

Notes on Some Poisonous Plants of Guam¹

Nancy INMAN

4555 Cristy Way, Castro Valley, Calif., 94546

Although there are 180 catalogued plants of Guam reported to be "poisonous", (Souder, 1963), it seems useful rather to present here an account of only the most commonly encountered ones known or considered to be lethal, or those causing serious symptoms, which known individuals on Guam have repeatedly contacted. Many toxic plants in the United States have been introduced from foreign countries where the natives may possess a wider and more intimate knowledge of the organic poisons. The hazard is not so much in the plants as in our unfamiliarity with their properties. Three out of four Americans are sensitive to poison ivy, poison oak and their relatives (*Rhus* spp.), yet more toxic, less known plants present an even greater peril because they are not suspected. On Guam, it is most often the unsuspecting "Statesider" who has become ill following contact with one of the local poisonous plants.

The dissemination of accurate information about poisonous plants is hampered in several ways. Since some of the most popular garden ornamental plants in the Continental United States are poisonous, real estate men and nurserymen become antagonized over dissemination of information harmful to their sales. Newspaper accounts of poisonings are often sensational and inaccurate. The average layman (botanically speaking) is unaware of sufficient grounds for concern.

The following factors should be considered before deciding to maintain such plants as garden ornamentals: the proximity of small children and one's willingness to educate them and others about the plants and their properties; one's own ability to distinguish between harmful and harmless plants; and perhaps most important, one's willingness as a property owner to dispose of discarded plant portions such as fruits or trimmings.

A number of factors make the study of plant poisoning difficult. Individual susceptibility varies. Immunity may be temporary and may depend on the physical condition of the individual. Children and adults of small stature are more seriously affected, yet any individual may be affected, though less so on a full stomach. Few people are familiar with the possible sources of poisoning. The possibility of a baffling skin irritation being traced to one of these plants should not be overlooked. It is often impossible to discover which plant was the cause although the Plant Anatomy Division of the Botany Department of such an institution as The Smithsonian can often identify from the smallest fragment presumably unrecognizable materials. Some plants are reputedly "poisonous" merely because someone ate them who already had indigestion or because of simple failure to digest the plants (leaves, stems, etc.) complicated by subsequent putrefaction and fermentation. Not every child who has become ill after eating a plant has been poisoned. Further making the study of plant poisoning difficult,

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a number of days may elapse before symptoms appear. Plants themselves can be more or less toxic depending on the season, stage of growth, or even location of plants or weather conditions. The content of young leaves, for example, may differ greatly from the mature leaves, being harmless at one stage (and nutritious) and poisonous at another. Flowers may contain the highest concentration of active principles before or at the time of pollination. The constituents of plants vary with soils in which they grow. Certain medicinal plants produce a desired chemical substance in some regions but are lacking in these properties when cultivated in other areas. Cultivated plants are often found to be less toxic than their wild counterparts.

An intelligent study of plant poisoning is further complicated by generalizations such as "beware of plants with milky juice" yet the very basis of chewing gum is the milky latex of *Manilkara achras*, of the family Sapotaceae. Likewise, in South America, the natives tap the cow tree, *Brosimum galactodendron*, for its milky sap, which they drink as we do cow's milk. Milky sap, though a clue, is therefore not necessarily an indication of toxicity. Bitterness, likewise, though common in some poisonous plants, is not an unailing clue to toxicity. Families of plants give clues but contain "black sheep" also; e.g. the lima bean has a close relative, the poisonous wild sieva bean (*Phaseolus lunatus*). Finally, because one part of a plant is poisonous all of it is not necessarily so; e.g. the tomato and potato are poisonous plants but the ripe fruit in one and the tuber in the other are edible.

Although this presentation is primarily a summary of commonly encountered plants poisonous to humans, it is interesting to note that toxicologists around the world are interested in the numerous plants which present a hazard to animals. Of interest to residents of Guam might be the seasonal fatal epidemic among toads, *Bufo marinus* (the only species of toad presently known on Guam) in Foster Botanical Gardens in Honolulu from the ingestion of fallen blossoms of Strychnine, *Strychnos nux-vomica*.

