

EXPERIMENTAL POISONING OF CATTLE BY THE PERICARP OF THE FRUIT OF *Ricinus communis*¹

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O pericarpo do fruto maduro de *Ricinus communis* L. (fam. Euphorbiaceae), administrado por via oral a oito bovinos, causou sintomas de intoxicação em seis deles, provocando a morte de quatro animais que receberam o material vegetal em quantidades a partir de 5 g/kg. Os sintomas neuro-musculares foram os mesmos que os observados na intoxicação pelas folhas, mas diferentes da gastro-enterite causada pelas sementes da planta; consistiram em desequilíbrio no andar, necessidade de deitar após curta marcha, que era feito com dificuldade, em tremores musculares, sialorréia e movimentos de mastigação, recuperação ou morte rápidas. A evolução foi sempre de poucas horas. O pericarpo dessecado é aproximadamente quatro vezes mais tóxico que as folhas verdes recém-colhidas e o quadro de intoxicação é mais agudo ainda. Tanto os achados de necropsia como histopatológicos na intoxicação pelo pericarpo foram praticamente negativos.

TERMOS DE INDEXAÇÃO: Plantas tóxicas, *Ricinus communis*, Euphorbiaceae, pericarpo do fruto, intoxicação experimental por planta, bovinos.

ABSTRACT.- Pericarps of the ripe fruit of the castor bean plant (*Ricinus communis* L., Euphorbiaceae) were given orally to eight steers. Symptoms of poisoning were seen in six of the animals. Four receiving 5 g/kg or more of the plant material subsequently died. The neuro-muscular symptoms were the same as those observed in experimental poisoning by the leaves, different from the gastro-enteritis produced by the seeds of the plant. The symptoms were: swaying gait; a necessity to lie down after short periods of exercise; difficulty in lying down; muscular tremors; salivation and chewing movements. The symptoms persisted a few hours and were followed by either rapid recovery or death. The dried pericarps are approximately four times as toxic as fresh green leaves and the reaction observed is even more acute. Only minor post-mortem and histopathological changes were found.

INDEX TERMS: Poisonous plants, *Ricinus communis*, Euphorbiaceae, pericarp of the fruit, experimental plant poisoning, cattle.

INTRODUCTION

The toxicity of the seeds of the castor bean plant (*Ricinus communis* L.) is well known (Steyn 1934, Völker 1950, Watt & Breyer-Brandwijk 1962, Kingsbury 1964, Clarke & Clarke 1967). Due to ricin, a toxalbumin, ingestion of the seeds by

animals causes a gastro-enteritis. It has been shown that the leaves of this plant are also toxic to cattle, eliciting neuro-muscular symptoms, assumed to be due to a toxic principle different from ricin (Tokarnia et al. 1975).

The known toxicity and wide distribution of *R. communis* in Brazil, both as a wild and as a cultivated plant, prompted the examination of the pericarp of the fruit for toxic properties.

MATERIALS AND METHODS

Eight steers, 1 to 2 years old, were given orally variable amounts of the dried and milled pericarps of the ripe fruits of *Ricinus communis* L. (fam. Euphorbiaceae). The plant material was collected in the State of Rio de Janeiro. (Fig. 1)

The experimental animals were kept in individual boxes with ample water and a normal supply of concentrates and cut green grass. Clinical examinations were performed before and during the experiments. Body temperatures were taken and auscultation of heart, lungs and rumen was made. The animals were exercised to help identify neuro-muscular symptoms.

In the cases where death occurred, post-mortem examinations were performed immediately, completed by histopathological examinations of the central nervous system and organs of the thoracic and abdominal cavities. Small pieces of the organs were fixed in 10% formalin, embedded in paraffin; sectioned with a microtome and stained with haematoxylin and eosin (H + E). When vacuolation of liver cells was observed in H + E preparations, more sections were cut in a cryostat and stained with Sudan III.

