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Incidences of poisonings due to *Chlorophyllum molybdites* in the state of Paraná, Brazil

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ABSTRACT

Three recent cases of poisoning by Chlorophyllum molybdites, *including the first one known from Brazil, have been reported from the state of Paraná. A morphological description of the material causing the first poisoning was provided and the associated case history has been described in detail. An overview of this species' distribution in Brazil is given.*

Key words: *Chlorophyllum*, poisonous fungi, mycetism, Paraná (state) - Brazil

INTRODUCTION

In the Brazilian state of Paraná, few cases of poisoning by wild mushrooms have been reported (Meijer 2001: 146) but in none of the cases the fungus material was directed to a specialist for the identification, except in the cases described here. On September 16, 2000, a poisoning occurred due to the consumption of a fungus collected from a rural property in the municipality of Araucária, situated in the metropolitan region of Curitiba, state of Paraná. The clinical aspect was partially documented by the Public Health Secretary of Araucária. The site was visited nine days after the poisoning, and a collection of the species was made and identified as *Chlorophyllum molybdites* (G.Mey.: Fr.) Massee.

The aim of this work was to provide a description about the species and discuss its distribution and toxicity in a general context.

MATERIALS AND METHODS

The mushroom collections were studied with an Ernst Leitz Wetzlar monocular microscope with 100X objective, and a 10X eyepiece with micrometer disc. For the microscopic study of hyaline structures, Congo Red in water was used for the fresh specimens and Congo Red in 10% ammonium hydroxide for the dried specimens. Amyloidity tests were done with Melzer's reagent prepared according to Singer (1975). Metachromy of spore walls was checked in Cresyl Blue in dilute aqueous solution. Descriptive morphological terms followed Vellinga (1988) and Vellinga and

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Noordeloos (2001). The abbreviation K. and W. refers to Kornerup and Wanscher (1978). Slenderness index = (stipe length x stipe length) / (stipe thickness x pileus breadth). Q = (length of spore) / (breadth of spore). The notation [20/2/1] stands for '20 spores measured from 2 basidiocarps belonging to one collection'. HFM refers to 'Herbário Fernando Cardoso', at the *Centro Nacional de Pesquisa de Florestas - Embrapa Florestas*, Caixa Postal 319, 83411-000 Colombo, Paraná, Brazil. Abbreviations of scientific periodicals and monographs and of authors of taxa follow the Plant Names Project (http://www.ipni.org).

RESULTS

Morphological description

Short characteristic: Medium-sized to large basidiocarps. Pileus, when opened, with smooth brown disc and with brown scales on white background colour. Lamellae remote from stipe, white at first and mostly gaining green or olive tint on maturing. Stipe with smooth to striate surface, and with clavate base and thick, membranous, double-edged annulus. White context changing to greyish orange on bruising. Fresh spore print greyish green. Spores mostly 10-13 x 8 µm, ovoid to amygdaliform, dextrinoid, thick-walled, with broad, truncate germ pore.

