Responses of Photosynthetic Rate of Lucerne and the Mechanisms under Cutting at Different Water Availabilities

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Responses of photosynthetic rate of lucerne and the mechanisms under cutting at different water availabilities

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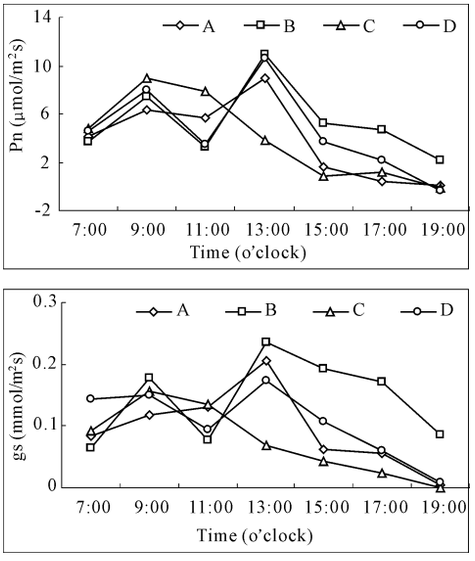
Key words : forage cutting , photosynthesis , regrowth , stomatal character

Introduction The regrowth after cutting (defoliating) is essential to the utilization of forage and grassland . After forage cutting , the residue has to change its original function to adapt new situation . Some clue showed that photosynthetic rate (Pn) of the aboveground part would increase after cutting and would keep higher for a longer period (Nowak and Caldwell , 1984 ; von Caemmerer and Farquhar , 1984) . That might be resulted from the change of light illumination . However , Pn change shortly after cutting was still not clear and the mechanisms under cutting stimulus awaited further exploitation .

Materials and methods Local Lucerne variety (*Medicago sativa* cv . Xinjiangdaye) was chosen as the experimental material . One group of materials was kept 70% field water capacity (FWC) and another was 35% FWC . On a clear day , plant Pn and stomatal conductance (gs) were measured every two hours using LI-6400 after forage cutting . Proline and antioxidases were also measured 5 , 10 and 30 h after cutting .



Results and discussions Higher Pn was observed in the residue with cutting , especially 5 h after cutting . Accordingly , greater gs was also measured under cutting treatment . Furthermore , proline content and the activities of SOD (superoxidase) , POD (peroxidase) and CAT (catalase) were greater under cutting than without cutting 5 h after cutting . Greater gs promised enough CO_2 supply , thus resulting in higher Pn . The enhanced antioxidases would efficiently clean out free radicals resulting from cutting stimulus and more proline would help to maintain cell osmotic potential , thus maintain cell normal function , including guard cell/stomatal function . Additionally , more water supplies (i .e . 70% FWC) could keep plant more sensitive and efficient in response to cutting stimulus . CAT was found very significant responding to cutting , suggesting that it may play a key role in this stimulus-response signaling . Further investigation concerning regrowing mechanisms is now conducted .

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