TOXICITY FROM INGESTION OF JATROPHA CURCAS ('SABOO DUM') SEEDS IN THAI CHILDREN

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Abstract. Jatropha curcas is widely cultivated in Thailand, the seeds of which yield high quality oil used for biodiesel production. Toxicity due to ingestion of Jatropha curcas has become more common among children due to the close proximity between cultivation and residential areas. We report 10 calls made over a 40-month period to the Siriraj Poison Control Center involving 75 children ages 2-14 years who experienced toxicity after ingesting various amounts of Jatropha beans. The amounts ingested, presenting symptoms, pertinent laboratory findings and their collective dispositions are reported. A brief review of recent published literature on toxicity due to ingestion of Jatropha curcas was also done.

Keywords: Jatropha curcas seeds, toxicity, children

INTRODUCTION

Jatropha curcas or ‘saboo dum’ (Thai: black soap) is an endogenous plant to parts of Asia, South America and Africa. It grows in tropical climates and is called by various names, depending on the geographic location. In Barbados, it is called ‘the purging nut tree’, while in India it is called Physic nut or Jungle Erandi (Barceloux, 2008). The tree produces a fruit that dries with seeds inside. The seeds have been used as abortificients, anthelmintics and purgatives. Analysis of the seeds reveals the latex inside the seeds contains a proteolytic enzyme, curcin, and an octapeptide, curcacycline A, which have shown anticomplement activity in vitro. Oil extracted from the seeds contains curcanoleic acid, which has an activity similar to ricin, a toxalbumin capable of causing hepatotoxicity in humans (Adam and Magzoub, 1975; Ahmed and Adam, 1979; Begg and Gaskin, 1994). The oil comprises 40% by weight of the seed, making the Jatropha bean desirable for biodiesel production (Berchmans and Hirata, 2008; Patil and Deng, 2009). In rural Thailand, Jatropha curcas is cultivated close to homes and schools. It produces a yellow fruit which matures into seed pods that fall to the ground and can be particularly enticing to curious children (Devappa et al, 2010). As a result, inadvertent and intentional overdoses have occurred in Thailand with increasing frequency over the past 3 years. With such exposures, the clinical concern centers around its
ricin-like activity which is well known
to cause hepatotoxicity in humans. We
present here the largest number of cases
of Jatropha poisoning ever reported in
an attempt to shed light on the frequency
and severity of Jatropha curcas poisoning.

**MATERIALS AND METHODS**

Records of calls reporting toxic ingestion
of Jatropha beans from January 2006
to April 2009 from the Siriraj Poison Cen-
ter in Bangkok, Thailand were reviewed.
Information collected included the num-
ber of children involved in each call, the
number of beans ingested by each child,
the age of the child or children in years
and the geographic location and present-
ing symptoms and signs. The protocol of
the Siriraj Poison Center is to advise that
patient be observed in the emergency
department for 6-12 hours. Patients with
persistent symptoms of nausea and vomit-
ing are advised to be admitted for further
observation and laboratory evaluations.
This project received approval of the Siri-
raj Hospital Ethics Committee.

**RESULTS**

There were 10 calls made to Siriraj
Poison Center over the study period, in-
volving 75 patients. The youngest child
was 2 years old and the oldest was 14. Six
out of 10 cases involved more than 1 child,
the largest being a group of 48 children
who ingested the beans at school. The
most common presenting symptoms were
nausea, vomiting, diarrhea and abdomi-
nal pain. Twelve patients were admitted
because of dehydration due to severe
vomiting. Of these, one patient had a
slightly elevated AST on presentation and
2 patients had abnormal liver enzymes
at 24 and 48 hours after ingestion. The
largest number of beans ingested was 20.
All patients did well. Table 1 outlines the
details of each call to the Siriraj Hospital
Poison Center.

