

A Survey of Medicinal Plants of Curaçao^{1,2}

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Autopsy records (1936-66) show esophageal cancer to be the most common tumor for both men and women among the locally-born negroid population of Curaçao. Crude incidence rate of 20.9 per 100,000, virtually constant over 30 years, is exceeded only by that of certain parts of Russia and the Transkei region of South Africa. The island of Aruba (42 miles distant) has a very low incidence. Drought conditions and food and water supply are virtually identical in both islands, also reverse smoking by women only. But there are striking contrasts in the use of plants for remedies. In Curaçao, more than 100 species of local plants are employed for self-medication and for "tea." Interrogation of living esophageal cancer victims and survivors of deceased has revealed consistent use of these plants. Species cited most frequently in interviews are being collected, lyophilized, and supplied to the Laboratory of Pathology, National Cancer Institute, for animal-testing.

There are several widely scattered parts of the world where the incidence of cancer of the esophagus is high—Chile, Scotland, Finland, parts of France, Russia, China and Japan, South Africa, and some islands of the West Indies. Usually it occurs mostly in men. Since World War II there has been a five-fold increase in esophageal cancer among the Bantu people in the Transkei region of South Africa, and in some areas of the Transkei it occurs as frequently in women as in men. Various theories as to the cause have been advanced: using zinc containers, drinking hot tea, consumption of alcohol, smoking, eating corn infected with fungi, or the possibility that severe droughts have left the soil deficient in molybdenum and the food crops may have a high content of nitrosamines (7, 8, 14). The most logical theory seemed to be the one put forward by the late Dr. Rex Burrell who worked among these people for ten years. He found that the men went off to work in industries and when they came home they ate the meat or whatever good food there might be. The women stayed home and ate mostly plants they raised in their gardens and supplemented this diet with wild plants. They also used

plants for self-medication. He suggested that the habitual intake of certain plants might produce a chronic irritation of the esophagus that could result in cancer (7, 8). He compiled a list of their food and medicinal plants and sent it to the National Cancer Institute in Bethesda. They asked me (in early 1962) to evaluate the plants and indicate those that were worthy of further investigation. On completion of this evaluation, I was asked to make a cross-check of the useful plants of the Transkei region and the flora of the Netherlands Antilles, and this comparison showed there are many species which occur in both areas. It was pointed out that esophageal cancer was common in Curaçao. Curaçao is much closer than the Transkei region for study and it might be possible to discover a cause for this disease in a small island with a limited and relatively static native population.

Autopsy records (1936-1966) show esophageal cancer to be the most common malignant tumor for both men and women among the locally-born negroid population of Curaçao. Crude incidence rate of 20.9 per 100,000, virtually constant over 30 years, is exceeded only by that of certain parts of Russia (40-60 per 100,000) and the Transkei region of South Africa (over 100 per 100,000) (9, 10).

Dr. Philip H. Hartz, who served as government pathologist in Curaçao from 1935 to 1951, and who reported his findings on esophageal cancer in 1958, believed that the high frequency must be due to an environmental factor. He discredited the racial theory, inasmuch as the rate of occurrence was

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Fig. 1. Mampuritu (*Porophyllum macrocephalum* DC.), an upright, slender-stemmed weed, native to Curaçao and Bonaire, is highly valued as a source of "tea" for beverage or healing purposes (All photographs by Julia Morton).

ten times that found among the negro population of Tennessee. He stated that, if lack of vitamins were a major cause, the disease would be less common in Curaçao than in other Caribbean areas with poorer diets; also that consumption of alcohol and tobacco was higher in neighboring areas. He posed unanswered the question of air pollution by the large oil refinery. His immediate successor, Dr. L. H. v. d. Hoeven, furnished him with data from autopsies performed from 1951 to 1954 (13).

Thereafter, the study of esophageal cancer was continued by Dr. Rolf Eibergen, who has found the pattern unchanged to the present time. In his book, *Kanker op Curacao* (1961), he stated: "It is postulated that the principal cause of the exceedingly frequent occurrence of cancer of the esophagus among the poorer negroid population of Curaçao, male as well as female, should be traced to the habit prevailing in the island of consuming the national food—called *funchi*—at an extremely high temperature. Alcoholic excess and a deficient diet are highly likely to be additionally responsible for this situation." (9).

