International Organization for Chemical Sciences in Development

**Working Group on Plant Chemistry**

# CHEMISTRY, BIOLOGICAL AND PHARMACOLOGICAL PROPERTIES OF AFRICAN MEDICINAL PLANTS

Proceedings of the first International IOCD-Symposium
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African traditional healer and *Harpagophytum procumbens* (Pedaliaceae)


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# 17. Constituents of muthi plants of Southern Africa: magical and molluscicidal properties

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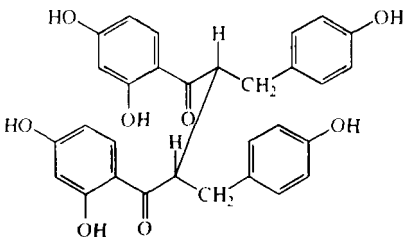
## Introduction

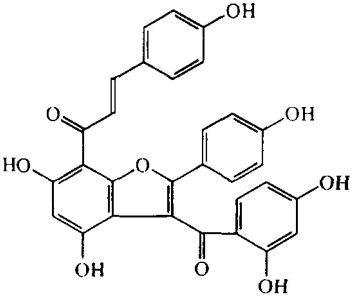
Southern Africa has a variety of muthi plants which are used for magical and other purposes. The focus in this contribution is on four such plants, namely, *Brackenridgea zanguebarica*, *Cassipourea gerrardii*, *Hypoxis hemerocallidea* (formerly *rooperi*) and *Ocotea bullata*. Finally there is a contribution on a muthi tree which has potential as a Third World molluscicide, *Apodytes dimidiata*.

## Results and discussion

The small tree *Brackenridgea zanguebarica* (Ochnaceae; see also chapter 16), which grows in the Northern Province of South Africa and Zambia, has a bright yellow bark. Various magical powers are ascribed to it by indigenous Venda people who call it "*mutavhatsindi*". It is supposed to protect from lightning strikes and also no adult may dig up the roots of the tree as this can lead to sterility. From the bark two new compounds (**1**, **2**) were isolated and fully characterized (Drewes and Hudson 1984, Drewes *et al.* 1987).




**(1)**

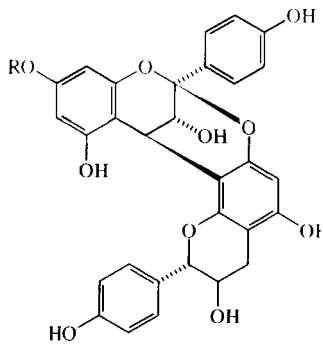



**(2)**

These are a dimeric dihydrochalcone (**1**) and a dimeric chalcone (**2**). Other compounds were present in lower concentration.

The tree known as onionwood, *Cassipourea gerrardii* (Macarisiae), is believed to have many magical properties but it is used as a skin lightener, particularly by the indigenous people of Kwazulu-Natal. The finely ground bark is mixed with sodium carbonate and milk and then applied as a face-pack by young maidens.

Since hydroquinone was used in commercial preparations of skin lighteners (now no longer on the market) and since *Cassipourea* was known to contain phenolic compounds, this investigation was undertaken. The related plant *C. gummiflua* ("*umqonga*") was also examined. Both plants contained novel dimeric A-type proanthocyanidins (Drewes *et al.* 1992, Drewes and Taylor 1994). The structures (**3** and **4**) are shown below.



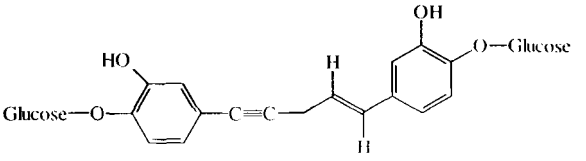

(**3**) R = H

(**4**) R = $CH_3$

The compound **4**, obtained from *C. Gummiflua* undergoes an interesting rearrangement, which involves a hydroquinone intermediate, when treated with $NaHCO_3$.

The commonly occurring bulbous plant (Kwazulu-Natal) *Hypoxis rooperi* (now *hemerocallidea*) has certain magical properties but is also used mainly for treating urinary ailments (Drewes and Liebenberg 1982, Marini-Bettolo *et al.* 1982, Drewes *et al.* 1984). Our initial investigation was prompted by the observations of a representative of a pharmaceutical company that it cured certain cancers. From the plant we obtained as major product, the new compound (**5**), named hypoxoside by Marini-Bettolo (Marini-Bettolo *et al.* 1982).

Hydrolysis of compound **5** with β-glucosidase leads to the aglycone which we named rooperol. In this form the compound certainly inhibits the growths of certain cancer cells. The tests carried out on rooperol form the basis of chapter 21.



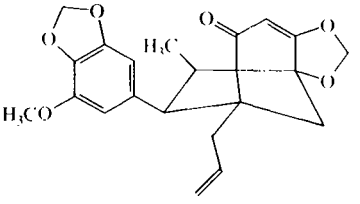

**(5)**

The black stinkwood (*Ocotea bullata*; Lauraceae) which occurs in the Eastern Cape Province and Kwazulu-Natal is one of the top-selling "muthi" plants. Reserves are now very low and the tree is specially protected by Government Ordinance. The bark is used by traditional healers to cure headaches, but its main use relates to its magical powers. It is a favorite love potion and it is alleged to promote a wide variety of magical effects. Our interest here was twofold:

i) to establish the structure of the main constituents in the bark

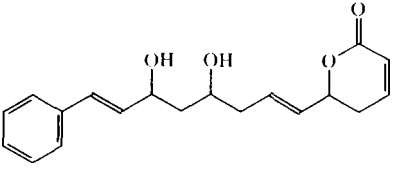
ii) to examine the chemical relationship between *Ocotea* bark and *Cryptocarya* bark (also belonging to the Lauraceae family). This was particularly important as the scarcity of *Ocotea* bark has led to the use (by traditional healers) of *Cryptocarya* bark as substitute.

The bark of *O. bullata* gave as major product the neolignan **6** which we have named ocobullenone (Sehlapelo *et al.* 1993).




**(6)**

From four *Cryptocarya* species we were able to isolate a variety of new α-pyrones, for example cryptofolione (**7**), but no ocobullenone. (Drewes *et al.* 1995).



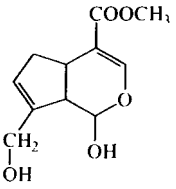

**(7)**

In one species of *Cryptocarya*, *C. liebertiana*, growing in the northern part of South Africa and in Zimbabwe, we were however, finally able to demonstrate that ocobullenone also occurred, thus supplying the "missing link".

*Molluscicides*

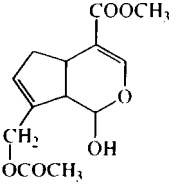
From *Apodytes dimidiata* (Icacinaceae) the iridoid genipin (**8**) and its 10-acetyl derivatives (**9**) were isolated (Drewes, S.E., Kayonga, L., Appleton, C.C., Clark, T., and Brackenbury, T., *Journal of Natural Products*, in press). These two compounds were shown to have molluscicidal properties as shown by tests on *Bulinus africanus* the intermediate host of *Schistosoma haematobium*.

Results are shown below:




Genipin (**8**)

$LD_{50}$ 25.27 ppm
$LD_{90}$ 32.57 ppm




Genipin acetate (**9**)

$LD_{50}$ 21.72 ppm
$LD_{90}$ 39.40 ppm

The use of this plant as a Third World molluscicide is being investigated.

## Acknowledgments

Thanks are due to the University Research Fund for financial assistance.

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