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## Strictness of the Centrifugal Location of Bundle Sheath Chloroplasts in Different NADP-ME Type C<sub>4</sub> Grasses

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**Abstract:** C<sub>4</sub> plants have many attractive traits for crops, but their structural and functional relationships are complicated. C<sub>4</sub> plants are different in bundle sheath cell (BSC) chloroplast location (centrifugal or centripetal) among species. The effects of light intensity on the centrifugal location of BSC chloroplasts were investigated in four grass species of NADP malic enzyme (NADP-ME) type (*Zea mays*, *Echinochloa utilis*, *Sorghum bicolor* and *Eriachne aristidea*) by light and electron microscopy. Furthermore, the degree of granal development was examined to investigate the relation between BSC chloroplast location and dependence of BSC chloroplasts on the reducing power of mesophyll cells. We investigated BSC chloroplast location grown under high intensity light (HL) (600 μmol m<sup>-2</sup>s<sup>-1</sup>), low intensity light (LL) (2.5 μmol m<sup>-2</sup>s<sup>-1</sup>) and dark conditions and counted the number of granal thylakoids per granum. Although BSC chloroplasts of maize maintained the centrifugal position under all light conditions, the centrifugal location of other species was disturbed under LL and in the dark. Granal development in BSC chloroplasts in the plants grown under HL was suppressed, although the suppression in *Z. mays* and *S. bicolor* was more prominent than in other two species. These findings indicate that there is a difference in the strictness of centrifugal location of BSC chloroplasts among NADP-ME type C<sub>4</sub> grass species and the strictness had no relation to the degree of granal development in BSC chloroplasts.

**Keywords:** [Bundle sheath chloroplast](#), [C<sub>4</sub> plant](#), [Centrifugal location](#), [Echinochloa utilis](#),



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