Plant poisoning should be suspected if a child or adult, seemingly in good health, suddenly evidences distress and is known to have been handling plants or has had the opportunity to do so. His actions immediately prior to illness should be quickly investigated. This may require some efficient detective work. The suspected plant should be supplied to the attending physician. Plant poisoning may be suspected under circumstances when symptoms seemingly identical with acute indigestion, appendicitis, epilepsy, meningitis, cerebral hemorrhage, tetanus or cholera, occur.

The following thirteen species should be recognized at sight by all persons as potentially harmful. Parents especially should know them and warn their children never to eat or handle them. These species fall into eight botanical families, by which the following accounts are alphabetically arranged.

Mangifera indica, Mango (Chamorro: Mangga). Fam. Anacardiaceae.

Description: cultivated large tree thirty to fifty feet tall with ornamental pink "flushes" (new growth) when new leaves appear. Large fleshy oval edible yellow fruit, with one flat seed, very fibrous.

Poisonous part: sap from skin of fruit causes rash in some people called Mango dermatitis; contact with smoke from burning wood may cause rash in some

individuals.

Symptoms: edema, redness, severe itching in affected areas.

Treatment: ferric chloride solution applied early a specific cure (Arnold, 1944). Mopping with alcohol and ether serially is effective. Best preventative measure experienced by the present writer after eating mangoes in India during 18 years is to wash with soap around lips and face after eating fruit taking care to rinse thoroughly.

Toxic agent: peel of fruit contains cardol, a substance closely related to urushiol. Like the latter, it may cause severe dermatitis in sensitive individuals. Irritant in outer peel or sap. Leaves yield euxanthic acid (Farnsworth, 1965).

Other uses: a decoction of leaves is claimed to cure dysentery (Farnsworth, 1965). Cattle have been known to choke to death on Guam and the United States Virgin Islands on mango seeds.

Nerium indicum, Oleander, (Chamorro: Adelfa or rosa laurel). Fam. Apocynaceae.

Description: ornamental evergreen shrub with narrow green leaves in pairs or whorls of three around twigs. Leaves 3-10 inches long; flowers range from white and pink to deep carmine; are more or less fragrant.

Poisonous parts: all parts highly toxic including leaves, bark, roots, juice, flowers. Even inhaling smoke from burning parts of plant can cause serious symptoms of poisoning. Recorded deaths in Florida from eating meat cooked on Oleander skewers (Morton, 1958). Honey from nectar of flowers is toxic.

Symptoms: resemble those of cholera. Nausea, vomiting, colic, dizziness, drowsiness, decreased pulse, irregular heart beat, marked mydriasis, bloody diarrhea, unconsciousness, respiratory paralysis and death. In severe poisoning pupils are constricted and nonreactive; the patient first becomes somnolent and later comatose. In protracted cases anesthetics, paresthesias and visual disturbance may be present. Contact dermatitis in some sensitive individuals.

Treatment: as for digitalis poisoning. Induce vomiting, cautious use of atropine, supportive treatment (Arnold, 1944).

Toxic agent: contains two toxic glucosides, neriin and oleandrin plus rosaginin with properties similar to those of digitalis glucosides. Leaves contain cornerin, a crystalline glucoside.

Other uses: in India extracts used as means of suicide, as treatment for leprosy. Ingestion of one leaf will kill a mature horse or cow.

Thevetia peruviana, Yellow Campanilla, "Be Still Tree" or Lucky Nut. Fam. Apocynaceae.

Description: cultivated shrub or small tree with narrow leaves similar to those of oleander. Fruits like small, irregularly-shaped apples (somewhat triangular) which range from green to yellow to black at maturity and contain two large oily nut-like seeds. Flowers bright yellow, bell-shaped. Two known fatal cases (Arnold, 1944). Most common cause of fatal or dangerous poisoning on island of Oahu.

Poisonous parts: all, including orange flowered variety.

Symptoms: burning, tingling and dryness of throat, slow irregular pulse followed by vomiting and diarrhea, dilatation of pupils and finally shock. Oc-

asionally convulsions may be observed. Dermatitis from sap in sensitive individuals.

