

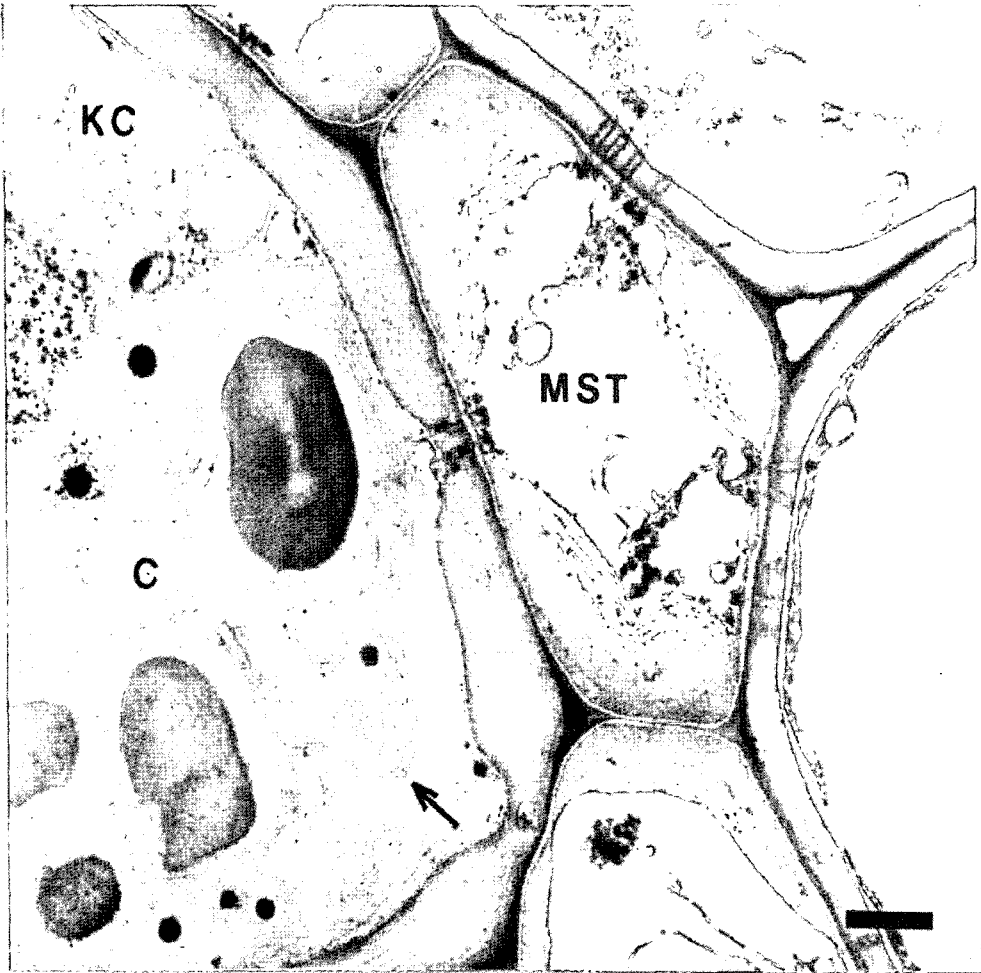
## Kranz syndrome in the chlorocyperoid species

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Unique anatomical and structural features of the chlorocyperoid Kranz syndrome were studied in some cyperaceous species. Two bundle sheath layers completely encircled the vascular tissues, yet distinct cellular differentiation was noticed between the inner and outer layers. The inner bundle sheath cells, so-called Kranz cells, were large and contained centrifugally arranged cellular components. Chloroplasts exhibited rudimentary grana with swirly or convoluted thylakoids, but numerous starch grains also occurred. The outer bundle sheath cells, mestome sheath cells, were sclerenchymatous and they developed unevenly thickened cell walls. The mestome sheath cells, tightly encompassing the Kranz cells, were small and possessed almost none to little cytoplasm. Their radial walls were shorter than the tangential walls, but all exhibited a suberin lamellae where traversed by numerous plasmodesmata. Plasmodesmata were most frequent between the mestome and Kranz cells, but they were not found between Kranz and neighboring vascular cells. The plasmodesmata connections were restricted in the pit field where the suberin lamellae showed a distinct polylamellate structure. The Kranz syndrome in *Cyperus* and *Kyllinga* species examined in the study was similar to those reported in the NADP-ME C<sub>4</sub> type and this will be discussed in relation to its photosynthetic function.

*Key Words:* Kranz syndrome, Cyperaceous species, Kranz cells, Mestome sheath cells, Ultrastructure



**Figure 1.** Mestome sheath cells (MST) neighboring part of the Kranz cell (KC) in *Cyperus iria* leaf. Note the convoluted thylakoids (arrow) in the KC chloroplast (C) and the MST which is devoid of cellular components. Plasmodesmata are conspicuous between the MST and neighboring cells. Scale bar = 1.5  $\mu\text{m}$ .