



Title	Effects of mesophyll water potential on photosynthesis in Cyperaceae plants: with special reference to phylogeny of tribes and decarboxylation sub-types
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Effects of mesophyll water potential on photosynthesis in Cyperaceae plants: With special reference to phylogeny of tribes and decarboxylation sub-types

We examined the photosynthetic rates under water stress conditions in 43 Japanese Cyperaceae species using the same method used for Gramineae plants. In Fig. 4, all the data for these 43 species are shown. The solid lines denote C3 species while the dotted lines denote C4 species. It is evident that C3 species were more resistant to water stress than C4 species. However, the inhibition patterns were different considerably. We, therefore, compared the patterns among the tribes. In Fig. 2, the data are shown for each of the species. The decreasing patterns were similar within each tribe. In Fig. 3, the values averaged for respective tribes are shown. Among C3 tribes, it appears that Cariceae tribe species were most resistant. Among C4 species, although the differences were

small, Scirpeae tribe species would be most susceptible.

Compared with Gramineae, [Note: it refers to (Takeda & Fukiyama, 1981) <https://doi.org/10.5281/zenodo.8090028>] the difference between C4 and C3 species was more distinct in Cyperaceae. Moreover, C4 Cyperaceae species were very susceptible to water stress like Panicoideae C4 species. These species belong to the NADP-ME subtype. It appears that the sensitivity of photosynthesis to water stress would be different depending on the decarboxylation sub-types (Fig. 4).

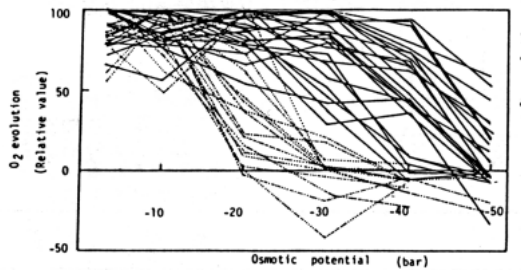


Fig. 1 Relation between O_2 evolution from the leaf sections and the osmotic potential of the buffer solution (family Cyperaceae).

C₃ ——— C₄ - - - -

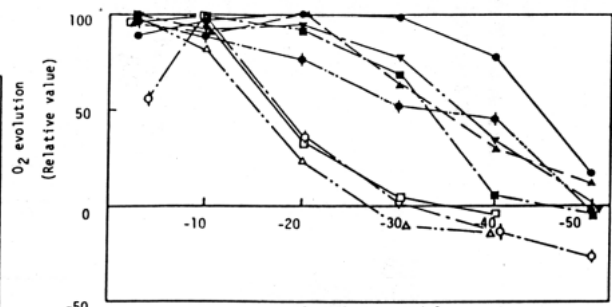


Fig. 3 Relation between O_2 evolution from the leaf sections and the osmotic potential of the buffer solution (averages of each Tribe).

C₃ ●— Tribe Cariceae ▼— Sclerieae
 ▲— Scirpeae ■— Cyperae ◆— Rhynchosporeae
 C₄ △— Scirpeae □— Cyperae ◊— Rhynchosporeae