Treatment: remove toxic agent by gastric lavage, saline cathartics, enemas, diuretics and other supportive measures. Arnold (1944) states that atropine is to some extent an antidote.

Toxic agent: active principle is glucoside thevetin, a digitalis-like substance and cardiotoxin (thevetoxin) also digitaloid. Fruits contain fatty oil and four crystalline substances.

Other uses: In West Indies seeds called "lucky seeds" and carried on charms or pendants. In India criminal poison made from sap, seeds. Arnold (1944) states thevetin "coming into some use in medicine as remedy in heart disease". Seeds are exported—hundreds of pounds monthly—from Honolulu for manufacture of this drug.

One seed may be lethal.

Alocasia macrorrhiza, Elephant ear, (Chamorro: piga). Fam. Araceae.

Description: large leaf four feet long, heart-or arrowhead-shaped, green or green with white patches, principal veins below light green, leaf stem light green with brown speckles.

Poisonous part: all, particularly juice in stems and leaves. Not lethal.

Symptoms: intense itching and burning of skin or mucous membrane of mouth, if eaten; numbness of tongue and throat for thirty to forty minutes and feeling of "choking" related to this author by individual who had been told plant good to eat raw in salads. If introduced into conjunctival sac, produces keratitis with resulting opacities somewhat resembling an acid burn. Chemical trauma added to by abrasive effect of needle-shaped calcium oxalate crystals contained in plant.

Treatment: drinking cold water relieves burning mouth; washing with soap and water relieves skin itching experienced by this writer. Von Oettingen (1963) suggests application of ice for encounter with *Dieffenbachia picta* (Dumbcane), a plant in same family producing comparable symptoms.

Toxic agent: calcium oxalate crystals plus unidentified acrid principle. Similar properties to well-known houseplant, Dumbcane.

Other uses: application of heat breaks down crystals and thorough cooking renders edible. A native of the Truk Island of Dublon (Eastern Caroline Islands) states stems must be peeled in a certain way before cooking to render edible. Only certain people know how to do this (James, 1966).

Dieffenbachia picta, Dieffenbachia or Dumbcane. Fam. Araceae.

Description: cultivated large luxuriant foliage plant popular as houseplant with dark green foliage with creamy white or chartreuse markings or variegations. Leaves ten to twelve inches long and four to five inches wide.

Poisonous parts: highly acrid juice from leaves or stems.

Symptoms: paralysis of tongue making speech intensely difficult for some time hence, tingling pain of lips and mouth, vomiting (Farnsworth, 1965).

Treatment: consists essentially in application of ice (Von Oettingen, 1963).

Toxic agent: not analyzed.

Rhoeo spathacea, "Moses-in-a-boat". Fam. Commelinaceae.

Description: sword-shaped leaves bright green on top and reddish purple underneath. Many small, short-lived pink or white flowers appear from their axils, supported by two boat-shaped bracts.

Poisonous part: not known, probably leaves.

Symptoms: skin itching reported to this writer by several gardeners who had carried them in contact with skin or simply from handling plants.

Treatment: wash with soap and water after contact.

Cycas circinalis, Federico palm or Cycas (Chamorro: Fadan, fadang). Fam. Cycadaceae.



Fig. 1. *Cycas circinalis* (seeds).

Description: low palm-like tree with cylindrical trunk and a crown of glossy stiff fern-like leaves. Stems on male trees topped with two foot cone covered with spore-bearing scales. Female forms with brown, seed-bearing leaves that resemble antlers. Instead of flowers, tuft of leaves with notched margins where the large round seeds are produced. Immature seeds resemble dried raisins.

Poisonous part: Uncooked seed which is very bitter. Fosberg (1965) states all parts poisonous.

Symptoms: irritation of mouth and gastrointestinal tract. Eating nuts can lead to paralysis and death (Morton, 1958). Dr. Richard Need (1966) of the United States Public Health Service, states that studies done on rats on a very limited basis at National Institutes of Health and at Michigan indicate the toxic agent may be carcinogenic to the liver. These nuts (seeds) have also been

suspected as a possible causative agent in amyotrophic lateral sclerosis, prevalent on Guam. This latter aspect is presently under investigation by the National Institute of Neurological Diseases and Blindness.