In November of 1964, I conducted prelim-

inary interviews in Curaçao, and I have made four field investigations since, under a National Institutes of Health grant and with the full cooperation of Dr. W. Oostendorp, Inspector of Public Health for the Netherlands Antilles, Dr. Eibergen and the physicians comprising the local Working Group on Esophageal Carcinoma. They do not accept the oil refinery fumes as a factor in esophageal cancer, since the prevailing winds carry the fumes nearly always in a westerly direction and the mapping of the 200 cases given radiology in the 10 years 1954-1964 shows a distribution throughout the island, the greatest density coinciding merely with the area of most concentrated habitation. I have explored the hot *funchi* theory and found it weak. *Funchi*, formerly made mainly of locally grown sorghum meal, is now usually prepared from imported finely ground cornmeal, boiled vigorously, stirred with the *palu funchi* (roughly carved from wood of *Cordia alba*), scooped out of the pot onto a cold plate, flattened by another cold plate pressed on top and removed, smoothed around the circumference with the *palu funchi*, and pressed again with the sec-

ond plate. By the time the funchi reaches the table, it is not excessively hot. The people simply do not eat it cold, because it becomes heavy as it cools. Any unused portion is heated in the oven for serving at another meal.

Several teams of investigators have probed into the reverse or inverted smoking of cigarettes and small cigars (*huma cu candela pa den*), a custom not limited to Curaçao but practiced in the other Dutch islands, in Venezuela, Colombia, Panama, Jamaica, in India, Sardinia and elsewhere. Some have associated this practice with cancer of the palate (15). It apparently is not an important factor in the incidence of esophageal cancer in Curaçao for, in this island, it is indulged in solely by women.

There are those who contend that native Curacaons invite esophageal carcinoma by drinking their coffee while it is very hot. However, Dr. Eibergen asserts that if this were a contributing factor it would more likely affect the orifice of the esophagus, whereas the majority of the tumors occur near the bifurcation of the trachea (the middle region) and the rest at the lower end.

Food plants with possible high load of nitrosamines were not chosen for initial study in my investigation, because the island is burdened with perennial drought and agriculture has diminished to a minor status. Some vegetables are raised by Portuguese or Chinese truck gardeners, but most fresh produce is brought from Venezuela or the Dominican Republic by sailboat and sold in the picturesque "floating market." The ingestion of plant material arising from local soils reaches significant proportions only in the widespread and active use of native and exotic plants as home remedies. Folk-medicine plants were, therefore, selected as prime subjects for study. They had received no prior recognition nor attention as potential factors in esophageal cancer in Curaçao. The currency and extent of their use was virtually unknown to the Working Group on Esophageal Cancer who, almost unanimously, declared that they knew "bush teas were used in the English islands but not in the Dutch islands!"

Early steps in my exploration revealed that leaves, roots and entire herbaceous plants are not only gathered from the wild

or from dooryards when needed but are also regularly brought to the native market in Willemstad, fresh or partially dried, for sale. Also, an elderly priest, Father Paul Brenneker, whom I visited with Dr. Eibergen, presented each of us with a little book entitled *Jerba: Kruiden van Curacao en hun Gebruik* (Herbs of Curaçao and their Use), known only to a few local people. This book contains 500 Papiamento plant names, each followed by a few lines in Dutch relating medicinal uses as gleaned by Father Brenneker from questioning the natives (6). He gave us each an additional printed sheet, "Non Publicanda," appending 10 plants used to achieve abortion.

Father Brenneker's acquaintance with the plants themselves is limited. It was necessary for me to work with the old and current floras of the Netherlands Antilles (mostly in Dutch) to establish the botanical identities corresponding to the colloquial names. It became apparent that certain plants were dealt with under several different names, and the 500 entries can be associated with approximately 104 species in current use.

Having paired off most of the Papiamento names with their plant identities, I was able to communicate with the herb vendors and local users, acquire specimens for pressing and maintaining as vouchers in the herbarium of the University of Miami, photograph the marketed material and the corresponding living plants in the wild or in gardens, and add to father Brenneker's data further uses gathered through personal contacts with the native people.

In order to discover any possible association between esophageal cancer and plant remedies and also to determine prime suspects among the large number of plants involved, I proceeded to interview hospitalized victims of the disease and also to interrogate survivors of victims in their hard-to-find homes scattered the length of the island. Thirty-five interviews have yielded ample evidence of a consistent internal use of plant decoctions and infusions (as well as various external applications), not only for healing purposes but some as daily beverages, as tonics or to "protect the kidneys" after over-indulgence in alcohol. In addition, it has become obvious that certain plant brews have been traditionally and still are routine-



Fig. 2. Welensali (*Croton flavens* L.), with grayish, downy leaves, is one of the most abundant wild shrubs of Curaçao, Aruba and Bonaire. Leaf decoction is frequently given to children and adults. Leaves are also used for cleaning dishes, especially to remove the odor of fish.



