Jequirity bean, castor oil plant & Co. – exotic souvenirs can contain poisonous plant seeds

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Beautiful and dangerous at the same time – this description applies to numerous poisonous plant seeds. Thanks to their colourfully appealing look, some seeds are also used as decorative elements in the manufacture of jewellery or decoration of musical instruments and toys. Such products can be found at bazaars and souvenir markets in some countries that are also popular with German tourists. By searching for a nice memento, holidaymakers are often unaware of the health risk that can come from these seeds.

One example is the jequirity bean, which has many other names depending on the country. Its seeds contain abrin – one of the most potent phytotoxins in the world. With 75 µg (micrograms), even a single seed contains enough abrin to induce severe poisoning in an adult. In children, a dose between 75 µg and 150 µg can lead to death, while in infants the lethal dose is significantly lower. Severe gastritis accompanied with vomiting, diarrhoea and cramps, kidney and circulatory failure with considerable dehydration, paralysis of the central nervous system and even death can occur after a few hours to two days.

If the seed is swallowed whole, the risk of poisoning is low due to the sturdy outer shell. If the shell is damaged, however, because it is pierced for jewellery making or mistakenly chewed in the mouth, the phytotoxin can be released. There is also a risk that people can mistake the seeds of the jequirity bean for other edible seeds. For example, a German tourist brought a colourful pepper mixture from Tunisia which turned out to contain jequirity beans.

Another example of poisonous plant constituents is the castor oil plant. Because of its coloured leaves, it is often to be found in parks and gardens as a decorative ornamental plant. The problem here is that all parts of the plant,also known as “miracle tree” or “palm of Christ”, contain the strong poison ricin, for which the indications of poisoning are similar to those of abrin. The bean-shaped seeds of the plant are located in the spherical, prickly fruits and contain high levels of ricin. They are also used in jewellery manufacturing and can accidentally be mistaken for nuts, especially by children.

The lethal dose after oral intake is estimated to be in the range of 1mg/kg bw (milligrams per kilogram of body weight, which equates to around five to ten castor bean seeds) to 20 mg/kg bw. The intake of only a few (three to five) chewed castor bean seeds can cause fatal poisoning in children.

The range of decorative “natural beads” from the fruits of legumes is extensive and also applies to the seeds of other plants such as *Ormosia*, coral tree, *Rhynchosia*, mescal bean or the red sandalwood tree. For some plants, there is currently hardly any information on the toxic effects of the constituents contained (e.g. alkaloids).

For this reason, the German Federal Institute for Risk Assessment (BfR) advises tourists in particular to pay special attention when buying products decorated with plant seeds in exotic countries, or which they mistakenly believe to contain edible components, as in the case of the pepper mixture.

1 Introduction

Because of their decorative character and bright colours, the seeds of various legumes (*Fabaceae*) and the miracle tree (*Ricinus communis*) are commonly used for jewellery purposes all over the world. People who buy necklaces, bracelets or other souvenirs containing these "natural beads" should be aware, however, that the seeds of several plants are highly poisonous.

2 Seeds of the jequirity bean contain one of the strongest phytotoxins in the world

Especially prominent are the seeds of the jequirity bean (*Abrus precatorius L.*), also called rosary pea or crab's eye. They are around 5 millimetres in size and are coloured an intense red with a black tintat the base. They also appear as white, brown and orange varieties. [1]. The seeds are known by many different names, depending on the country (e.g. jequirity (UK, Philippines), gunja, rati (India), rosary pea (Egypt), precatory bean (US)). In previous times, the seeds were used for the decoration of rosaries, hence the name rosary pea. Nowadays, they are commonly used as beads in the manufacture of jewellery and for decorating musical instruments (e.g. maracas) and toys. They are often sold to tourists as souvenirs in certain countries.

The phytotoxin **abrin** contained in the seeds belongs to one of the most potent phytotoxins worldwide. Depending on the form of application, the lethal dose in humans ranges from 0.1 - 1 µg/kg bw (micrograms per kilogram of body weight). One seed contains roughly 75 µg of abrin (equivalent to 75 milligrams/100 grams). This dose can cause severe poisoning in adults, and can even be fatal to children and infants [2; 3].

Abrin consists of two subunits, the A- and the B chain. The B chain contains two binding sites for certain saccharide structures on cell surfaces ("property of lectins") and permits the penetration of the toxin into the cytosol of the target cells. Following cellular uptake, the A chain binds irreversibly to the ribosomes in the cytoplasm and inhibits protein biosynthesis. Oral poisoning in humans, suicidal or accidental, can lead to diarrhoea, vomiting and nausea after a latency period of a few hours to days. The risk of circulatory failure rises due to high loss of fluids. Other symptoms can appear, such as hallucinations, cramps, fever and tachycardia, depending on the dose. In cases of severe poisoning additional symptoms, such as impaired visual function, liver damage, symptoms of acute renal failure and paralysis of the central nervous system and even death are also described [3; 4].

The health risk posed by the intake of whole, unchewed jequirity beans is relatively low, as the hard, resistant shell of the seed prevents the release of abrin in the gastrointestinal tract. The seeds are often drilled to make necklaces and other items of jewellery, and thereby there is a risk that the toxin could be ingested through sucking or swallowing [5]. The Hessian Ministry for Social Affairs and Integration already reported in 2004 about a case in a children's day care centre where the minder and some children were admitted to hospital for suspected acute poisoning after jequirity beans had detached themselves from maracas while playing music and were picked up by children and were putted into their mouths [6].