Macroscopical characters: *Basidiocarps* gregarious, densely gregarious or fasciculate. *Pileus* when young and unopened 10-60 mm diam. and 9-45 mm high, globose to hemispherical, evenly brown (K. and W. 6E4); when opened 60-230 mm diam., from hemispherical with inflexed margin to plano-convex with broad, low umbo, surface layer remaining continuous on the disc, but around it disrupting into dispersed, large (about 5 mm diam.), appressed scales with uplifted edge; the background remaining rather smooth or becoming densely squarrose or appressed squamulose from small (about 1.5 mm diam.) and triangular, whitish then brownish orange (5C3) scales; the background between scales remaining white; dry all over, non-hygrophanous, entire outer margin (10 mm width) sulcate-striate, or smooth; thin- to thick-fleshed (context < 24 mm thick near centre and < 15 mm thick above midpoint of lamellae). *Lamellae* free, < 3 mm remote from stipe, close, < 10 mm broad in unopened pileus and < 24 mm broad in opened pileus, first pure white, then yellowish white/greenish grey (1AB2) or pale green/greyish green (27AB3), finally olive brown (4EF3), with concolorous, even edge; lamellulae attenuate. *Stipe* when young with pileus still unopened 18-110 mm long, 12-21 mm wide at base and 5-11 mm wide at narrowest part; when mature and pileus opened 100-187 mm long, 15-29 mm wide at base and 9-15 mm wide at narrowest part; base clavate, above base gradually slightly attenuated to apex; at first stuffed, becoming fistulose; annulate; at first entirely pure white, below annulus finally becoming partially or entirely yellowish brown (5DE4), turning greyish brown (8F3) on drying, above annulus remaining white; surface smooth, below annulus longitudinally striate when fully dry, macroscopically subglabrous; basal mycelium cottony and pure white. *Slenderness index* = 7-24. *Annulus* superior, descending, thick membranous, persistent, immovable when fresh, < 8 mm broad, white and smooth above, edge double, inferior edge concolorous with the pileus centre. *Context* pure white; after bruising slightly or strongly and quickly changing to greyish orange (6B3) in all parts of stipe and pileus centre, finally brown (6E4); *odour* weak; *taste* mild. *Spore print* greyish green (27-29C4) when fresh.

Microscopical characters: *Basidiospores* [20/2/1] 10-13 x (7.2-)7.8-8(-8.8) µm (measured from spore prints), Q = 1.3-1.6(-1.8), average Q = 1.4, ovoid to amygdaliform, hyaline, containing one large guttule, dextrinoid; apex not papillate, germ pore truncate and < 2 µm broad; wall smooth, < 1 µm thick; hilar appendage 1.5 x 1 µm. *Basidia* 25-29 x 12-13 µm, 4-spored, clavate. *Cheilocystidia* densely packed, 32-45 x 14-38 µm, pyriform, clavate or spheropedunculate, smooth, thin-walled, hyaline or more frequently with evenly dissolved, very pale yellowish grey intracellular pigment. *Pleurocystidia* absent. *Hymenophoral trama* made up of parallel chains of 4-15 µm broad, thin-walled, smooth, non-amyloid hyphae, the narrower ones strictly cylindrical, the broader ones constricted at the septa. *Pileus covering* in centre made up of cylindrical-strangulated, smooth, thin-walled to very slightly thick-walled, obtuse hyphae 20-100 x 6-12 µm, with pale brown intracellular pigment. *Clamp-connections* easily found in the pileus covering.

- Material studied: BRAZIL, state of Paraná, Araucária, Palmital district, 25º38'S, 49º23'W; 25.ix.2000, leg. R.M. Curial (*de Meijer 3786*; HFC

274); same locality, 18.x.2000, leg. A.A.R. de Meijer and M.A.L. de A. Amazonas (*de Meijer 3792*; HFC 279).
- Habitat: at farm, on heap of bare, disturbed, peaty soil mixed with sawdust and enriched by pig excrement.

The poisoning case in the municipality of Araucária was well documented. The victims (with names on file in the authors' records), a farm labourer (at that time aged 43), his wife (a housewife, aged 37) and two sons (aged 21 and 23) - collected two large and four small fruitbodies of the species on a single spot. The mushrooms were prepared for the afternoon snack by soaking and cooking in oil for (at most) 10 to 15 minutes, with the addition of salt and garlic based seasonings. The mushrooms were consumed at 3 p.m., together with roasted chicken heart (which had been prepared separately), black coffee, Coca-Cola and bread. One of the victims did not drink coffee, another did not drink Coca-Cola and yet another did not eat bread. About two hours after the mushroom consumption all four victims experienced a bad taste reminiscent of the mushroom flavour rising back in the throat. This quickly turned to real nausea and, then, all four started to vomit with great intensity. In all male victims the vomit was bloody. One of the sons - with whom the symptoms started a few minutes later - still managed to telephone to his brother in Curitiba, asking him to come along quickly by car. But, as he did not tell him what was happening - not wanting to cause unduly alarm possibly resulting in high speed and a traffic accident - the brother arrived only one hour and a half later.