Fig. 3. Typical street sign in village of Montanja, Curaçao. This and others bearing names such as Welensaliweg and Lamoengrasweg, attest the popularity of these plants in local folk-medicine.



Fig. 4. A decoction of the leaves of basora pretu (*Cordia cylindrostachya* R. & Sch.) is taken as a morning beverage or for various ailments in Curaçao, but used mainly as an abortifacient in Aruba.

ly administered to infants even when they are not ill, and often just to induce sound sleep. Adult victims or their survivors are unable personally to attest ingestion of such potions in infancy, but it is reasonable to assume that they were given them by their mothers. These doses are of major interest, inasmuch as many investigators believe that cancer of the esophagus may be of early origin and prolonged development.

The people of Curaçao have an abnormal fear of catching cold; they do not like to go out in the rain; and take many plant remedies for sore throat, coughs, and real or fancied ailments of the chest. Other common reasons for taking remedies are to relieve stomach ache, kidney pain, high blood pressure and diabetes. One of the most striking facts which have appeared in my appraisal of the plant life and usages of the island is that the most popular herbs gathered for medication or "tea" are highly aromatic weeds which the roaming goats avoid. Thus, there is little competition between the goats and the people for the scant vegetation.

In the accompanying table appear 22 of the plants most consistently used in folk medicine in Curaçao.

Dr. Roger W. O'Gara of the Laboratory of Pathology, National Cancer Institute, has been giving lyophilized material of 13 of these plants and the *kalbas* sirup, orally or by injection, to rats and mice for a little more than a year. None of the plant extracts have as yet shown carcinogenic properties in the rodent. Other series of plant materials will soon be subjected to similar animal-testing.

There are, too, various untrod avenues waiting exploration, such as the popular consumption of hot peppers (*promente*) as selenium has been found in sesame grown in Venezuela; also soil analyses, and the sesame oil which may be suspect, inasmuch seed (*sjodjoli*) and the culinary use of (*Cucumis anguria*); the eating of sesame contamination of vegetation by the outfall from phosphate mining and refinery operations. During plant collecting, my hands



Fig. 5. Kleistubom (*Passiflora foetida* var. *Moritziana* Killip), a wild vine common on fences and bushes. The leaf decoction is often imbibed by children and adults. An extract is an effective application on prickly heat.

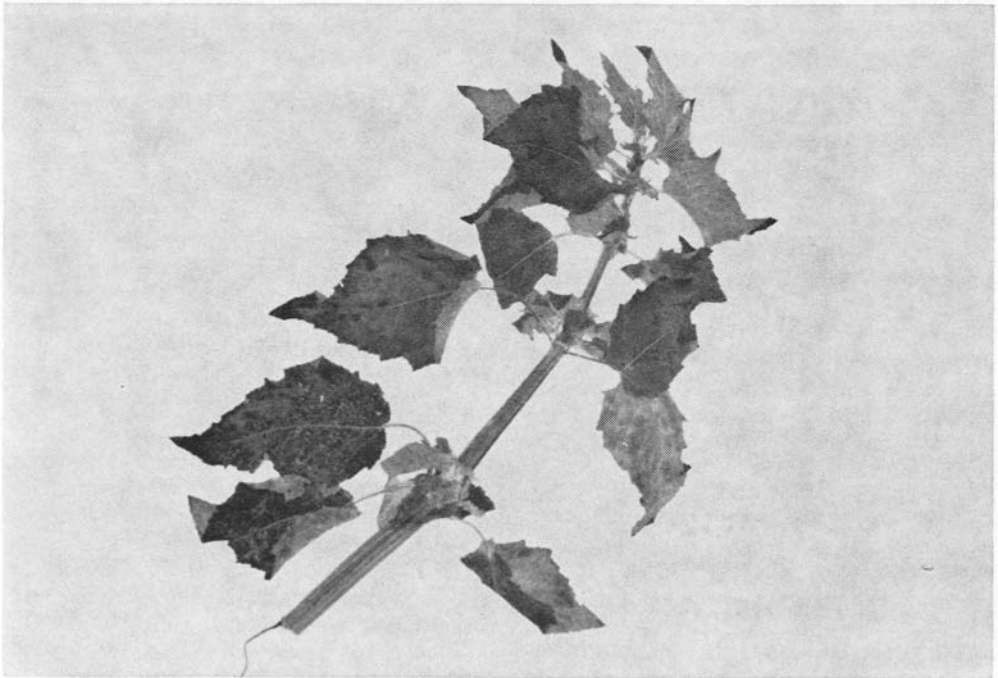


Fig. 6. Sangura (*Hyptis suaveolens* Poit.), a square-stemmed, velvety-leaved weed, is commonly brewed to promote appetite, relieve indigestion.

