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DAVIS FUND EXPEDITION REPORT: PAPUA NEW GUINEA PHYTOCHEMICAL SURVEY

PAPUA NEW GUINEA PHYTOCHEMICAL SURVEY: The search for plants containing antibacterial agents in the rain forests of Papua New Guinea

Project Aim : To test with antibiotic assays, the plants identified in the two previous ethnobotanical surveys (1997, 1998).

Permits and Authorisation: A 6 month research/academic visa was obtained from the National Research Institute in Port Moresby.

Location and Timetable: The same locations were used as in previous surveys as well as the addition of the Hewa area in the highlands of mainland Papua New Guinea. Locations were chosen to sample a wide variety of forest types so as to give the greatest chance of finding active plants. The survey was carried out over five months nearly all of which was spent in the field.

19th April to 24th May. Bulumuri/Buludava villages. Coastal area of New Britain Island. The Williamez Peninsula, West New Britain Province, Talasea district.

Buludava and Bulumuri villages are set on opposite sides of the volcanic tip of a 50 km long peninsula. In the centre is Lake Dakatau, a crater lake 10 km in diameter. The forest is coastal monsoon mainly between 0 to 200m elevation. Access is via dugout canoe with outboard engine 50 to 90 km along the peninsula depending on which side it is approached.

The "tribal" group is Bulu, which also designates the language name. The Bulu dialect is Malayo-Polynesian in origin and exhibits some similarities to other languages of the Bismark Archipelago. The Bulu number roughly 600 in total, (Bulu 566, 1982 SIL) and are scattered between 5 large settlements and other smaller "breakaway" camps all set just back from the beach. The Bulu people were converted to Christianity in the 1930's by catechists operating from nearby catholic missions. Despite intense missionary activity traditional beliefs still persist such as the mythical crocodile *Migo* that is said to live in lake Dakatau. Their diet includes fish such as Tuna, Baracuda and other coral reef species as well as pigs, turtle, coconuts, sweet potato, cassava, "Taro" (*Colocassia esculenta*) and local spinach varieties. Copra is sold to develop an income. Much Bulu *Kastom* has been eroded through intermarriage with the neighbouring Kombe people, but they are still marked out by their impressively large out-rigger canoes. One active plant (*Terminalia catappa*) was found.

1st June to 12th July. Umbi village. Mountainous interior of New Britain Island. The Whiteman Range, West New Britain Province, Kandrian District.

Umbi village is the most inland village of the Whiteman Range, a very high rainfall area with extremely rugged terrain broken by limestone karst formations and numerous sinkholes. The forest is lowland to lower montain at 200 to 1900m

elevation. Access is via Cessna 205 one engine aircraft to a 400m jungle airstrip (arranged through New Tribes Mission Aviation) followed by one days walk along bush tracks.

The people speak the Kaulong dialect and would describe themselves as Kaulong though feel more part of the Palang Asengseng group who number 3000 (1991 SIL). The main bulk of the Kaulong group live on the coast so these inland Kaulong may be considered somewhat a breakaway group. First contact with this group probably occurred with Australian census patrols in the 1950's as the previous German administration had little reason to venture inland away from their lucrative copra plantations on the coast. Diet in this area includes sweet potato, cassava, Taro, local spinach varieties, pigs and jungle game such as flying fox, cockatoo, eels, grubs and the giant tree insect *Eurycantha horida*. The Palan Asengseng are marked out by their painted shields, their colourful 18ft blow guns with large feathered darts (they are the only Melanesians to use blow guns), their elongated heads and the now extinct practice of widow strangling. Head elongation is achieved by binding children's heads when they are still malleable and is still carried out in the neighbouring villages. Widow strangling died out in the 1950's and was carried out by members of the same family after the death of the husband, the women were hung between tree branches. Five active plants were found at this location.

28th June to 30th June. Ishmin village. Inland North Coast, Kulu Dagi area. West New Britain Province. Talasea District.

Ishmin village is set in lowland forest (30 to 300 m elevation) with large oil palm plantations to the south. Access was by 4-wheel drive vehicle up logging tracks as part of a census patrol to identify a small nomadic clan living further inland, (I had taken a GPS fix on a remote clearing seen whilst flying back from the south coast).

