BOTANICAL PESTICIDES FROM GARCINIA, GLYCOSMIS AND AGLAIA SPECIES

M. Rahmani, M.A. Sukari, A.M. Ali, H.B.M. Ismail, I.C. Wairt and S.M. Muhamed

Department of Chemistry, Faculty of Science and Environmental Studies
Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia

Keywords: natural products, bioactive compounds, antimicrobials, spectroscopic method, anticancer.

Introduction

Malaysia is endowed with potentially valuable natural resources and many species of higher plants have been used in various traditional medicinal practices. Usually, two or more plants mixed and given either as brews, decoctions or juice extracts. For external application they are given as paste, lotions or ointments. Despite their popularity, the active components and the effectiveness of the preparation still remain largely unknown. However, the efficacy of some of the constituents and crude extracts of the medicinal plants have been monitored by various bioassay techniques such as antifungal, antibacterial, anticancer, antioxidants etc. In this study, various plant species were investigated in detail for their chemical constituents (coumarins, xanthones, alkaloids, terpenes, flavonoids, sulphones etc) together with various biological activities (Rahmani, 1997).

Materials and Methods

Plant materials were collected from various parts of Malaysia and allowed to dry at room temperature. The samples were then extracted with solvents for isolation and bioassay works. Plants showing very strong biological activity were investigated in detail. The natural products from the extracts were then isolated by using extensive chromatographic methods until pure compounds were obtained. The chemical structures of the isolated pure compounds were determined by spectroscopic techniques (UV, IR, MS and NMR) and chemical derivatisations. More specific bioassays were also carried out on the pure components both *in vivo* and *in vitro*. For compounds showing excellent antifungal and antibacterial results, formulations were also attempted.

Results and Discussion

A large pool of plant species has been investigated for their biological activity and from this two species were chosen for more detailed research: *Glycosmis calcicola* (Rutaceae) and *Scorodocarpus borneensis* (Olacaceae). The former plant samples were collected from two separate locations, in Langkawi and Templer Park, while the later species was collected from Sungkai area in Perak. From *G. calcicola* collected in Langkawi, two alkaloids and a sulphur containing compound (a sulphone) were isolated and spectroscopically identified (Rahmani et al. 1998). This sulphur containing compound gave excellent cytotoxic activity against T-lyphoblastic leukemia (CEM-SS), chronic myelogeneous leukemia (KU812F), colon cancer and melonoma cells. The IC_{50} values against leukemia cells (CEM-SS) and KU812F) were obtained as 0.25 µg/ml and 1.3 µm/ml respectively, which is comparable to modern drug used to treat these diseases. At these concentrations it was found that the compound has no significant effect on the normal cells. Time course studies indicated that this sulphur compound killed cells directly by causing cell necrosis but did not inhibit cell proliferation of the unaffected cells. Plant sample collected from Templer Park do not give this sulphur compound but instead provided different alkaloids having some interesting biological activity.

Another sulphur-containing compound was obtained from the seed extracts of *Scorodocarpus borneensis* (Olacaceae), a fairly large tree with garlic-like smelling fruits (Abdullah et al. 1998). Locally the plant is used in traditional medicine for skin infections, intestinal worms, and headache treatment and also as spice since the seeds have garlic aroma. The crude extract of the fruits was found to be vary strongly active against a number of fungi and bacteria with optimum activity achieved on *Saccharomyces cereviseae* and *Candida lipolytica* with 32 mm and 24 mm inhibition zone respectively. The sulphur-containing compounds were isolated by bioassay-directed fractionation procedure and these pure substances were found to have antibacterial activity against antibiotic resistant bacteria (meticillin resistant *Staphylococcus aureus)* with 15.3 mm inhibition and MIC value of 75 µm/ml. The compound was also found to be active towards PN6 leukemia cells but with weak activity against chronic myelogeneous leukemia cells.

Conclusions

The crude extracts and chemical constituents of both *G. calcicola* and *S. borneensis* gave very interesting and excellent biological activity. Their strong activity might be useful to treat human, animal or plant mycoses. It could also find application as food preservative. The LD_{50} is relatively moderate and this encouraged us to pursue more pharmacological testing and the possibility of pharmaceutical application. These results illustrate the amazing potential of Malaysian plants as a new source of fine chemicals for the next century.

References

Abdullah, I.W., Rahmani, M., Manaf, A.M. and Sukari, M.A. 1998. *Scorodocarpus borneensis* seeds extract: a possible way to antifungal therapy, International Science Conference, UPM.

Rahmani, M. 1997. Chemical constituents and biological activities of natural products from Malaysian medicinal plants, *International Symposium of Advanced Technology in Organo and Biochemical Industries,* Osaka Municipal and Technical Research Institute, Osaka, Japan.

Rahmani, M., Chew, Y.L, Ismail, H.B.M., Sukari, M.A., Meon, S. and Aimi, N. 1998. 7-Methoxglycomaurin: a new carbazole alkaloid from *Glycosmis rupestris, Plant Medica.* 64: 780.

Supported by IRPA Grant 03-02-04-0006