Treatment: observation, symptomatic.

Toxic agent: uncooked nuts contain hydrogen cyanide. In times of famine on Guam the endocarp of seed has been prepared as follows: grate or break into pieces and soak for several days in water which must be periodically changed. After thorough soaking, dry and grind into meal and bake in thin tortilla-like cake. Nuts contain glucoside pakoain and also physosterine.

Eating improperly prepared raw nuts is lethal (Morton, 1958).

Ricinus communis, Castor Bean (Chamorro: Agaliya). Fam. Euphorbiaceae.



Fig. 2. *Ricinus communis*.

Description: weed which has become a popular garden ornamental, leaves with six to eleven broad pointed lobes with toothed edges. Stems green or red, hollow. Seed cases prickly (some varieties smooth) about one inch long, containing three rounded shiny, black, grey or black-marked seeds.

Poisonous parts: seeds—harmful when eaten. One seed can be lethal in a child (Driesbach, 1963). One ten thousandth of a milligram per kilogram of body weight is lethal (Arnold, 1944). Toxicity increased if introduced into circulation through cut or scratch. Green fruits will make one sick.

Symptoms: akin to those of snake venom poisoning—none except for loss of appetite for several days following toxic dose. Then, vomiting, strong purgation followed by delirium, collapse and death. In many cases there is more or less

severe injury to kidneys resulting in oliguria and death in uremia up to twelve days after poisoning (Driesbach, 1963). In such cases, urine contains albumin, sugar, casts and red and white cells. In case of severe poisoning, the patient may suffer from intermittent convulsions. Skin becomes cold and clammy, sometimes cyanotic, rapid pulse and blood pressure decreased. The patient may die from vascular collapse. Pathologic findings in fatal cases of this and *Abrus precatorius* include hemorrhages and edema of the gastro-intestinal tract, hemolysis and degeneration of the kidney. A dilute solution of ricin rapidly agglutinates the red blood cells *in vitro*, but the poisonous effects are apparently not due to this action.

Exposure to dust of Castor Bean: (used as an agricultural fertilizer) causes conjunctivitis and lacrimation congestion of the nasal passages, dryness and soreness of the pharynx, swelling of the lips, some bronchial irritation and, in a few instances, asthma of allergic origin (Driesbach, 1963).

Self-inflicted injury by malingerers: (powdered seeds injected into conjunctival sac) resulting in violent chemotic conjunctivitis sometimes membranous in character, a keratitis occasionally involving ulceration and an iridocyclitis. Seeds also used to provoke dermatitis by malingerers.

Treatment: no home treatment. Symptomatic by physicians. An immunity of very high titer may be obtained to ricin (harmful toxalbumin in this plant) by repeated injections at appropriate intervals. The antitoxin, however, is not available commercially (Arnold, 1944). Remove toxic agent by gastric lavage followed by saline cathartics and sample fluids.

Toxic agent: seeds contain toxalbumin ricin and alkaloid ricinine the latter of which is not markedly toxic.

Other uses: seeds are source of castor oil which is expressed from the decorticated seeds without assistance of heat. (Toxic ricin is not expressed with oil but former substance is destroyed by heat before being fed to cattle). Refuse of seed after oil is extracted is also used to make fertilizer. Known as a purgative to Greeks and Romans in 500 B.C. (Seeds of commerce today sometimes confused with those of *Jatropha curcas* which is a stronger purgative than castor oil). All airplane engines in World War I were lubricated with castor oil (Fosberg, 1966).

One seed can be lethal.

Jatropha curcas, Physic Nut (Chamorro: Tubatuba). Fam. Euphorbiaceae.

Description: evergreen shrub or small tree often used for hedges or fences. Smooth five-lobed or -angled leaves three to seven inches long; inconspicuous yellow or greenish flowers. Fruits are the size of small apples and contain three peanut-sized seeds characteristically yellow when ripe, but which dehydrates on the tree, turning black and splitting open to reveal the three seeds. Sticky milky juice.

Poisonous parts: Seeds. As few as three fruits may be fatal though one to four seeds would be only mildly purgative (Von Oettingen, 1963). Since the taste is like beechnuts and very agreeable, one wants to eat more (seeds) (Arnold, 1944).