During this phase of vomiting all four suffered from colicky abdominal pain, which the woman described as being comparable in intensity as when giving birth to a child. At a moment, the woman fainted for a short while. In all four victims, the vomiting was so powerful, that - a few minutes after the process had started - they felt weakness to the point of being almost unable to move their legs, and they could no longer stand upright. It was not known if this was an effect of the dehydration and electrolyte imbalance caused by profuse vomiting or some direct toxicity effect. None of the victims felt able to walk to a neighbour to ask him to drive them to a hospital. Thus, they had no option except to wait for the unharmed son's arrival. The father felt he could be dying, and was already starting to accept this fate, as he knew he would make the transition in the best company ever. When his son finally arrived, a quick car-drive brought them to the nearest health care centre. During this 5 minutes trip the woman fainted four times. When arriving at the health care centre, nearly four hours after ingestion of the mushrooms, all four were still vomiting. Administration of intravenous fluid consisting of 5% glucose to rehydrate the victims immediately started the treatment. In addition, they received intramuscular injections with two medicaments, viz. Buscopan (N-butilescopolamine bromide and sodium dipirone), for relieving abdominal pain, and Plasil (metoclopramide chlorhydrate) to control vomiting. During this treatment all victims, except the father, felt a high pulse-rate. When leaving the centre, on their way to the car, the father and his oldest son had a fainting sensation and quickly returned to the centre to lay down for a while. In the meantime, the youngest son started to get diarrhoea. This also happened in the evening to the other two men, and to the woman in the next day. The stools were watery, but with the woman - not the men - it was pale blood-stained. Vomiting stopped soon after having left the centre and all four continued to take an oral rehydratant during the following 24 hours. The day after the poisoning all victims except the father felt intense headaches and all four experienced intermittent cold sweating. In several more days all victims felt a kind of bad taste and a slight disgust of food in general. It took them a full week to feel completely recovered from the poisoning. Amongst the victims, the woman seems to have suffered the most. She explained this by her weak and stressed condition at the moment the poisoning happened, because she had given much assistance to her ailing mother, who had died only one month before.

All four victims told us, afterwards, to regard the attendance at the health-care centre excellent. Actually, the treatment hardly differs from that given to a victim of the same fungus in India (Natarajan and Kaviyarasan 1991). But according to Lehmann and Khazan (1992) in the treatment of *C. molybdites* poisoning no materials that reduce the rate of gut motility should be administered.

The symptoms mentioned in this case history, particularly the intensive vomiting, and the moment of their appearance - rather soon after the ingestion - are typical for gastrointestinal syndrome and this is indeed the group of mushroom poisonings in which *C. molybdites* has always been classified.

After this first proven poisoning with *C. molybdites* two more cases followed in the state of Paraná involving the same species, one in 2000 and one in 2003. In both cases the fungus material was directed to AARM for identification, through the Secretaria de Estado da Saúde in Curitiba. These cases were the following:
- 16 October 2000, in the municipality of Marumbi (23º46'S, 51º44'W), a farm labourer aged 44 ate (raw or cooked?) one tenth of a mushroom pileus and started to feel the symptoms one and a half hour after consumption. More data on this case were not made available to us. This material has been preserved as exsiccates HFC 277 and *de Meijer 4166*. The spore size in this collection is 10-12 x 7.8-8 µm (Q = 1.25-1.5);
- on 17 February 2003, in the municipality of Irati, Monjolo district (25º33'S, 50º42'W), a housewife aged 26 collected this fungus in a pasture near her home, ate a little fragment raw and cooked the rest at home for dinner, which then was consumed by herself, a man aged 22, a girl aged 12 and a boy aged 10. All four persons started to feel the first symptoms of poisoning three hours after ingestion. All four then experienced lethargy for a period of 5-13 hours, and nausea, vomiting and excessive salivation for a period of 2-5 hours. All but one (the man) got colic (lasting 3-7 hours), all but one (the girl) got diarrhoea (lasting 3-7 hours) and one (the woman) felt dizzy (for 4 hours). All four got hospitalised in the evening (there they received a symptomatic treatment: endovenose re-hydration, Plasil and Buscopan) and were discharged from the hospital 20 hours afterwards. The fungus material causing this poisoning has been preserved as exsiccate *de Meijer 4148*. In this collection spore size is 9-12(-14) x 7-8(-9) µm (Q = 1.3-1.5[-1.6]).

