

THE FLAVONOIDS OF *EQUISETUM RAMOSISSIMUM*

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Equisetum flavonoids have recently received a great deal of attention. The first report was the occurrence of luteolin-5-glucoside and kaempferol-7-diglucoside in *E. arvense* [1]; several other species have been found to contain flavonol di- and triglycosides [2-5]. In the present study, two subspecies of *E. ramosissimum* viz. *ramosissimum* and *debile* were analysed for flavonoids, the former being widespread throughout Africa, Europe and most of Asia, the latter being restricted to southeast Asia and the southern Pacific Islands [6].

Eleven samples of subspecies *ramosissimum*, and one sample of subspecies *debile* all contained kaempferol-3-sophoroside-7-glucoside and lesser amounts of kaempferol-3-sophoroside. No luteolin-5-glucoside was detected. The simplicity and consistency in the flavonoid pattern is noteworthy compared to those of other species studied [3, 5]. The absence of kaempferol-3,7-diglucoside is also noteworthy—since it was consistently present in other species examined [3]. It is interesting to note that all samples studied were identical, although they were from a variety of geographic sources.

EXPERIMENTAL

Plant material. *Equisetum ramosissimum* Desf. was collected from El-Baharia Oasis by Prof. Dr. L. Boulos. Other samples examined were herbarium specimens from the following localities: Shirshara Desert, Libya; Wadi El-Arbain, Sinai; Isla, Sinai; Wadi Gaza near El-Noushairat; Gebel Mara, the Sudan; 25 km west of Taiz, Yemen; Wadi Abha, Saudi Arabia. *E. ramosissimum* var. *subverticillatum* near Nervia river in Italy; *E. ramosissimum* var. *virgatum* on the

lake of Geneva, *E. ramosissimum* var. *pannonicum* on the lake of Geneva, Switzerland. All these varieties are considered as synonyms for the subspecies *ramosissimum* [6]. *E. ramosissimum* subspecies *debile* was a gift from Prof. Dr. R. L. Hauke collected in India.

Identification. Both glucosides gave kaempferol and glucose on acid hydrolysis. They co-chromatographed with authentic samples of kaempferol-3-sophoroside and kaempferol-3-sophoroside-7-glucoside [3, 4]. Their structures were further confirmed by UV spectrophotometry, H_2O_2 oxidation, enzymic hydrolysis and mild acid hydrolysis. No negatively charged flavonoids were detected on electrophoresis.

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