Symptoms: irritation of throat, intense abdominal pain with abdominal distention, vomiting (vomitus sometimes tinged with blood) and diarrhea. Patient becomes dizzy, restless and may develop muscular spasms; may become drowsy

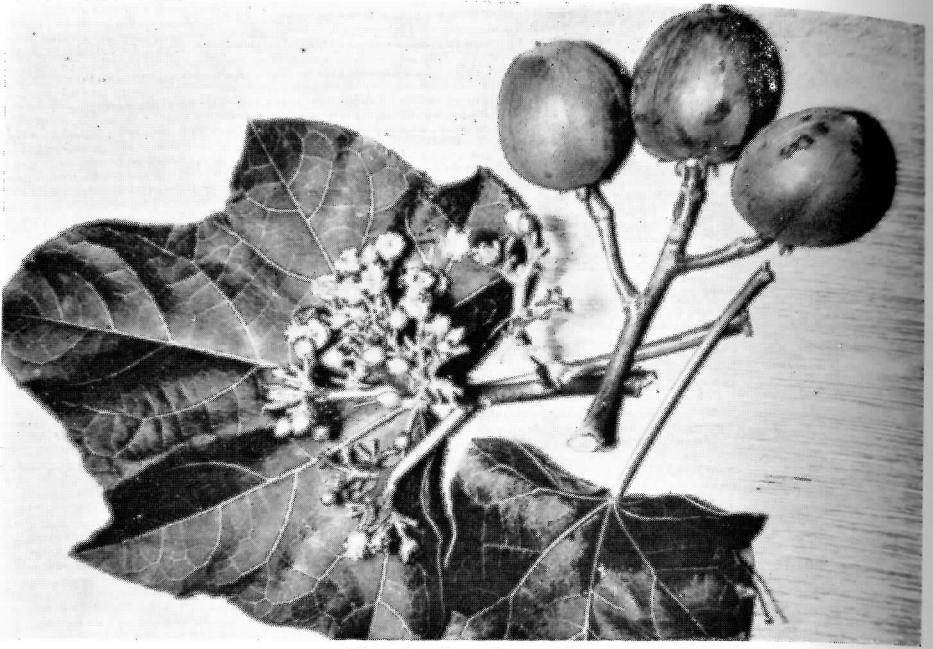


Fig. 3. *Jatropha curcas*.

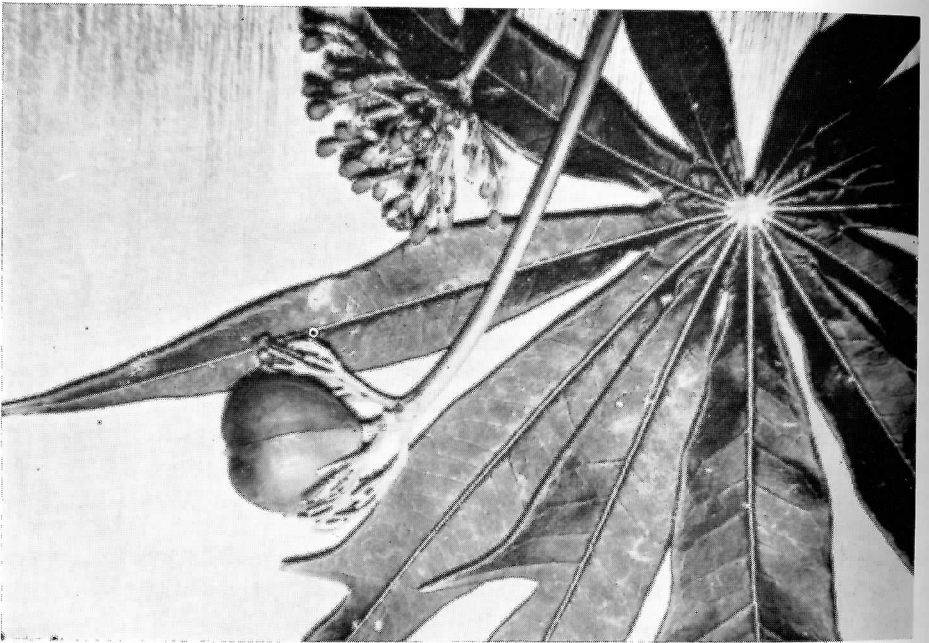


Fig. 4. *J. multifida*.

and finally collapse; the skin becomes cold and clammy, pulse small thready and irregular, respiratory rate rapid and panting. Some patients show mydriasis.

