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DIURNAL VARIATIONS IN LIPIDS OF BRACKEN FRONDS

MICHAEL C. JARVIS and HENRY J. DUNCAN*

Agricultural Chemistry, Department of Chemistry, University of Glasgow, Glasgow G12 8QQ, Scotland

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Key Word Index—*Pteridium aquilinum*; Polypodiaceae; bracken; glycolipids; phospholipids.

Abstract—The galactolipids, sulpholipid and phosphatidyl glycerol in the fronds of bracken show diurnal variations of 50–100%, with a maximum at about 1600 hr.

In our previous study of the glycolipid and phospholipid composition of bracken [1], all samples were collected at the same time in case their lipid composition varied during the day [2]. We now report the diurnal variations which occur in the levels of the major "chloroplast" lipids [3] of bracken fronds, necessarily at a more advanced stage of maturity than those analysed previously.

The levels of all the lipids studied increased by 50–100% during the morning and fell during the evening, the fall beginning before sunset (Fig. 1). During the night there may have been a slower decrease to the original levels, but this is not certain as the fine weather might have caused some net synthesis of lipid material.

The increase during the morning is more rapid than is usually observed when etiolated tissues of higher plants turn green in the light [4–7]. It is not accompanied by any clear change in the ratio of monogalactosyl to digalactosyl diglyceride [6, 8]. The decrease in lipid levels during the evening is considerably faster than that due to senescence [9, 10], for example, and its mechanism remains obscure. In particular, it is not clear whether the fatty acids and glycerol are degraded at night or merely transferred to another site [4].

The size of these diurnal variations, and the equally large differences between our previous results [1] and the present series of data taken as a whole, imply that great caution is necessary when results from different experiments are compared. Our earlier figures [1] applied to a different part of the frond, and to woodland bracken at a different stage of maturity. Within a single experiment, the histories of leaf samples for lipid analysis should clearly be as similar as possible.

EXPERIMENTAL

Plant material. Samples were collected at Drumclog Moor, Dunbartonshire (Grid Ref. NS 553757) at approximately 3 hr intervals on 14 August. Throughout the sampling period and for 2 days beforehand, the weather was warm and dry with some haze but virtually no cloud. The top 12 cm of the lamina (6–7 pinnae) was removed from each of 12 healthy fronds on each occasion. The samples were immediately frozen on solid CO_2, brought back to the laboratory in a vacuum flask, and stored at −15°.

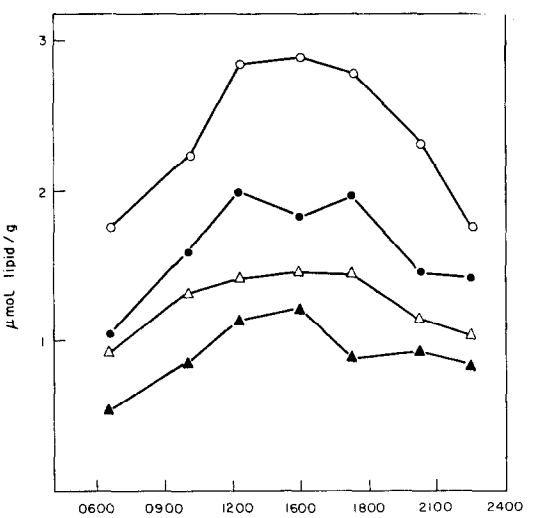

Fig. 1. Amounts of monogalactosyl diglyceride (○), digalactosyl diglyceride (●), sulpholipid (▲), and phosphatidyl glycerol (△) in bracken fronds at different times during the day.

* To whom communication should be made.

Lipid analysis. Analytical methods were as described previously [1]. The results are on a fr. wt basis. Parallel investigations showed that diurnal variations in water content did not exceed ±5%.

REFERENCES

1. Jarvis, M. C. and Duncan, H. J. (1974) *Phytochemistry* **13,** 979.
2. Roughan, P. G. and Batt, R. D. (1969) *Phytochemistry* **8,** 363.
3. Kates, M. (1970) *Adv. Lipid Res.* **8,** 225.
4. Trémolières, A. T. and Lepage, M. (1971) *Plant Physiol.* **47,** 329.
5. Tevini, M. (1971) *Z. Pflanzenphysiol.* **65,** 266.
6. Roughan, P. G. and Boardman, N. K. (1972) *Plant Physiol.* **50,** 31.
7. Bowden, B. N. and Williams, P. M. (1973) *Phytochemistry* **12,** 1059.
8. Poincelot, R. P. (1973) *Plant Physiol.* **51,** 802.
9. Draper, S. R. (1969) *Phytochemistry* **8,** 1641.
10. Ferguson, C. H. R. and Simon, E. W. (1973) *J. Exp. Botany* **24,** 307.