TABLE I
22 MOST COMMONLY USED FOLK MEDICINE PLANTS OF CURACAO

<i>Plant</i>	<i>Curacao Use</i>	<i>Remarks*</i>
<i>A. Traditionally Administered to Infants and Older Children</i>		
CAJUDA (<i>Annona glabra</i> L.) Annonaceae	Very popular remedy. Every infant is given decoction of 1 leaf a day. For infant diarrhea, 3 leaves are heated in water, not boiled and the liquid administered. Leaf decoction given to children for stomachache. One esophageal cancer patient said he drank the leaf decoction as tea anytime. Leaf extract used for bathing children; said to be good for the skin.	Leaves considered pectoral, anthelmintic and antirheumatic in Cuba; but Correea (Brazil) is cited as stating they are narcotic, poisonous and at least fatal to fish. Trees dying in several Curaçao locales because of drought.
FLAIRA (<i>Jatropha gossypifolia</i> L.); green-leaved. Euphorbiaceae	For infant diarrhea, one (3-lobed) leaf heated in water, not boiled, and the infusion administered. Decoction of young leaves given for stomachache. Leaf decoction drunk as a laxative, also gargled for throat inflammation, and used by men for washing venereal sores. Flowering tips with 7 raw coffee beans, boiled, and the water drunk 9 days for asthma. Decoction of fresh or dried leaves taken every day for diabetes; also for gall bladder trouble. Root decoction taken for sore throat and for diabetes, Root used with leaves of KALBAS (<i>Crescentia cujele</i>) and WELENSALI (<i>Croton flavens</i>) for colds. Root boiled to a thick sirup which, with salad oil, is taken for stomachache, also for bloody stool. Leaf decoction used for bathing wounds; afterwards rub burned leaves to a powder and sprinkle on wound. Let sap from broken stem drip into a scratch or any wound. Clean-scraped stem used as rectal suppository for baby when bowels have not moved. Leaves burned in house as disinfectant.	Common wild shrub all over Curaçao. Goats do not eat it. Sap is poisonous. Seeds are used as drastic purge in other tropical areas, but dangerous. The root contains very toxic alkaloid, jatrophine.
TANCHI (<i>Capraria biflora</i> L.) Scrophulariaceae	Leaf decoction taken for colds; also for stomachache for 3 days in succession. Leaf decoction with decoction of COCOLODE (<i>Heliotropium angiospermum</i>) given to every negro baby when "changing skin." Some say when 1 week old, others 3 weeks, a baby's skin peels, even on head like dandruff. Must keep skin oiled and give tea of TANCHI (or TANCHI and COCOLODE).	Antibiotic principle, biflorine, isolated in Brazil. In Cuba, Mexico, etc., leaves are dried in shade and prepared as infusion taken daily for indigestion, diarrhea, etc., but strong decoction given as remedy for diabetes, gonorrhoea, etc., and used as vaginal douche. Considered powerful, in large doses producing general debility, paralysis, and loss of memory.

TABLE I--(Continued)

<i>Plant</i>	<i>Curacao Use</i>	<i>Remarks*</i>
COCOLODE (<i>Heliotropium angiospermum</i> Murr.) Boraginaceae	Leaf decoction always given to baby when "changing" skin (see above). Leaf decoction with decoction of TANCHI (see above) taken for jaundice.	Dried herb sold in native market. <i>Heliotropium</i> species are popular herbs in Cuban folk medicine also. However, a number of alkaloids are reported for members of this genus (cf. USDA Tech. Bul. 1234).
ANGLO (<i>Tribulus cistoides</i> L.) Zygophyllaceae	Root decoction given to children when teeth hurt, without fever.	In Mexico, plant considered tonic, stimulant, aperient and antirheumatic. In Cuba, root is declared to be an active diuretic.
B. Commonly Administered to Children; also Taken by Adults		
MAMPURITU (<i>Porophyllum macrocephalum</i> DC.) Compositae	Much used herb. Primarily for children; first thing given to them when ill. Leaf decoction for stomach complaints; gas, bloating, pain. A weak leaf decoction drunk for nausea during menstruation. Weak leaf decoction drunk as tea; improves appetite. Often taken morning and night as a pleasant beverage by children and adults.	Various local people affirm this to be the most popular of all the bush teas of Curaçao. Partly dried plant sold on native market. People conserve their supply; do not pull up the weed but break it off so that it will continue to grow. Plant has strong, peculiar odor. Is little known outside Curaçao. In Venezuela, <i>P. ruderale</i> , equally odoriferous, is said to impart unpleasant odor to flesh and milk of cows that graze on it. It is employed as snakebite remedy and as an antispasmodic and sudorific.
BASORA PRETU (<i>Cordia cylindrostachya</i> R. & Sch.) Boraginaceae	Leaf decoction drunk as tea. Considered good for children. Every child given a mixture of BASORA PRETU and WELENSALI (<i>Croton flavens</i>) decoctions at birth. This combination also taken for diarrhea. Leaf decoction together with that of KATUNA (<i>Gossypium hirsutum</i>) and CANGREUW (<i>Elytraria imbricata</i>) drunk for stomachache. Leaf decoction together with that of KARAWARA (<i>Cordia alba</i>) and WELENSALI (<i>Croton flavens</i>) drunk for 9 days after confinement; also new mother sits over hot decoction. Leaf decoction taken for menstrual cramps. Some say to put 3 or 4 leaves in a cup, pour in boiling water, add a little salt, drink and "you feel the flow go down." For diarrhea, the leaves are boiled.	One of the most commonly used "bush teas." The plant is common all over the island. Is not eaten by goats. The dried herb is sold on the native market. Apparently not similarly used elsewhere. In El Salvador the plant has been employed to coagulate rubber and indigo.

