with NH_3, at R_f values of 4–20 (H_2O) and 16–50 (HOAc) The species with *C*-glycosylxanthones were subjected to 2D-PC in TBA and 15% HOAc [9] The compounds were eluted in 80% MeOH for R_f comparison in TBA, BAW, 15% HOAc and H_2O with authentic mangiferin and isomangiferinfrom *Asplenium montanum* [10]

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FLAVONE *C*-GLYCOSIDES OF *PHORADENDRON TOMENTOSUM* FROM DIFFERENT HOST TREES

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Key Word Index—*Phoradendron tomentosum*, mistletoes, Loranthaceae, flavones, apigenin mono- and di-*C*-glycosides

Abstract—Apigenin, three known apigenin *C*-glycosides, vitexin, schaftoside and isoschaftoside together with apigenin 4′-*O*-glucoside have been identified in leaves of *Phoradendron tomentosum* growing on different hosts

Mistletoes are semi-parasitic plants which in modern botanical taxonomy are classified into two families, the Loranthaceae and Viscaceae [1] In an earlier paper Becker and Exner [2] reported the isolation of eight flavonoids from *Viscum album* all of which were methylated quercetin derivatives The present paper describes the characterization of apigenin *C*-glycosides from plants of *P tomentosum* (DC) Gray, growing on three different host trees *Ulmus crassifolia* Nutt, *Prosopis glandulosa* Torr and *Celtis laevigata* Willd

Ethyl acetate and water extracts of air-dried leaf material of *P tomentosum* resulted in the isolation of the previously known flavonoids vitexin [3, 4], schaftoside (6-*C*-glucosyl-8-*C*-arabinosylapigenin) and isoschaftoside (6-*C*-arabinosyl-8-*C*-glucosylapigenin) [5] together with lesser amounts of apigenin 4′-*O*-glucoside and apigenin Colour reactions in UV light before and after fuming with ammonia (olive) and spraying with Naturstoff reagent (NA) (green) [6] are in accordance with those of apigenin derivatives Isomerization with 0 1 N trifluoracetic acid indicated the presence of *C*-glycosides Cochromatography with authentic samples and UV, ^1H- and ^{13}C NMR data were in agreement with reported values [3, 7–9]

The present investigation has revealed that apigenin mono- and di-*C*-glycosides are the predominant compounds in *P tomentosum*, the distributional pattern being uniform irrespective of the host plant It is interesting to note that the methylated quercetin derivatives of *Viscum album* [2] also show a quite uniform pattern However further investigations on the flavonoids of other mistletoe species are needed before any conclusions on their value in systematic differentiation can be drawn

EXPERIMENTAL

P tomentosum leaves were collected by J Exner near Austin, Texas, U S A Voucher specimens are deposited in the Herbarium of the Botany Dept, University of Texas at Austin

Extraction and isolation Air dried leaves (200 g) were ground and extracted with 80% MeOH (1 l × 3), filtered and evaporated

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to a syrupy residue under red pres at 30° The syrup was partitioned between petrol (50–70°, 1 l), $CHCl_3$ (1 l), EtOAc (1 l) and H_2O (1 l) EtOAc and H_2O fractions containing flavonoids were further subjected to a Craig distribution with 70 steps in a two phase system as follows (1) EtOAc fraction, $CHCl_3$–MeOH–PrOH–H_2O (4 6 1 4, upper phase as mobile phase), and (2) H_2O fraction, EtOAc–PrOH–H_2O (4 3 5, upper phase as mobile phase) Individual fractions were monitored using Si gel rapid plates, Woelm F 254, using mobile phase (upper layer) as solvent system from the Craig two phase system Flavonoid containing fractions were pooled and further chromatographed

Chromatography CC cellulose microcrystalline, ashless quality, acid washed (solvents 0 05–0 1% HOAc, 10% MeOH), Sephadex LH 20 (solvent MeOH) TLC cellulose plastic sheets without fluorescent indicator (solvents 15% HOAc, 25% HOAc, BAW, upper phase), spray reagent NA

Hydrolysis and acid isomerization 5 ml 0 1 N TFA [10] and 10 mg flavonoid heated in a stream bath for 1 hr PC of sugars, Whatman 3 MM (solvent pyridine–EtOAc–HOAc–H_2O, 36 36 7 1) Spray reagent Aniline hydrogen phthalate

UV spectroscopy As described in ref [11]

^1H- and ^{13}C NMR spectroscopy The spectra were recorded in DMSO-d_6 at 30°

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A FLAVANONE GLYCOSIDE FROM THE FRONDS OF *CETERACH OFFICINARUM*

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Key Word Index—*Ceterach officinarum*, Polypodiaceae, naringenin 7-[*O*-L-arabinopyranosyl-(1 → 6) glucoside]

Abstract—From the fronds of the fern *Ceterach officinarum* naringin and a new flavanone, naringenin 7-[*O*-L-arabinopyranosyl-(1 → 6) glucoside], have been characterized

Early investigations of the chemical constituents of *Ceterach officinarum* Lam et DC have led to the identification of lignin [1], higher alkanes (the entire series from C_{19} to C_{31}) [2], triterpenoids [22 (29)-hopene and cyclolaudenol] [3] and by using neutron activation analysis, the sodium, potassium, chlorine and manganese levels have been determined in a pharmacological study [4] on diuretic drugs Recently an examination of its polyphenolic constituents in this laboratory has led to the identification of three hydroxycinnamic acid–sugar derivatives (1-caffeyl glucose 6-sulphate, 1-caffeylglucose 3-sulphate and 1-caffeylglucose 2-sulphate) [5], and four flavonol glycosides quercetin 3-glucoside, quercetin 3-gentiobioside, kaempferol 3-(6″-malonyl) glucoside and kaempferol 3-(6″-malonyl) galactoside) [6]

In the present study another flavonoid band was isolated from an ethanolic extract of fresh fronds of *C officinatum* The UV spectral data λ_{max}^{MeOH} nm 267 (sh), 282,