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Biological and chemical examination of Pittosporum phillyraeoides

Undertaken at the Institute of Pharmacy
Department of Pharmaceutical Biology
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The leaves of Pittosporum phillyraeoides DC var. microcarpa S. Moore or leaf extracts resp. are called "Gumby Gumby" by the Australian Aboriginals, and they are used for medical treatments. For some time now it is proclaimed on the Internet the plant has an effect on cancer and other diseases. But until now there are no scientific results to support this statement known. Biological testing of the leaves/extracts on a cellular level in vitro was not done until now. Some preliminary phytochemical investigations have been done only about 20 years ago. The diploma thesis were intended to contribute a scientific verification for the use of P. phillyraeoides and showed the following results:

Morphological examination of the leaves
The dried leaves are yellow green, long and narrow, and have a weak aromatic fragrance. They taste bitter and cause some itching of the throat. Microscopy of a cross-section of the leave shows a dorsiventral leaf structure with druses in the mesophyll.

Qualitative phytochemical analysis
During screening investigations secondary plant substances belonging to the following groups could be found:

- Saponins, probably belonging to the triterpen saponins
  The presence of saponins was confirmed by the froth test and by the blood agar test.
- Other terpenoid compounds, probably as components of essential oils or as bitter principles.
- Phenols, more detailed examination showed that they are tannins and flavonoids, but other phenols are also possible.
- The presence of cumarins seems to be possible.

With respect to the exact chemical structure of the compounds more investigations are necessary.

Quantitative phytochemical analysis
The leaf showed a small content of 1.34% tannins, calculated as pyrogallol. Also the flavonoid content, which was determined with two different methods, calculated as hyperosid, was fairly low with 0.54 and 0.54% respectively. On the other hand the content of carbohydrates was fairly high with 29.17%. Further on 4.53% protein and 6.24% lipids were found.

Antibacterial activities
None of the tested extracts showed a noteworthy inhibition of the tested bacteria Staphylococcus aureus, Bacillis subtilis, Escherichia coli, Micrococcus flavus, Pseudomonas aeroginosa or of the fungus Candida maltosa.

Free radical scavenging activities
Many of the extracts showed only moderate radical binding capacity, compared to ascorbic acid. The most active extract was the methanol 80% extract.

Cytotoxic activities
The extracts showed in the neutral red assay weak to moderate cytotoxicity against FL cells and lung cancer cells of the cell line A427. The polar ethanolic and water extracts showed a higher cytotoxicity than the lipophilic extracts. The extracts performed with cold ethanol, hot ethanol, Amylase treatment (1 day) and methanol showed the lowest IC50-values in the range between 60 to 83 ug/ml against FL cells. The following extracts showed the strongest suppression (IC50 values in the range of 83-119 µg/ml) of the growing A427 cells: hot water, methanol, methanol 80% and cold ethanol.

Effect of selected extracts on human blood leucocytes
The extracts effective against FL and the tumor cell line A427 (tea, cold ethanol and Amylase 1 day) were also tested on primary human leucocytes. Concentrations which were highly cytotoxic for FL and tumor cells, showed a stimulating effect on

the human blood cells (MTT test). Cytotoxic effects are only observed in far higher concentrations.

Immunmodulatory properties of selected extracts
The extracts with cancer cell cytotoxicity were also tested for their immunomodulatory properties. It could be shown that the extracts stimulate human blood cells to produce in vitro Tumor Necrosis Factor a up to cytotoxic concentrations.

Summary
The effects observed in the in vitro studies with various leaf extracts from phillyraeoides DC var. microcarpa S. Moore correspond to the clinical observations of the assumed therapeutical benefit of Gumby Gumby in cancer patients. At least in vitro a suppression of tumor cells was shown. Especially the Amylase treated (1day) extract, which imitates the process used by the Aboriginals for breaking down the leaves, as well as the tea, made according to Gumby Gumby Natural Therapeutic Products Ltd., were noticeable for their cytotoxic effect as well as their immune stimulating effects. Further investigations are necessary to identify the compounds which are responsible for the cancer cell cytoxicity and the immunomodulatory properties as well as to get more information about the mode of action of these natural compounds.

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