**DISCUSSION**

There have been 5 reports of toxic-
ity due to Jatropha bean ingestion in
the literature (Table 2). None were fatal.
Because of its curcanoleic acid content
which has been shown to produce severe
gastrointestinal irritation in animals,
symptoms of nausea, vomiting and diar-
rhea are common after ingestion (Stirpe
*et al*, 1976; Rug and Ruppel 2000; Sudheer
Pamidimarri *et al*, 2009). In more severe
cases, such as one reported by Levin
*et al* (2000), the gastrointestinal symptoms
can last up to 72 hours. Diarrhea can be
particularly severe, necessitating constant
intravenous hydration (Levin *et al*, 2000).
The other principal toxin in the seeds
can be seen even after the oil has been
extracted is a toxalbumin, curcin, which
can inhibit protein synthesis (Barceloux,
2008). Curcin has been shown to be 1,000
times less potent than ricin, which may
explain the relatively mild, transient
liver enzyme elevations observed in our
patients. In our series, only 3 cases had
mildly-elevated liver enzymes, of which
2 cases had delayed elevations of 24 to 72
hours. Levin *et al* (2000) reports the delay
can be up to 4 days.

The dose ingested is a major concern
for physicians consulting the poison
center. The children in our case series
ingested up to 20 seeds with no perma-
nent injury. There seemed to be no direct
dose-response relationship between the
number of seeds ingested and symptom
severity. One interesting note is that in
our report and in all 5 reports from the
literature, Jatropha bean ingestion often

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Table 1
Details of phone calls regarding Jatropha ingestion made to Siriraj Poison Center over a 40-month period.

<table>
<thead>
<tr>
<th>Record number</th>
<th>No. of children involved</th>
<th>No. of seeds ingested</th>
<th>Age of patient (years)</th>
<th>Symptoms</th>
<th>Number admitted</th>
<th>Laboratory findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>11 to 20</td>
<td>5 to 6</td>
<td>Admitted all 6 patients</td>
<td>6</td>
<td>All children had normal AST/ALT levels.</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
<td>0.5 to 10</td>
<td>6 to 12</td>
<td>Admitted 2 patients with severe nausea/vomiting</td>
<td>2</td>
<td>An 8-year-old child had a normal initial AST/ALT, but at 72-hours follow-up had an AST of 51 units/l. One week later at follow-up, the AST/ALT were normal. A 10-year-old child had a normal initial AST/ALT, but at 24-hours follow-up had an AST of 48 units/l and an ALT of 39 units/l. Follow-up at 10 days showed normal AST/ALT levels.</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>10 to 20</td>
<td>6</td>
<td>Vomiting/abdominal pain</td>
<td>0</td>
<td>------</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>6 to 20</td>
<td>2 to 10</td>
<td>Nausea, vomiting, diarrhea</td>
<td>1</td>
<td>1 child had an AST of 51 units/l then normal at follow-up</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>2 to 3</td>
<td>3, 2, 9, 14</td>
<td>Nausea, abdominal pain</td>
<td>0</td>
<td>------</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>Unknown</td>
<td>5 to 7</td>
<td>Vomiting</td>
<td>0</td>
<td>------</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>10</td>
<td>9</td>
<td>Diarrhea, abdominal pain</td>
<td>1</td>
<td>Normal AST/ALT</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>Diarrhea, abdominal pain</td>
<td>1</td>
<td>Normal AST/ALT</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>6 to 7</td>
<td>6</td>
<td>Nausea, vomiting</td>
<td>0</td>
<td>------</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>9</td>
<td>5, 7</td>
<td>Abdominal pain</td>
<td>0</td>
<td>------</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>10</td>
<td>5</td>
<td>Vomited 20 times</td>
<td>1</td>
<td>Normal AST/ALT</td>
</tr>
</tbody>
</table>
involved multiple victims (Joubert et al., 1984; Abdu-Aguye et al., 1986; Levin et al., 2000; Kulkarni et al., 2005; Menezes et al., 2006; Rai and Lakhanpal, 2008). The fact the children concerned are older, school-aged children, suggests the ingestion is a result of curiosity and exploration rather than excessive hand-to-mouth activity normally observed with poisoning in younger children.

Because of its potential for systemic toxicity, we recommend gastric lavage be performed when ingestion is recent (within one hour) and activated charcoal be given for all cases where time of ingestion is < 4 hours. Many patients may not be able to tolerate activated charcoal if they already have nausea and vomiting. Patient outcomes, both in our case series and in the reported literature, were favorable. No permanent sequelae or major morbidity were reported.

Although Jatropha curcas ingestion can cause severe gastrointestinal symptoms, it is not associated with major morbidity or mortality. However, school children, especially in rural areas, should be warned of the plant’s potential for toxicity to discourage experimentation by tasting.

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REFERENCES