* Based on personal observation and data in subject files of Morton Collectanea.

TABLE I—(Continued)

Plant	Curacao Use	Remarks*
SANGURA (<i>Hyptis suaveolens</i> Poit.) Labiatae	Leaf decoction often drunk as tea, but must be weak; if allowed to boil too long becomes bitter. Some prefer in combination with MAMPURITU (<i>Porophyllum macrocephalum</i>). Improves appetite; halts nausea. Given to children as morning beverage. Leaf decoction is taken for stomachache or indigestion. Leaves are cooked, put in sack, given to baby to suck, puts him to sleep.	One of the commonest bush teas of Curaçao. Plant is highly aromatic. Principal constituent of its volatile oil is menthol. Infusions commonly taken as stimulant, carminative, depurative, etc., in tropical folk medicine. However, the plant is suspected of poisoning cattle and causing illness in horses in Queensland. Has reputation of repelling mosquitoes.
KLEISTUBOM; CORONA DE BIRGE (<i>Passiflora foetida</i> var. <i>Moritziana</i> Killip) Passifloraceae	Leaf decoction often given to children as morning beverage. Men, women and children take leaf decoction for inflammation—kidney, bladder, stomach—before seeing doctor. If this plant doesn't help, they use CADIA DEL PERRO (<i>Krameria ixina</i>). Men and women take leaf "tea" after imbibing too much liquor. Leaf decoction taken to stop vomiting. Leaf extract, after standing in sun for one day, used to cure prickly heat. Root decoction drunk to alleviate "internal heat."	Dried herb sold in market. Vine abundant on fences and draped over bushes. Has strong odor. Goats do not eat. Leaves used as emmenagogue in Cuba. Immature leaves contain cyanogenetic glycoside. Leaves contain also unknown alkaloid (USDA Tech. Bul. 1234).
KALBAS; KALBAS DI MONDI (<i>Crescentia cujete</i> L.) Bignoniaceae	Standard remedy for colds; given to children and taken by adults. Prepared in various ways: 1) Cut fruit open, remove flesh in center, put in milk and boil over small flame and drink from fruit. 2) Bruise fruit a little, hold in fire, let cool, press out juice, add sugar, cinnamon, nutmeg and aniseed and cook to sirup. 3) Take flesh out, mix with milk and nutmeg, replace and boil in shell. 4) Add liquorice drops and seasonings to fruit juice and boil to sirup. 5) Boil flesh with mucilaginous pulp of aloe (<i>Aloe barbadensis</i>), brown sugar and cinnamon. 6) Use seeds only, pound them fine, mix with sugar and a little water and boil. The sirup resulting from method 5 or 6, called STROP DI KALBAS, may be taken 3 or 4 times a day at any sign of catching cold. Also taken to relieve asthma. The pulp is also applied externally to sores; also as a protection against, and as remedy for, dermatitis from caustic sap of MANCHINEEL (<i>Hippomane mancinella</i>). Cut open	Tree scattered all over island. Fruits sold by the wayside. Syrup sold on native market. In Cuba, also, it is a common remedy for chest afflictions; the pulp is considered laxative, emetic, astringent and used to heal wounds. Burkill (Malaya) says the flesh poisons birds and small mammals.