The people from Ishmin village describe themselves as Sokhok, a language spoken inland from the south coast. They fled from the Second World War when Japanese troops advanced and after living a nomadic lifestyle in the Whiteman Range were settled in the 1970's by an Australian administrator. Whilst our patrol was not able to follow trails inland it would seem that at least one family is still isolated further inland. One active plant was found at this location.

17th August to the 17th Sept. Wanakepa village. Central Range of Mainland Papua New Guinea. Southern Highlands Province. Lagaip district.

Wanakepa village is set next to the Lutheran Missions' airstrip that serves the Hewa region, a large area set in several valleys in mainland Papua New Guinea's Central Range. The terrain is mountainous and mostly forest covered (Lower to Upper Montain forests between 500 and 3000m elevation) although there are some grassland areas too. Access is achieved from Tari station 80km to the south east using the Missionary Aviation Fellowship's twin engine Islander aircraft. The Hewa number over 2000 (2147 1986 SIL), and their language is Austronesian in origin. First patrols into the area were carried out by the Australian administration in the 1970's and the Lutheran Mission was established by the 1980's. The Hewa are distinguished by their large multi-roomed houses and colourful ceremonial dances in which the dancers faces are covered, and their heads adorned with bird of paradise plumes. Marriage for

girls traditionally occurs at an unusually young age where they are in effect marked for marriage but still living at home.

Results: In all, over 150 different plant species were tested in bacteriacidal assays using both gram negative and positive bacteria. 8 plants tested positive in that they produced a zone of inhibition for one of the two bacterial species.

Species	Local Name (Language)	Part of Plant	Traditional Use	G + Active	G- Active
Terminalia catappa	Tarilay (Bulu)	Leaves	Tea made with leaves and taken for sore throats.	Yes	Yes
Omalanthus pupulneus	Mikyu (Kaulong)	Leaves	White latex from leaves applied to tropical ulcers.	Yes	Yes
Omocarpum orientale	Kayaya (Kaulong)	Bark	Moist inner surface of bark applied to tropical ulcers.	Yes	No
Garcinia dulcis	Kap (Kaulong)	Bark	Sap from bark applied to tropical ulcers.	Yes	No
Alpinia sp.	Kikhoti (Kaulong)	Rhizoid	Sap from rhizome applied to tropical ulcers.	Yes	No
Still identifying	Aviyai (Kaulong)	Bark	Moist bark shavings applied to tropical ulcers.	Yes	No
Still identifying	Nelang (Sokhok)	Bark	Moist bark shavings applied to tropical ulcers.	Yes	No
Still identifying	Layeesie (Hewa)	Leaves	Sap from leaves applied to tropical ulcers.	No	Yes

Evaluation and Further Work: For each of the above species the traditional use is confirmed by the antibacterial effect detected by the assays. The traditional use of the plants is to treat bacterial infections caused by pathogens such as *Staphalococcus aureus* and *Mycobacterium ulcerans* (tropical ulcers) and Staphalococal bacteria (throat infections). An export licence was obtained from the PNG Department of Forestry to allow removal of plant material. In each case, dried material from the relevant part of each plant was collected. Work is now starting to isolate the active compounds from these plants and evaluate their safety. Extracts from each plant will be tested against a library of antibiotic -resistant bacteria from around the world. It is hoped this approach may lead to the discovery of novel antibacterial agents effective against drug resistant pathogens.

PHOTOGRAPHS

Top left vertical: Sunset at Buludava the Williamez Peninsula, West New Britain Province.

Top right vertical: Two Umbi boys temporarily abandoned on bush trail, startled by our approach on return from plant collecting in the forest. The Whiteman Range , West New Britain Province.

Bottom left vertical: Hornbill. Ishmin village, West New Britain Province.

Bottom right vertical: The bridge over the Wanakepa River. The Hewa, Southern Highlands Province.

Top left horizontal: Sunset at Lokum settlement. The Hewa, Southern Highlands Province.

Top right horizontal: Hewa house at Lokum settlement. The Hewa, Southern Highlands Province.

Bottom left horizontal: Fashionably dressed but well armed, Hewa men and boys at Wanakepa Mission. The Hewa, Southern Highlands Province.

Bottom right horizontal: Grasslands at the Strickland Gorge. The Hewa, Southern Highlands Province.