Treatment: gastric lavage, administration of cathartics, demulcents and supportive measures.

Toxic agent: toxalbumin, jatrophin or curcin contained in the yellow fixed oil yielded from seeds. This is known variously as Hell Oil, Pinhoen oil, *Oleum infernalis* and *Oleum ricini majoris*. It consists of the glyceride of a characteristic acid, belonging to the same group as ricinoleic and crotonoleic acids, but not identical with either. Its activity is greater than that of castor oil and less than that of croton oil. Purgative dose is 0.3 to 0.6 cc. Curcin agglutinates red blood cells. Unsafe therapeutic agent (Arnold, 1944).

Other uses: Juice foams like soapsuds when beaten. Children of Guam blow bubbles with joint of bamboo. On evaporation juice yields a red-brown resin; juice is applied to wounds and ulcers and prevents bleeding by forming a colloid-like film. Decoction of leaves used as a wash in eczema and ulcers. Plant used in Philippines to stupefy fish but inferior to *Barringtonia asiatica*. Oil used in England for soap making, as lubricant, as medium for mixing paint; Chinese boil it with oxide of iron and use preparation for varnishing boxes (Safford, 1905). Three fruits may be fatal.

Jatropha multifida, Coral plant (Chamorro: Mana) Fam. Euphorbiaceae.

Description: cultivated shrub reaching to seven feet high. Leaves deeply cleft into nine to ten pointed lobes somewhat resembling leaves of Castor Bean but with more intricate design. Very decorative. Brilliant red flowers in umbels resembling red coral. Sticky juice. Small one inch oval yellow fruit containing two to three oval brown delicious tasting seeds. Fruits fall intact and should be discarded.

Poisonous part: seeds.

Symptoms: vomiting and frequent bowel movements; "swollen hands, stiff fingers" (Fosberg, 1966).

Treatment: same as for *Jatropha curcas* as content and action of jatrophin, the poisonous albuminoid found in all the jatrophas, is the same.

Toxic agent: same as *Jatropha curcas*. Leaf contains saponin, a completely amorphous glucoside.

No fatalities recorded but highly suspect since contains same toxic agent as *Jatropha curcas*.

Euphorbia pulcherrima, Poinsettia, (Chamorro: Christmas flower). Fam. Euphorbiaceae.

Description: cultivated shrub two to ten feet high having rich green long-stalked leaves three to seven feet long. Leaves terminating stem are brilliant red and often mistaken for the true flower which is in the center of these red leaves. Some white and pink varieties. Familiar in Continental United States, as blooming at Christmas time.

Poisonous Part: showy red leaves; and stems are lethal if eaten. Two recorded deaths in Hawaii (Arnold, 1944). Milky sap produces vesicant dermatitis and a chemotic conjunctivitis with a keratitis if introduced into the eye.

Symptoms: intense emesis and catharsis followed by delirium and death in

cases of large consumption; skin itching.

Treatment: Eliminate poisonous material and treat shock. For dermatitis, wash sap from skin with soap and water.

Toxic agent: milky juice contains toxic euphorbon. Arnold (1944) states, "toxic substance is neither an alkaloid nor a glucoside: is probably a resin". The family of Euphorbiaceae contain urushiol and its relatives phenolic compounds as the irritant component of their sap.

Other uses: in Mexico leaves applied as, poultices brewed skin and taken internally by nursing mothers to increase milk flow; bark and red floral leaves produce a red dye. American Indians used milky juice as a depilatory.

Leaves, stems are lethal if consumed in quantity.

Abrus precatorius, Jequirity Bean or Crab's Eye (Chamorro: Kolales halom-tanto). Fam. Leguminosae.