TABLE I—(Continued)

Plant	Curacao Use	Remarks*
	fruit rubbed on dogs to cure mange. Decoction of leaves together with those of RATON (<i>Gliricidia sepium</i>) drunk for coughs. Leaf decoction with beaten egg, taken to loosen phlegm. Decoction of 3 leaves together with 1 leaf of WELENSALI (<i>Croton flavens</i>) and piece of root of FLAIRA (<i>Jatropha gossypifolia</i>) drunk to relieve colds. Seeds roasted with sugar and eaten to heal chest ailments. Local physician says pulp of green fruit and leaves of WAJACA (<i>Guaiacum officinale</i>) taken for diabetes by some of his patients; urine becomes normal. He says the pulp heals coral cuts when remedies prescribed by physicians have failed.	
DAL PEGA (<i>Mentzelia aspera</i>) Loasaceae	Leaf decoction may be given to children as morning beverage. Is given to young people to improve complexion; clear up pimples. Young airline cargo clerks say it is successful if taken for 9 days and then followed by a laxative. To relieve liver and gall bladder ailments, people prefer to take leaf decoction combined with decoction of SANGURA (<i>Hyptis suaveolens</i>). This combination taken for biliousness.	Bundles of fresh plant sold in native market. The plant is exceedingly rough, covered with irritating hairs. Plants of this family reported to have acrid juice.
SORSACA (<i>Annona muricata</i> L.) Annonaceae	Leaves are dried in sun, not oven. The tea tastes good. Often given to children to make them sleep well, or as morning beverage. Leaf decoction drunk for gall bladder trouble; also for easy delivery. Decoction of leaves together with those of LARAHA (<i>Citrus aurantium</i>) taken every morning to relieve nervousness. Leaves put in pillowslip or strewn in bed to aid sleep.	Leaves contain HCN. For other properties see: Callan, T. and F. Tutin, Chemical Examination of the leaves of <i>Annona muricata</i> . Wellcome Chem. Res. Lab. Paper 135 (1911). 1-8. Repr. Pharm. Jour. 12/2/11.
	<i>C. Commonly Taken by Adults.</i>	
CADIA DEL PERRO (<i>Krameria ixina</i> L.) Krameriaceae	Plant is washed and boiled and purplish-red juice results. Or stems are merely broken and soaked in water. Weak decoction or extract of leaves taken for kidney pain or kidney stone, 9 days in succession, and then a purgative is taken. Women take plant decoction to induce menstruation; very strong and very astringent for abortion. Men	Partly dried plant common in market. Wild plant plentiful in certain coastal areas; when scarce in extreme drought, is obtained from northern Venezuela, where it is also a popular herb. The strong decoction is said to be so astringent "it nearly twists the tongue." <i>Krameria tri-</i>

TABLE I—(Continued)

Plant	Curacao Use	Remarks*
	and women take infusion after imbibing too much liquor; some take every morning. Decoction may be taken several times each day for "liver trouble." Strong root decoction is taken to achieve abortion.	<i>andra</i> is in international drug trade as an astringent. It contains the alkaloid ratanine (USDA Tech. Bul. 1234).
LAMOENGRAS (<i>Cymbopogon citratus</i> Stapf.) Gramineae	Very popular leaf decoction taken as a pleasant tea, hot or cold. One cup is drunk out-of-doors before going away from home at night to protect from cold. Decoction taken for colds and fever.	Fresh grass abundant in native market. Commonly cultivated in small gardens. Contains 70-80% citral; also methyl heptenone and myrcene; traces of HCN.
OREGANO (<i>Lippia alba</i> N.E. Br.) Verbenaceae	Plant decoction commonly drunk as a pleasant tea. Taken as a digestive after overeating; also as a remedy for stomachache and colds. People place a couple of leaves under roasting meat to give it flavor.	A favorite herb of Curaçao. The people take delight in its fragrance and flavor. The fresh plant is plentiful on the native market. This is not one of the plants furnishing the condiment "oregano" of commerce, though Mexican oregano is usually <i>Lippia graveolens</i> . The European seasoning is generally a species of <i>Origanum</i> .
LARAHA (<i>Citrus aurantium</i> L.) Rutaceae	Leaf decoction commonly taken as a tea when "feeling out of sorts." Also taken for high blood pressure and for gall bladder trouble. For latter purpose, people use 2 leaves with 2 leaves of SORSACA (<i>Annona muricata</i>) per cup, boil, and keep the decoction in refrigerator for frequent drinking. Same decoction is taken every morning "for nervousness"; and some take it every night to induce sound sleep. Leaf decoction is used to wash the head to calm nerves.	A very popular remedy. Leafy branch tips regularly sold on native market, fresh or partly dried. Elsewhere in West Indies, leaf decoction is taken for stomach, liver and chest ailments and as an emmenagogue. The leaves contain the alkaloid 1-stachydrine (C ₁₇ H ₁₃ O ₂ N.H ₂ O) (Manske & Holmes).
WLENSALI (<i>Croton flavens</i> L.) Euphorbiaceae	Leaf decoction given to every child at birth. May be frequently given to children as morning beverage. Often taken by adults "to liven up; when not feeling up to par." Sometimes taken as a remedy for rheumatism or fever. For menstrual pain, women make a cup of tea with 4 or 5 leaves that have turned partly yellow (too sour when green) and they add a little sugar. To stimulate menstruation leaves are used together with IA (<i>Malvastrum spicatum</i>). For diarrhea, leaves are combined with BASORA PRETU (<i>Cordia cylindrostachya</i>). For colds, leaves are combined with KALBAS (<i>Crescentia</i>	Plant is highly aromatic. Goats do not eat it. It is one of the commonest shrubs over most of the island. Leaves formerly much used for washing dishes. Cozignsen (Utretch) reported histamine and choline in leaves; antipyretic action of infusion; spasmogenic action on isolated small intestine; and volatile oil repellent to house fly

