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NOTES

Effects of Clipping Purple Loosestrife Seedlings During a Simulated Wetland Drawdown

T. SHANE GABOR[1] AND H. R. MURKIN[1,2]

INTRODUCTION

Purple loosestrife (*Lythrum salicaria* L.) was inadvertently introduced to the northeast coast of North America from Europe in the early 1800s and has subsequently spread across mid-latitude wetlands (Thompson et al. 1987). It is an erect herbaceous perennial producing many small viable seeds that are readily dispersed by wind, water, and animals (Shamsi and Whitehead 1977; Thompson et al. 1987). This species spreads rapidly and forms dense monospecific stands (Shamsi and Whitehead 1974) that outcompete and eliminate important native wetland wildlife food plants (Malecki and Rawinski 1985; Smith 1964). Loss of native habitat to loosestrife is a major concern of wetland and waterfowl managers.

Control of purple loosestrife[3] has achieved marginal success to date. Drawdowns or dewatering of wetland basins to re-establish desirable plant species and improve overall productivity may only increase loosestrife densities and compound infestation problems. Although seed germination and seedling establishment has been studied under laboratory conditions (Shamsi and Whitehead 1974), little is known about natural establishment patterns following a drawdown. Our objectives were to monitor loosestrife seedling establishment following a simulated wetland drawdown and to determine the effect of clipping all existing seedlings at pre-determined intervals following drawdown.

METHODS

The study was conducted in greenhouse facilities at the Delta Waterfowl and Wetlands Research Station, on the Delta Marsh in south-central Manitoba (50° 11′ N, 98° 19′ W), Canada.

On 22 June 1988, soil for this study was obtained from a wetland with established loosestrife stands near Smith Falls, Ontario (44° 46′ N, 76° 01′ W).The upper 2 cm of soil was collected from an area 2 x 2 m within a flooded (30-cm) population of loosestrife and transported in sealed, dark plastic containers to avoid seed germination. On 24 June 1988 following a thorough mixing, a 3-cm depth of the collected soil was placed in each of 16 trays (20 x 20 x 6 cm) over a 2.5-cm depth sand/clay base. Every 24 hours, trays were watered to saturate the soil surface and maximum/minimum greenhouse temperatures were recorded. Trays were randomly divided into 4 groups of 4 trays each. One group was left unclipped. In the other 3 groups all seedlings in all trays were clipped at the soil surface on day 21, day 42, or day 63. Numbers and heights of loosestrife seedlings were recorded weekly through day 70.

RESULTS

Loosestrife densities in all treatments increased through week 2 with a slight decrease by week 3 (Figure 1). Densities remained relatively stable in the unclipped treatment ($\bar{x}$ = 59.9 ± 1.6) during weeks 4 to 10 (Figure 1A). The mean number of seedlings per tray per week following the day 21 clip was 8.4 ± 0.71 (Figure 1B). Re-establishment following the day 21 clip was entirely due to seed germination with no vegetative regrowth from the clipped stems. Stable densities were reached within 1 week of clipping.

The mean number of seedlings per tray following the day 42 clip was 28.6 ± 2.0 (Figure 1C), with 91% of the shoot re-establishment due to vegetative sprouting of 2 new shoots from each of the original clipped stems. Again, stable densities were attained within 1 week of clipping. Vegetative regrowth was similar following the day 63 clip (94%).

Prior to clipping, seedling height was ≤ 2 cm by day 21, ≤ 7 cm by day 43, ≤ 10 cm by day 63 and ≤ 10 cm in the unclipped trays at the end of the study.

The mean maximum and minimum greenhouse temperatures (C) were calculated for June 25-30 (max. = 31.5 ± 0.82(SE); min. = 14.7 ± 1.4), July (max. = 36.7 ± 0.69; min. = 13.1 ± 0.57) and August (max. = 35.8 ± 0.83; min. = 10.9 ± 0.58).

DISCUSSION

It appears that most of the loosestrife germination on the simulated drawdown treatments occurred within 2 weeks. A decrease in the total number of seedlings from week 2 to 3 indicates seedling mortality occurred before

[1]Department of Renewable Resources, Macdonald College of McGill University, 21111 Lakeshore Road, Ste. Anne de Bellevue, QC, H9X 1C0. Received for publication January 2, 1990 and in revised form May 3, 1990.

[2]Ducks Unlimited Canada, 1190 Waverley Street, Winnipeg, MB, R3T, 2E2.

[3]hereafter called loosestrife.