Description: Smooth, slender, branching vine, with seven to thirteen oblong leaflets each about one-half inch long. Small pink or lavender flowers crowded in short clusters. Conspicuous part of plant are the hard, glossy, brilliant red seeds marked with a black spot on one end. Seeds about 3/8 inches long, oval.

Poisonous part: seeds, if exceedingly hard covering broken and well chewed. Coating of immature beans softer and more easily broken. Half of one well-chewed seed is lethal. Recorded deaths of children at Rockhampton (Farnsworth, 1965)—one child—and Florida (Morton, 1962)—three children. Toxicity is multiplied one hundred times if substance of seeds injected subcutaneously or introduced through cut or scratch in skin. No mineral or synthetic poison even remotely approaches the standard of toxicity of abrin (albuminoid substance in seed) or ricin of Castor Bean (Arnold, 1944). Lethal dose of abrin (intravenous) is 0 to 0.01 milligrams for a two hundred pound man (or same dose per kilogram of an animal's weight).

Symptoms: "Those of acute gastroenteritis, with nausea, vomiting and diarrhea leading to dehydration, convulsions and collapse and perhaps death. When abrin instilled into the eye, irritation leads to a dose-related reaction ranging from a mild conjunctivitis to a marked loss of substance of the globe itself. Oral or parenteral poisoning is followed by severe gastroenteritis accompanied by multiple serosal hemorrhages, and swelling and inflammation of Peyer's patches and of the retroperitoneal lymph nodes. Focal necrosis in the liver and kidney has also been reported. Retinal haemorrhages appear early in the course of intoxication. Abrin also agglutinates the red blood cells, apparently by combining with the cell stroma, leading to thrombus and embolus formation. Toxic effects of abrin are considered to be due both to the red cell agglutination and to a direct toxic action on parenchymal cells, the nature of which is poorly understood" (Hart, 1963).

Treatment: no specific therapy with possible exception of anti-abrin, prepared from serum of immune animals which is difficult to obtain and virtually untested in human subjects. Supportive measures including blood, parenteral fluid and electrolyte administration, are recommended as useful and perhaps lifesaving. Removal of poison from the gastrointestinal tract with saline cathartics may be advisable, but emesis and stomach intubation should be instituted with caution

due to necrotizing action of abrin (Hart, 1963). Alkalinization of the urine with sodium bicarbonate is also recommended for prevention of precipitation of hemoglobin and its products in the kidney tubules.

Toxic agent: seeds contain an amino acid, N-methyltryptophan; abric acid, glycyrrhizin, a lipolytic enzyme and abrin, the toxic albumin responsible for the toxic effects of the bean.

Other uses: has been used therapeutically in an attempt to clear corneal opacities or trachomatus pannus, but is a dangerous remedy; the effects of which may easily escape control of the surgeon (Duke-Elder, 1954). Arrow poison or poison needles or pellets made using paste of powdered seeds and water, killing in twenty-four hours. (Animal's hides thus stolen). In India seeds are used by jewelers and druggists as weights, as each seed averages 1.75 grains; the Koh-i-nur diamond was weighed with these seeds. Seeds are often used for jewelry or rosaries, and are imported into Continental United States, thereby causing exposure which would not otherwise occur.

One half of one well-chewed seed is lethal.

Hippobroma longiflora (*Isotoma longiflora*) Estrella, Star of Bethlehem. Fam. Lobeliaceae.

Description: an herbaceous weed one to two feet high with few or no branches. Narrow stemless leaves two to six inches long with many pointed toothed lobes. White star-like long-tubular erect flowers. Fruit is a nodding capsule about one-half inch long.

Poisonous part: said to be milky juice.

Symptoms: according to the United States Bureau of Agriculture one drop of juice in eye may cause blindness; respiratory stimulant, slowed heart rate, vomiting, and even convulsions in large doses; burning and local irritation where juice has touched. Dr. Wendell Thomas, ophthalmologist, formerly of United States Naval Hospital, Guam, states symptoms in two cases treated where patients were known to have been handling plant, were redness of eye with mild irritation. It could not be ascertained if sap had been introduced into eye (Thomas, 1966).

Treatment: not stated.

Toxic agent: alkaloid, lobeline.

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