RESULTS

The main results, as summarized in Table 1, show that the pericarp of *R. communis* is toxic for cattle. Doses above

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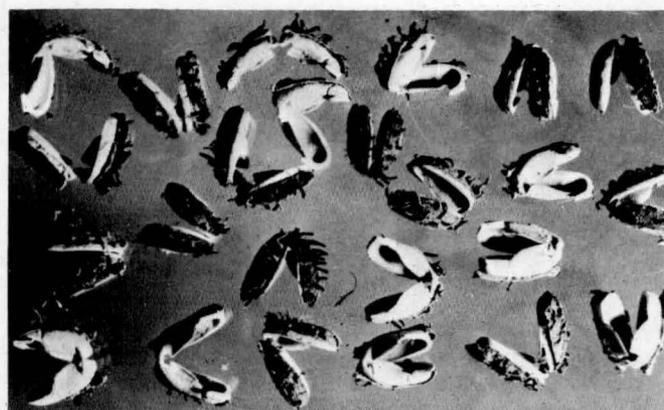


Fig. 1. Pericarps of mature fruits of *Ricinus communis* L.

5 g/kg caused the death of four animals. The symptoms and the course of poisoning were similar in all animals, but varied in intensity in the six animals affected. In the animals that died, first symptoms appeared between 1 h 45 min. and 4 h 35 min., and lasted from 1 h 30 min. to 4 h 40 min., with death occurring between 5 h 30 min. and 8 h 5 min. after the ingestion of the plant material. Two animals showing first symptoms of poisoning between 4 h 30 min. and 4 h 50 min. continued affected for 5 to 6 hours, but had recovered by 9 h 50 min. to 10 h 30 min. after the administration of the plant material. The symptoms observed were a swaying gait, the necessity to lie down after short periods of exercise, difficulty in lying down, muscular tremors, salivation and chewing movements. The only port-mortem finding was the presence of petequiae on the epicardium of one animal (Bov.

3570). Histopathological examinations revealed slight hydropic degeneration in the center of the liver lobules in one animal (Bov. 3565).

DISCUSSION AND CONCLUSIONS

The clinical picture and lesions observed in the poisoning of cattle by the pericarp of the ripe fruit of *Ricinus communis* are identical to those caused by the leaves of the plant, but different from those caused by the seeds. In poisoning by the seeds, the toxic principle responsible is ricin, a toxalbumin, causing a gastro-enteritis. That involved in the poisoning by the pericarp is probably the same as contained in the leaves, giving rise to neuro-muscular disturbances.

It should be mentioned that neurotoxic effects reproduced in mice by extracts of *R. communis* leaves were shown to be due to ricinine, an alkaloid (Humphreys 1977). The same toxic principle is possibly the cause of the neuro-muscular symptoms observed in cattle after the ingestion of the leaves, as well as the pericarps, being more concentrated in the latter.

The differences in the toxicity between the leaves and the pericarps are 1) the toxic dose levels, 2) the time before first symptoms appear, and 3) the duration of the symptoms. The dried pericarps were four times more toxic than the fresh leaves; the lethal dose of the fresh leaves was 20 g/kg (Tokarnia et al. 1975), while that of the dried pericarps was 5 g/kg. The first symptoms after ingestion of the plant material, in the cases resulting in death, were observed earlier in the poisoning by the pericarp, between 1 h 45 min. and 4 h 35 min., compared with 3 to 6 hours after ingestion of the leaves.

Table 1. Experiments with the pericarp of the ripe seeds of *Ricinus communis* L. in cattle

Animal		Plant material given				Symptoms	Appearance of symptoms	Duration of symptoms	Time of recovery	Time of death
Number	Weight kg	Amount g	Dose g/kg	Date of collection	Date of administration					
3563	167	334	2.5	1974	16. 1.74	Without	—	—	—	—
3494	153	400	2.5	"	15. 8.74	+(b)	4h 30min.(c)	< 6 hours	< 10h 30min.	—
2413	142	560	4	1968	10. 1.69	Without	—	—	—	—
3552	142	568	4	1974	10. 1.75	++	4h 50min.	5 hours	9h 50min.	—
3565 (21634)(a)	99	500	5	"	14. 8.74	Died	1h 50min.	4h 40min.	—	6h 30min.
3574 (21718)	188	940	5	"	17.10.74	Died	1h 45min.	3h 45min.	—	5h 30min.
3570 (21622)	91	682.5	7.5	"	31. 7.74	Died	4h 35min.	3h 30min.	—	8h 05min.
2852 (20124)	119	1260	10.5	1968	6. 1.71	Died	4h 30min.	1h 30min.	—	6h

(a) Histopathologic reference number.

(b) + Slight symptoms, ++ moderate symptoms.

(c) After the initiation of the administration of the plant material.

The course of the poisoning is also faster with the pericarp, between 1 h 30 min. and 4 h 40 min., as compared to 2 to 15 hours with the leaves.

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