Cases of poisoning keep occurring all over the world where young children in particular swallow the multicoloured, attractive jequirity bean seeds (1 or 2 are usually enough) [4; 7]. There is a definite risk of mistaking them for other edible seeds. Only recently, jequirity bean seeds were detected in a mixture of coloured peppercorns which a tourist had bought at a street market in Tunisia [8].

In the Ayurvedic medical practice, jequirity beans are also used for alleviation of diseases (e.g. gunja: the use of seeds and leaves as a paste) or as a component of cosmetic products (e.g. Indian hair oil with gunja). Due to traditional treatment and purification processes (Shodhana), these products are detoxified and do not pose a health risk to the user. [9]. Hence, Ayurvedic formulations should only be procured from reliable sources and people should not attempt to produce them by themselves.

3 The seeds of the miracle tree are very poisonous

The “miracle tree” or “palm of Christ” (*Ricinus communis*) belongs to the spurge family and is often cultivated for decorative purposes in parks and gardens because of its colourful leaves. Although all parts of the plant are poisonous, the bean-shaped seeds contain the highest levels of the toxin **ricin**. Ricin seeds are also used in the manufacture of decorative necklaces because of their reddish-brown marbling, which is reminiscent of a leopard pattern, and can be inadvertently mistaken for nuts and eaten by children due to their similarity [10].

Quelle: iStockphoto / stocksnapper

The signs of ricin poisoning are comparable to those of abrin poisoning. The lethal dose after oral intake is estimated to be in the range of 1 mg/kg bw (milligrams per kilogram of body weight, which equates to around five to ten castor oil seeds) to 20 mg/kg bw [11]. Ricin has a great structural similarity to abrin. The sequence homology of the glycoprotein chains A and B amounts to 40% and 60%, respectively. Ricin also belongs to the type 2 ribosome-inactivating proteins (RIP-II) and inhibits protein biosynthesis in the cell just like abrin. Currently, no antidote or any specific therapeutic options exist after poisoning with ricin or abrin. The type of therapy depends on the symptoms caused by the application route [12].

There are also repeated reports of cases of poisoning through castor bean seeds. The intake of only a few (three to five) chewed castor bean seeds can result in lethal poisoning in children. Skin contact with damaged seeds can also lead to local dermal symptoms of poisoning.

Between May 2018 and February 2019, 25 cases of poisoning accidents involving oral or dermal ricin exposure of infants and adults were reported to the eight German Poison Control Centreswithin the scope of the pilot study “National monitoring of poisoning”. Due to the small quantities ingested, the cases were either asymptomatic or involved only mild health complaints (erythemaafter dermal contact, short-term vomiting/diarrhoea after oral intake). The data originate from the still ongoing pilot project “National monitoring of poisoning”[18].

Contrary to this, the castor oil obtained through cold pressing the seeds does not contain any ricin, but acts as a laxative when taken in high quantities and it is used for the short-term, symptomatic treatment of constipation and as a pharmaceutical excipient, as well as in cosmetic applications [13].

4 The seeds of other legumes can be poisonous too

The range of decorative “natural beads” from the fruits of legumes is extensive and current information on the dose-response ratio of potential toxic components is limited.

A Swiss press release reports on a case in which a woman was admitted to hospital with stomach complaints after dermal contact with the damaged, oval, black-and-red seeds of a bracelet [14]. These beads were presumably huayruro seeds of the ormosia plant containing quinolizidine alkaloids, some of which have narcotic properties. Huayruro seeds (e.g. from *Ormosia (O.) coccinea, O. monosperma, O. cruenta*) are similar to jequirity beans in their colour and shape, but they are roughly four times larger and are sold, among others, in online shops [15].

The seeds of the coral tree (*Erythrina (E.) flabelliformis, E. lysistemon*) are also used for jewellery purposes due to their colourful appearance. The bright red beads of the Erythrina varieties contain alkaloids with effects similar to that of curare, an antagonist of nicotinic acetylcholine receptors [16]. In addition to these, there are numerous other plants whose seeds are also used for decorative purposes and which are to be found mainly in exotic countries. Examples of these are the seeds of rhynchosia (*Rhynchosia (R.) precatoria, R. phaseloides*), the psychoactive mescalbean (*Sophora secundiflora*) or the red sandalwood tree (*Adenanthera pavonina*) [17]. There is currently hardly any information on the toxic effect of the constituent substances they contain (e.g. alkaloids).

More information on the topic of jequirity beans at the BfR website

https://www.bfr.bund.de/cm/343/schmuck-aus-paternosterbohnensamen-nicht-fuer-kinder-geeignet.pdf

More information on the topic of miracle trees at the BfR website

https://www.bfr.bund.de/de/presseinformation/2015/31/blauer_eisenhut__engelstrompete_und_wunderbaum___das_risiko_akuter_vergiftungen_durch_pflanzen-195481.html

More information on the "Poisoning accidents among children" app at the BfR website

https://www.bfr.bund.de/de/apps_vergiftungsunfaelle.html

BfR "Opinions App"

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About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent institution within the portfolio of the Federal Ministry of Food and Agriculture (BMEL) in Germany. It advises the Federal Government and Federal Laender on questions of food, chemical and product safety. The BfR conducts its own research on topics that are closely linked to its assessment tasks.

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