TABLE I—(Continued)

Plant	Curacao Use	Remarks*
WATAPANA SHIMARON (<i>Acacia villosa</i> Willd.) Leguminosae	<i>cujete</i>) and FLAIRA (<i>Jatropha gossypifolia</i>). WELENSALI leaves are held in mouth to relieve oral inflammation. Leaves are boiled and steam inhaled for head colds. Leaf decoction used for bathing the sick and as remedy for skin diseases.	Very common shrub all over island. Bundles of roots are sold in native market. Plant contains an unknown alkaloid (USDA Tech. Bul. 1234). Many <i>Acacia</i> species yield tannin; quite a few contain saponin.
WANDU (<i>Cajanus indicus</i> Spreng.) Leguminosae	Leaf decoction drunk by pregnant women for 7 or 8 months for easy delivery. Leaf decoction taken to relieve colds; also used for bathing. Seeds parched a little and added to ground coffee beans for making decoction which is a remedy for headache and morning dizziness.	Bundles of fresh leaves sold in native market; also the peas in pods, which are a staple food in tropical countries. In Cuba, decoction of new shoots taken for bronchitis and colds. In Malaya, decoction or infusion taken for coughs, diarrhea and abdominal troubles. Plant widely grown for fodder; is rich in Vitamins A and B.
MANGO (<i>Mangifera indica</i> L.) Anacardiaceae	Leaf decoction drunk for high blood pressure, 2 cups a day, 3 days in succession. Or some take the decoction every day.	A frequently used remedy. Small bundles of sun-dried leaves regularly sold on native market. In East Indies, leaf infusion is taken for coughs, asthma, dysentery, etc. But mango leaves are often a source of skin irritation; are reported to contain mangiferin, 43-46.7% euxanthin acid (C ₁₉ H ₁₆ O ₁₀), and some euxanthon (C ₁₂ H ₈ O ₄); also benzoic acid and hippuric acid. Consumption of leaves for a few months reportedly fatal to cows.

TABLE I—(Continued)

<p>TABACU DI PISCADO (<i>Tournefortia gnaphalodes</i> R. Br.) Boraginaceae</p>	<p>Leaf decoction taken for venereal disease but not too strong; "it thins the blood." Leaf decoction taken for "cold in the body"; also as antidote for fish poisoning. A weak decoction, with sugar, drunk as a beverage. Pregnant women take very weak decoction for an easy delivery. Leaf decoction taken with CADIA DEL PERRO (<i>Krameria ixina</i>), liberally, is a strong abortifacient. Decoction used externally for rheumatism; also put in very hot foot bath for soaking stiff legs 10 minutes every night. Leaves are burned in house to drive out fleas.</p>	<p>Partly dried leafy twigs sold in native market in quantity. Seems very well known among natives though grows only in a few coastal areas. Herb vendors may refuse to sell to young girls. Local physician says girls seeking abortions and denied aid declare they will take TABACU DI PISCADO. Plant much used in Cuban folk medicine, also. Alkaloids supinine, tournefortine, cynoglossine reported in other species of <i>Tournefortia</i> (USDA Tech. Bul. 1234).</p>
<p>RATON; MATA RATON (<i>Gliricidia septium</i> Steud.) Leguminosae</p>	<p>Leaf decoction taken for fatigue and for severe colds. Also mixed with beaten egg for coughs; loosens phlegm. Decoction of leaves with leaves of SKOPAPPEL (<i>Annona squamosa</i>) taken for colds. Leaves frequently boiled together with JERBA HOLE (<i>Ocimum sanctum</i>) and decoction taken as a cold remedy. Leaves chewed raw or boiled in milk to relieve colds. Leaves soaked in water until it becomes green and is then used to bathe eruptions. Leaves put in children's bath water "for a good skin". Leaves under bed or under pillow or in pillow slip for insomnia. Leaves strewn around house to repel fleas or burned in house to repel mosquitoes; also burned to drive lice and fleas out of chicken coop.</p>	<p>Common tree around Curaçao. In American tropics the leaves are mixed with cornmeal for poisoning the mouse (<i>ratón</i>). U.S. laboratory experiments which failed to show toxicity to the rat (<i>rata</i>) probably used wrong animal (cf. Gale, L., M. Gibson, and P. Scott, <i>SCIENCE</i> 120: 500-1. 1954) The leaves, especially when young contain volatile aldehyde coumarin; are reportedly toxic to horses but not to cattle or goats.</p>

