG sward	TY sward
High:	6 times	5times
Middle:	4 times	3 times
Low:	3 times	2 times

The current cutting frequency in Hokkaido is represented in both swards by the Low plot.

2. Sub-plots : fertilizer application (yearly application amounts of N, P₂O₅, K₂O per ha basis)

	OG sward			TY sward		
High:	200,	150,	200	150,	110,	150
Middle:	100,	75,	100	100,	75,	100
Low:	50,	38,	50	50,	38,	50
	kg ha ⁻¹			kg ha ⁻¹		

These fertilizations were conducted with the split application in the early spring and after each cut.

RESULTS AND DISCUSSION

Percentages of quackgrass transplanted in OG sward decreased from year to year, but no obvious difference was obtained among fertilizer application.(Fig.1A) Percentages of quackgrass transplanted in TY sward increased in the third year, and the tendency toward increase was obvious with increasing fertilizer application amount.(Fig.1B)

Figure 2 shows the effect of cutting frequency on changes in percentages of quackgrass transplanted in OG sward(A) and TY sward(B). Percentages of quackgrass transplanted in OG sward were less than 2 % through the experimental period, and decreased from year to year. On the other hand percentages of quackgrass transplanted in TY sward increased clearly in the third year, except for the relatively low percentage in the plot of high cutting frequency. High cutting frequency caused serious damage to the regrowth of TY.

Results of this study show that the key factor in controlling quackgrass was the choice of OG at meadow establishment. As OG meadows are used under the conventional method of meadow management, the occurrence of meadow deterioration by increase of quackgrass is thought to be rare. On the contrary, quackgrass invading TY meadows was not controllable, irrespective of regulation of cutting frequency and fertilizer application.

REFERENCES

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Figure 1

Effect of different fertilizer application on percentages of weight of quackgrass in OG sward(A) and TY sward(B)

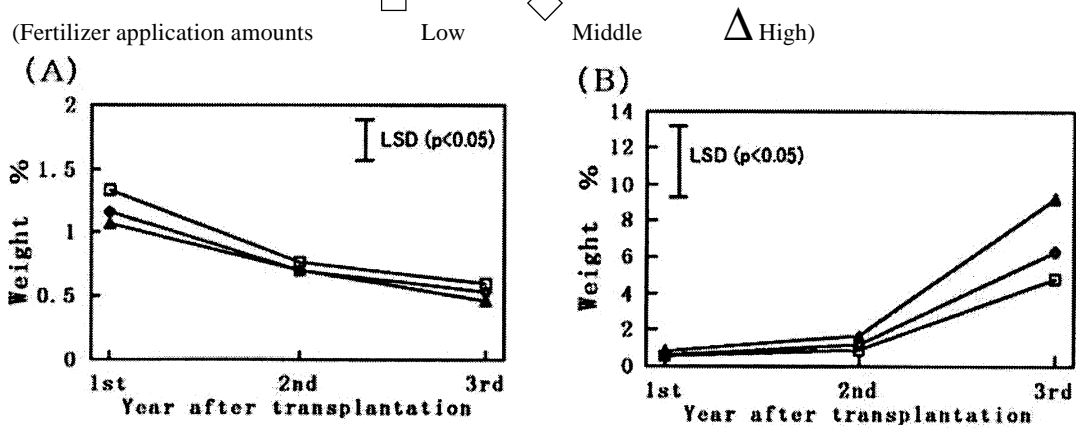


Figure 2

Effect of different cutting frequency on percentages of weight of quackgrass in OG sward (A) and TY sward (B)