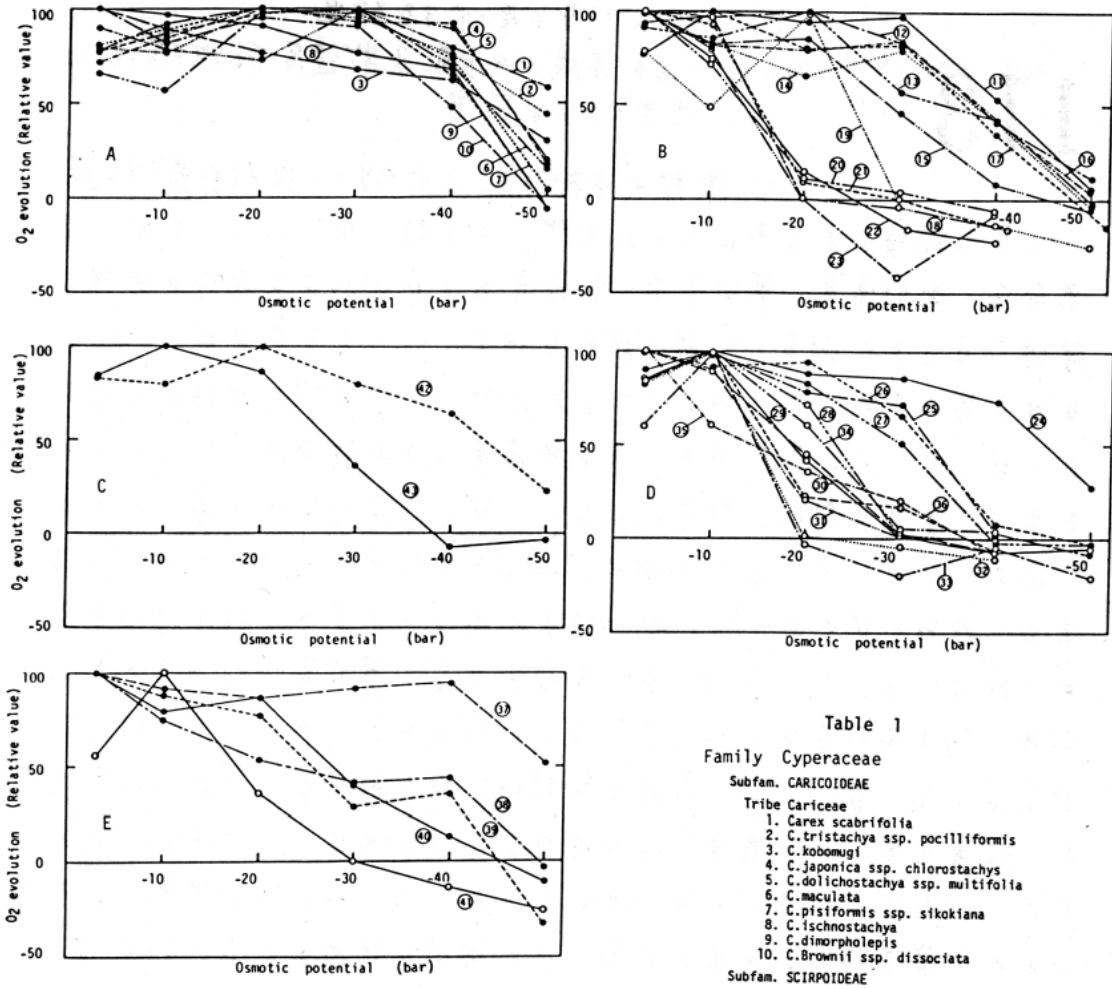


Fig. 2 Relation between O₂ evolution from the leaf sections and the osmotic potential of the buffer solution
 A : Tribe Cariceae B : Scirpeae C : Scirpeae D : Cyperaceae
 E : Rhynchosporaeae
 ○ C₄ ● C₃

Table 1
 Family Cyperaceae

Subfam. CARICOIDEAE

Tribe Cariceae

1. *Carex scabrifolia*
2. *C. tristachya* ssp. *pocilliformis*
3. *C. kobomugi*
4. *C. japonica* ssp. *chlorostachys*
5. *C. dolichostachya* ssp. *multifolia*
6. *C. maculata*
7. *C. pisiformis* ssp. *sikokiana*
8. *C. ischnostachya*
9. *C. dimorpholepis*
10. *C. Brownii* ssp. *dissociata*

Subfam. SCIRPOIDEAE

Tribe Scirpeae

11. *Scirpus fluviatilis*
12. *S. Wichurii*
13. *S. fuirenooides*
14. *S. mucronatus* ssp. *robustus*
15. *S. juncooides* ssp. *Hotaruji*
16. *Fuirena ciliaris*
17. *Eleocharis Kuroguwai*
18. *Bulbostylis barbata*
19. *Fimbristylis Sieboldii*
20. *F. sericea*
21. *F. tristachya* ssp. *subbispicata*
22. *F. complanata*
23. *F. dichotoma*

Tribe Cyperaceae

24. *Cyperus alternifolius* ssp. *flabelliformis*
25. *C. haspan*
26. *C. difformis*
27. *C. flaccidus*
28. *C. distans*
29. *C. nipponicus*
30. *C. rotundus*
31. *C. orthostachys*
32. *C. Ohwi*
33. *C. Irija*
34. *Mariscus javanicus*
35. *Torulium ferax*
36. *Pycurus polystachyos*

Subfam. RHYNCHOSPOROIDEAE

Tribe Rhynchosporaeae

37. *Cladium chinense*
38. *Machaerina nipponensis*
39. *Rhynchospora rugosa* ssp. *Brownii*
40. *R. chinensis*
41. *R. rubra*

Tribe Sclerieae

42. *Scleria levis*
43. *S. parvula*

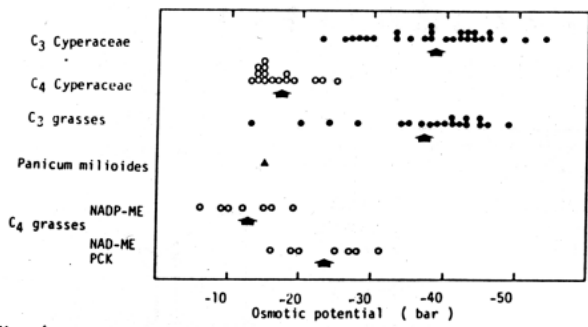


Fig. 4 Osmotic potential values at 50% O₂ evolution among photosynthetic types in the Cyperaceae and grasses. Arrows indicate averages for individual groups. NADP-ME : NADP-malic enzyme type ; NAD-ME : NAD-malic enzyme type ; PCK : PEP carboxykinase type.

Takeda, T., & Fukiyama, R. (1981). Effects of mesophyll water potential on photosynthesis in Gramineae plants: With special reference to phylogeny of subfamilies. *Japanese Journal of Crop Science*, 50(Extra issue 2), 115-116.