are sometimes so thoroughly blackened by the inconspicuous soot coating the foliage that only repeated scrubbing with abrasive cleansers will restore them to normal.

In order to test the premise that the habitual intake of certain plant remedies may contribute to the frequency of esophageal carcinoma in Curaçao, I have undertaken a comparative study of the plants and practices of Aruba, only 42 miles distant. Aruba is half the size of Curaçao and has half the number of inhabitants: roughly 60,000. In ratio to Curaçao's average of 20 esophageal carcinomas per year, Aruba

should have 10. The first statistics available, supplied to me by Dr. Otto Ten Thije, Aruba's first pathologist, who has served there since mid 1963, reveal only seven cases diagnosed in the three years from September 1, 1963 to September 1, 1966: 5 male and 2 female.

The two islands suffer similar conditions of drought, erosion and unemployment and a nearly identical supply of fresh produce by sailboat. As for oil refineries, Aruba now has one; formerly had two; and the drinking water of the populace, like that of Curaçao, is distilled from the ocean. *Funchi* is a staple



Fig. 7. Dal pega (*Mentzelia aspera* L.) has coarse, reclining stems and rough-hairy leaves which cling to clothing and irritate the skin. Decoction is taken to clear the complexion and for liver and gall bladder ills.

food of the Arubans and is prepared as it is in Curaçao; and it is often thinned with water and given to babies in lieu of milk. Aruban women indulge in reverse smoking and both women and men drink more and worse liquor than do the people of Curaçao.

The native inhabitants of Aruba, however, are Amerindians, or of mainly Amerindian ancestry, and are not gardeners. There is no native herb market. While a few of the streets in Oranjestad are named after fruit trees, I saw no street signs bearing names of herbs, as is *Mampuritu Weg* in the Montanja district of Curaçao. It is generally believed that folk medicine is not so commonly practiced in Aruba as in Curaçao, and I found this to be true. Nevertheless, I compiled information from various interviews on 60 species more or less used for medication and discovered several significant differences between plants and practices of the two islands:

1) MAMPURITU (*Porophyllum macro-*

cephalum), so popular and so consistently given to children in Curaçao, has been only sparingly introduced into Aruba, is scarce, and used mostly by adults.

- 2) BASORA PRETU (*Cordia cylindrostachya*), equally popular and consistently given to children in Curaçao, flourishes in the wild in Aruba, but is almost exclusively an abortifacient.
- 3) DAL PEGA (*Mentzelia aspera*), well known herb of Curaçao, is not used in Aruba.
- 4) KLEISTUBOM (*Passiflora foetida* var. *Moritziana*), taken internally as a cure-all for children and adults in Curaçao, is used externally only in Aruba.
- 5) CAJUDA (*Annona glabra*), always given to infants in Curaçao, does not grow in Aruba; is unknown.



Fig. 8. *Cadia del perro* (*Krameria ixina* L.), found on the native market in large bundles, yields a red-purple, astringent brew taken regularly as kidney tonic and as an emmenagogue.

- 6) OREGANO (*Lippia alba*), a favorite beverage plant of Curaçao, has been introduced into Aruba in a limited way; the popular "oregano" of Aruba, used for seasoning, is a very different plant, *Coleus amboinicus*.

There are many other contrasts, but these principal ones are sufficiently important to encourage the pursuit of plant remedies as possible contributors to esophageal cancer in Curaçao.

Field work in the Netherlands Antilles will be continued in September. Meanwhile, literature on medicinal, toxic and food plants is being processed by the Morton Collectanea at the University of Miami to make readily available what is known of the plants under study, their uses in other islands of the West Indies, in South Africa and elsewhere, their constituents and reported effects, if any, on the human system.

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