Abstract

The ethanolic extract of trunk wood of Tachigalia paniculata Ducke (Leguminosae-Caesalpinioideae) was found to contain substantial quantities of 2-(3-indolyl)-acetic acid.

INTRODUCTION

Tachigalia Aubl., a small genus of the tribe Caesalpinieae, subfamily Leguminosae-Caesalpinioideae, comprises 24 species which occur in tropical Central and South America, mostly in Amazonia (Polhill & Vidal, 1981). The sole chemical registry on the genus refers to T. paniculata Ducke, the inflorescences of which were reported to contain tryptamine and N-methyltryptamine (Svoboda et al., 1979). In continuation of our work on the chemistry of Leguminosae (for Part LIX see Braz Filho et al., 1980), a trunk wood sample, collected from a T. paniculata tree of the Ducke Forest Reserve near Manaus, was examined. To our surprise we were able to isolate from the ethanol extract, besides the common plant extractive sitosterol, only 2-(3-indolyl)-acetic acid.

EXPERIMENTAL

Isolation of the constituents. Trunk wood of Tachigalia paniculata was reduced to powder (5 kg) and percolated with ethanol. The solvent was evaporated and the residue (15 g) was extracted in a soxhlet apparatus successively with benzene and ethyl acetate. Both solutions were evaporated. The residue (9 g) of the benzene extraction was chromatographed on a column of silica gel (200 g). Elution with benzene, benzene — ethyl acetate 8:2 and ethyl acetate gave respectively aliphatic esters, sitosterol and indolylacetic acid. The residue (3.6 g) of the ethyl acetate extraction was chromatographed on a column of silica gel (110 g). Elution with chloroform and benzene - ethyl acetate 8:2 gave respectively sitosterol and indolylacetic acid. Totals obtained: aliphatic esters 3 g, sitosterol 1.5 g, indolylacetic acid 100 mg (20 ppm, calculated on wood).

2-(3-Indolyl)-acetic acid, crystals, lit. mp (Merck Index, 1976) and mp 168-170° (benzene — ethyl acetate). UV (Sadler UV n° 223), IR (Sadler IR n° 670), 'H NMR (Sadler NMR 1198) and mass (Jamieson & Hutzmager, 1970) spectra superimposable on analogous spectra given in the literature.

DISCUSSION

Indolylacetic acid (heteroauxin) is a plant growth hormone which controls growth by promotion of cell elongation at the growing tip. Even stems, branches and trunks of woody plants, however, may be major sites of auxin synthesis, although they are rarely mentioned in standard accounts of the subject (Little et al., 1978. Odani, 1970; Sheldrake, 1971; Sheldrake & Northcote, 1968). While there is thus little doubt that the compound is widely distributed in plant tissue, it is equally clear that being a hormone, relatively small quantities (a few μg/kg) are highly efficient (van Overbeck, 1966; Galston & Davies, 1969; Galston & Purves, 1960). This, added to the fact that it occurs in plants in different combined forms (Bandurski & Schulze, 1977; Harborne, 1971) explains why it has so far been isolated only infrequently in normal phytochemical work.
The unusual finding of mg/kg quantities of indolylacetic acid in T. paniculata could a priori be due to artifact formation. Indeed, the compound can be produced during extraction of plant material either by hydrolysis of combined forms (Brenner, 1981), or by enzymatic (Whitemore and Zahner, 1964) or spontaneous (Shantz, 1966) oxidation of tryptophan; and, as already stated above, T. paniculata is rich in tryptophan derived amines. Alternatively, epiphytic bacteria or fungi may introduce exogenous auxin into cellular tissue (Libbert et al., 1966; Pegg, 1976). This latter phenomenon is the most attractive rationalization of the present case. We have reported previously that wood samples, void of substantial quantities of autochthonous secondary metabolites, may contain a considerable gamut of fungal metabolites (Alvarenga et al., 1978) Thus also in T. paniculata the quantity of secondary metabolites may be too small for efficient defense against infestation by indolylacetic acid producing microorganisms.

ACKNOWLEDGMENTS

The authors are indebted to Coordenação do Aperfeiçoamento de Pessoal de Nível Superior (CAPES) and to Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for fellowships, and to Dr. Aderbal F. Magalhães, Universidade Estadual de Campinas, for mass spectra.

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(Aceito para publicação em 08/11/82)