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SHORT COMMUNICATION

THE PHENOL GLUCOSYLATION REACTION IN FERNS*

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Abstract—Twenty-nine species of ferns (from twenty-one genera) and one species of *Psilotum* were examined for their ability to glucosylate quinol and catechol. All species reacted positively.

INTRODUCTION

THE CAPACITY for glucosylation of administered phenols appears to be widespread amongst higher plants. With the exception of the studies by Pridham[1] and Roy[2] investigations have largely been restricted to angiosperm species. Pridham[1] included *Polystichum setiferum*, a *Polypodium* species and *Equisitum arvense*, while Roy[2] examined the reaction in *Adiantum macrophyllum*. The overall results of these studies suggest that the glucosylation reaction is distinctly polarized in the plant kingdom. Angiosperms and gymnosperms represent a group that reacts positively to produce high concentrations of glucosides. Bryophytes, algae, and fungi constitute a second, largely negatively reacting group. Considering the phylogenetic intermediacy of ferns between these groups we considered it valuable to obtain information regarding their position with respect to the glucosylation reaction.

RESULTS AND DISCUSSION

In all fern species examined as well as in *Psilotum nudum* considerable quantities of the monoglucosides of both quinol and catechol were formed following administration of these phenols. Table 1 lists the plants examined. It is striking to note that glucosylation capacity was present in 10-day-old, sterile-grown gametophytes of *Pityrogramma calomelanos*. At this age the gametophyte consists of a simple five-cell filament.

On the basis of this survey, along with the quoted works,[1,2] ferns may be grouped with the angiosperms and gymnosperms as plants capable of glucosylating administered phenols. The ability of the primitive tracheophyte, *Psilotum nudum*, to glucosylate phenolic compounds suggests an early appearance of this metabolic capacity in the evolution of vascular plants.

EXPERIMENTAL

Leaves of the ferns were cut and then recut under water. The cut ends were placed in 5 mM aqueous solutions of quinol or catechol. After 24 hr the plants were extracted with boiling 80% EtOH. The ethanolic solution was evaporated to dryness under an air jet and the residue extracted with boiling H_2O and filtered

* Part VI in the series "Phenolic Compounds in Ferns".

[1] J. B. PRIDHAM, *Phytochem.* 3, 493 (1963).
[2] C. ROY, M.Sc. Thesis, McGill University (1959).

TABLE 1. FERNS, INCLUDING *Psilotum nudum*, WHICH GLUCOSYLATED QUINOL AND CATECHOL

Adiantum capillis-veneris L.	*Microsorum punctatum* Feé
A. caudatum L. Mant.	*Nephrolepis exaltata* (L.) Schott
A. hispidulum Sw. Schrad.	*N. hirsutula* (Forster) Presl
Asplenium viviparum (L. Fil.) Pr. Tent.	*Pelleae andromedifolia* (Klf.) Feé
Athyrium felix-femina (L.) Roth.	*P. rotundifolia* Hook
Campyloneuron spp.	*P. viridis* (Forsk.) Prantl, Engl.
Cibotium splendens (Gaudichaud) Krajina	*Phlebotium aureum* J. Smith
Ctenitis decomposita (R. Br.) Copel.	*Pityrogramma calomelanos* (L.) Link (leaves)
Cyathea dealbata (Forst) Sw. Schrand.	*P. calomelanos* (L.) Link (10-day gametophytes)
Cyrtomium spp.	*Platycerium bifurcatum* (Cav.) C. Chr.
Davallia solida (Forst) Sw. Schrad.	*Polystichum aculeatum* (L.) Schott
Dennstaedtia wildfordii (Moore) Koidz	*Pteridium aquilinum* Kuhn var. *aquilinum*
Elaphoglossum reticulatum (Kaulfuss) Gaudichaud	*Pteris cretica* L.
Elaphoglossum spp.	*P. longifolia* L.
Hemionitis arifolia (Burn) Moore	*Psilotum nudum* (L.) Beavois

through Celite. After concentration the aqueous extracts were concentrated to a small volume and applied to sheets of Whatman No. 1 chromatography paper which were developed with *t*-BuOH–acetic acid–H_2O (3:1:1) for the first direction and *n*-BuOH–pyridine–H_2O (6:4:3) for the second direction. Phenolic glucosides were detected by means of diazotized *p*-nitroaniline oversprayed with dilute NaOH solution.

Spores of *Pityrogramma calomelanos* were surface-sterilized with 3% NaOCl, washed with H_2O, and inoculated into sterile nutrient solution.[3] The 10-day-old medium was inoculated with a solution of quinol or catechol so that the final concentration was 5 mM. Extractions and analysis were performed as described above.

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[3] A. J. WHITTIER, *Am. Fern. J.* **54**, 20 (1964).