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PHOTOSENSITIZING THIOPHENES IN *POROPHYLLUM*, *TESSARIA* AND *TAGETES*

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The recently discovered photosensitizing capacity of polyacetylenes of higher plants may be extended to include certain of their thiophene derivatives such as α-terthienyl (α-T) and 5-(3-buten-1-ynyl)-2,2′-bithienyl (BBT) [1–3]. These sulfur derivatives, which are of widespread occurrence in certain genera of the Compositae [4], are lethal to bacteria, yeasts and other fungi [2], nematodes [5] and fish (McLeay, D. J. *et al.*, unpublished results) in near ultra-violet light. α-T can also evoke photodermatitis in human or guinea pig skin characterized by severe erythema and long lasting hyperpigmentation [6]. Histopathological examinations of acutely infected human skin reveal 'sun-burn' cells in the epidermis. Plants which contain these compounds, therefore, are of dermatological interest.

α-T and BBT are often localized in the roots of composites, e.g. *Tagetes*, although in some species, such as *Eclipta alba*, they occur in leaves and other aerial parts [4]. In our survey of composites for phototoxic activity, we noted that roots of species of *Porophyllum* and *Tessaria* are strongly phototoxic to the pathogenic yeast, *Candida albicans*. We have now investigated these (Table 1) and have found that they contain α-T and BBT. We have also included in our survey a few species of *Tagetes* not covered in Bohlmann's extensive chemical surveys of the Compositae. In the meanwhile Bohlmann has shown that BBT occurs in the roots of *Tessaria absinthioides* (H. et A.) DC. and *T. integrifolia* R. et P. [7].

Table 1. Phototoxic compounds in Compositae

Species	Presence/absence of α-Terthienyl	Presence/absence of 5-(3-Buten-1-ynyl)-2,2′-bithienyl
Tagetes filifolia Lagasca	+	+
T. coronopifolia Willd.	+	+
T. tenuifolia Cav.	+	+
T. lucida Cav.	−	+
T. minuta L.	+	−
T. lemmoni A. Gray	+	+
T. elliptica Sm.	+	+
Tessaria integrifolia R. et P.	+	+
Porophyllum lanceolatum DC.	+	+

EXPERIMENTAL

Roots were macerated and extracted with hot EtOH (×4–5) in a Waring blender. After filtration and concn of the filtrate, an equal vol. of H_2O was added and the aq. phase extracted with petrol (bp 60–80°). The petrol extract was reduced in vol. and analysed by PC, TLC and GC–MS. Pure samples of α-T and BBT, obtained from *Tagetes patula* [1], were available for comparison. The solvent system for PC was *n*-BuOH–HOAc–H_2O (4:1:5) and for TLC on alumina or silica, petrol or petrol–Et_2O (9:1) or petrol–Me_2CO (9:1). α-T and BBT were identified by their blue fluorescence in long wave UV, by UV spectra and GC–MS. Their phototoxicity towards *Candida albicans* was assayed as previously described [2].

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