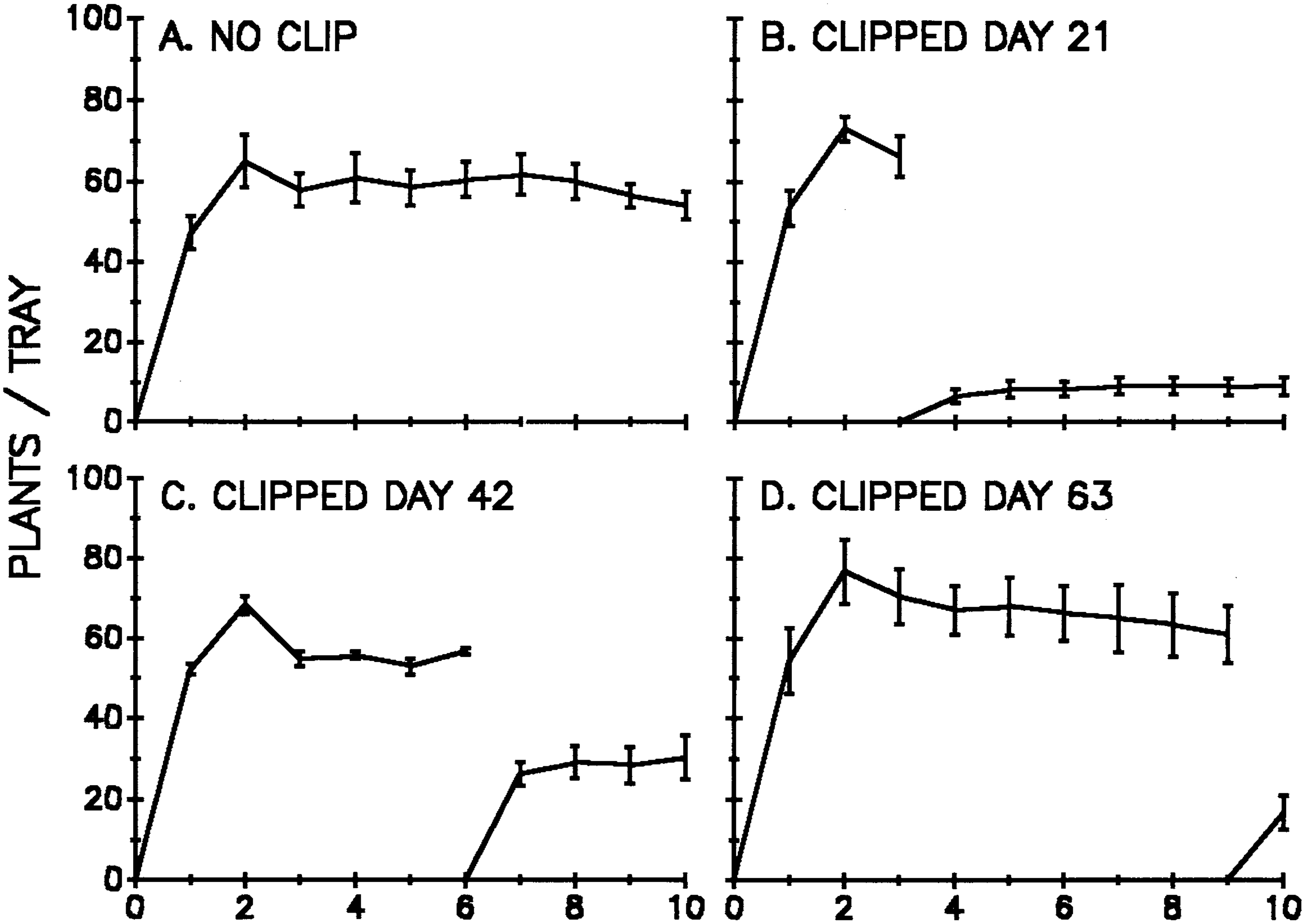

Figure 1. Mean number of purple loosestrife plants per tray per week (± SE) following a simulated drawdown and clipping at 0,21,42, and 63 days.

final densities were established. Seedling establishment after the day 21 clip suggests that conditions suitable for germination are present at least 3 weeks following our simulated drawdown. Seed germination was reduced considerably after week 3 as shown by the low percentage of re-establishment from seeds after the day 42 and 63 clips suggesting that conditions were less suitable for germination later in the season.

Shading by seedlings likely did not inhibit seed germination prior to the day 21 clip because all seedlings were less than 2 cm tall and produced minimal shade. Shading also seemed to have no effect on seed germination at 42 and 63 days because even after clipping all stems on these dates, germination was minimal.

Almost all establishment after the day 42 and 63 clips can be attributed to vegetative sprouting of new shoots from the clipped stems. The root stock is the main organ of vegetative reproduction for purple loosestrife and soon after germination the primary root grows rapidly and develops branched secondary and tertiary roots (Shamsi and Whitehead 1974). This well developed root system enables the plant to survive complete removal of the stem at an early developmental stage through vegetative propagation from belowground reserves. It appears that in our study, 21 days was not sufficient to develop roots capable of regeneration, however by day 42 loosestrife seedlings had enough belowground reserves necessary to facilitate vegetative sprouting. Because the period from germination to flowering is short (8 to 10 weeks) and flowering continues until September-October in some areas (Shamsi and Whitehead 1974), vegetative shoots may be capable of reaching maturity and producing seed within the same growing season. This would be especially true in southern regions with longer growing seasons. Malecki and Rawinski (1979) stated that mowing or cutting established stands of loosestrife in New York during June or early July can result in vegetative shoots that are capable of flowering and producing seed the same year. In our study, clipping purple loosestrife seedlings after day 42 stimulated the production of 2 new shoots from each stem, potentially increasing seed production by doubling the number of shoots that are capable of producing seed.

In summary, clipping seedlings on day 21 reduced seedling establishment and prevented re-establishment by vegetative sprouting. Almost all establishment after the day 42 and day 63 clips was due to sprouting of new shoots from each original clipped stem. Clipping seedlings after day 42 of development may compound infestation problems by increasing the number of aboveground first year stems that are capable of producing seed.

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