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Abstract

7KH FRPELQHG LPSDFW RI HQULFKPHQW DQG GHIROLDWLRQ VWUHVV QHHGV IXUWKHU L
JURZWK UHVSRQVHV RI SODQWV 8QIRUWXQDWHO\ IHZ VWXGLHV LQYHVWLJDWH
HQYLURQPHQW $GGLWLRQDOO\ D VPDOOHU QXPEHU RI WKHVH VWXGLHV GHDOW
WUHDWPHQWV ZHUH WHVWHG Cenchrus ciliaris ZDV JURZQ XQGHU HOHYDWHG
ZDV WR RXW KRZ FDQ D Cenchrus ciliaris UHVSRQGV WR GHIROLDWLRQ VWUHVV XQGHU
&2 DQG ZKHWKHU WKH &2 FDQ DOWHU JURZWK DOORFDWLRQ WR WKH GLIIHUH
C. ciliaris WKDW ZHUH JURZQ XQGHU HOHYDWHG &2 KDG ODUJHU OHDI DUHD WKDQ
XQGHU WKH VDPH FRQFHQWUDWLRQ

Keywords: Defoliation stress; CO_2 Enrichment; C. ciliaris

Introduction

Grazing-induced defoliation has caused serious challenges to natural and semi- natural grasslands worldwide. Especially with the anticipated increase in green-house gases such as carbon dioxide and the global impact on species growth. Simply because plants respond di erently when subjected to environmental stresses. Unfortunately, attention had been given to the change in the atmospheric CO_2 concentration and most of the published studies on plant response to elevated CO_2 focus on response under environmental stresses such as drought, high soil salinity, nutrient limitations and high and low temperatures. Very few studies [1], however, assessed plant responses under defoliation conditions coupled with CO_2 enrichment. Additionally, a smaller number of these studies dealt with C4 non-crop species. Defoliation, de ned as the removal of photosynthetic organs of the plant [2] could be caused by many factors such as insect attack, wind or hail damage, or feeding by livestock, is to be studies in combination with the impact of CO_2 increase. e direct e ect of elevated CO_2 on plants is mainly increasing its biomass [3] by increasing photosynthesis. e concern about defoliated plants' response to elevated CO_2 comes from the fact that defoliated plants have reduced photo- synthetic organs. Defoliation stress caused an improvement in tree blade quality [4], and decrease in blade size and weight [5]. During defoliation stages, plants require remobilization of the stored and accumulated N and C in plant organs [3]. Defoliation stress gradually reduces N uptake and photosynthesis. is leads to plant growth being highly a ected by the extra CO_2 supply and plant storage status [2]. Elevated CO_2 have the ability to improve mineralization and plant uptake of N [4]. In addition, elevated CO_2 increased the carbon content in the soil [1]. Soil carbon content may lead to increased concentration of the non structural carbohydrate in crown and roots [2]. Photosynthetic processes are therefore a ected [6] which may impact the plant's regrowth a er defoliation events. e combination of stresses such as defoliation with atmospheric CO_2 enrichment wills very likely lead to di erent growth responses as compared to one of the factors alone. is di erence in responses may also be dependent on the photosynthetic pathway (i.e. C3 vs. C4 species). Elevated CO_2 by itself stimulated the regrowth of C3 plants but inhibited that of C4 plants a er defoliation [2]. Consequently, in this study the aim was to nd out how can a C4 grass like Cenchrus ciliaris responds to defoliation stress under enriched atmospheric CO_2, and whether the CO_2 elevation can alter growth allocation to the di erent vegetative and reproductive parts.

*Corresponding author: 7DRX¿N 6DOHK .VLNVL %LRORJ\ 'H RI 6FLHQFH 8$(8QLYHUVLW\ $O $LQ 8QLW)D[(PDLO WNVLNVL#XDHX DF DH

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All defoliated plants had similar chlorophyll/b pigment during the whole trial at P>0.05 (Figure 7). A Non-defoliated plant under A_2CO_2 however, was lowest on 23 March and highest on 16 May (P 0.05).

Growth partitioning

tiller numbers and decreasing tillers weight and size [5]. Published data concluded that atmospheric CO_2 elevation can speed up plant growth and development by a ecting plant cells division and elongation [13]. e di erence in response between young and mature blades comes from the di erence in sugar content and hormone concentration, which reduces the stomata conductance under E_2 [13]. Chlorophyll/a and chlorophyll/b increased under $ALCO_2$ condition. It is believed that the plants under $ALCO_2$ may have considered the alternating supply of CO_2 as an additional stress, which led to a di erent response by C. ciliaris