The basidiospore size of the three *C. molybdites* collections causing poisoning in Paraná thus varies between 9-13(-14) x 7-9 µm.

The first author has been studying macromycetes in Paraná since 1979 (Meijer 2001), and encountered *C. molybdites* only three times, so the species is apparently rare on the Curitiba tableland where he has concentrated his work. Three more collections, made in Paraná by others, have come to his hands over the years. These collections, except those causing the poisonings and already listed above, are the following (preserved as exsiccata, unless otherwise indicated):

1989, April 19, Curitiba, Prado Velho quarter, campus of the *Pontificia Universidiade Católica* (25º27'S, 49º15'W), leg. M. de L. Todeschini (*de Meijer 1867*);

1993, February 17, Pontal do Paraná, Pontal do Sul (25º36'S, 48º23'W), leg. R. and H. Kolm (*de Meijer 2505*);

1993, March 25, São José dos Pinhais, Harry Feeken Street (25º33'S, 49º11'W), leg. A.A.R. de Meijer (*de Meijer 2602*);

2000, December 14, São José dos Pinhais, Roça Velha district (25º42'S, 49º05'W), leg. A.A.R. de Meijer (mat. not preserved);

2003, October 13, Antonina, Lageado (25º19'S, 39º35'W), leg. A.A.R. de Meijer (mat. not preserved);

2005, May, Pontal do Paraná, Pontal do Sul, Rua dos Flamboyants (25º36'S, 48º23'W), leg. H. Kolm (*de Meijer 4336*).

Menolli Jr. found the species in Londrina (23º23'S, 51º11'W), northern Paraná, in 2003 (Menolli Jr. and Ishikawa 2004).

The *habitat* and *distribution* of *C. molybdites* in Paraná is as follows. Rare in the temperate-subtropical climate zone, not rare in the subtropical-tropical zone; in the open landscape, in lawns among grass, and on disturbed soil, also on heaps of sawdust and/or soil mixed with excrement of domestic animals (poultry, pigs); from sea level to 1000 m. Fruiting from September to end of May.

DISCUSSION

Chlorophyllum molybdites has been a frequent cause of mycetism in all continents except Europe, as has been reported by many authors, viz. Avizohar-Hershenzon (1967), Natarajan and Kaviyarasan (1991) and Graff (1913, 1927) for Asia; Grgurinovic (1997), Southcott (1974) and Young (1989) for Australia; Arora (1991), CFSAN (2003), Eilers and Nelson (1974), Lehmann and Khazan (1992), Levitan et al. (1981), Pérez-Silva and Herrera (1986) and many others for North America; and Floch et al. (1966) and Singer (1969, 1975) for South America. Walleyn and Rammeloo (1994) summarise all references for Africa, and Reid and Eicker (1991) provide references for most continents. *Chorophyllum.molybdites* in North America is the species that causes more poisonings than any other mushroom, particularly because of its resemblance with *C. rachodes* (Vittad.) Vellinga and its ample occurrence in

lawns in urban areas (Arora 1991, Lehmann and Khazan 1992). Most cases of mycetism in residents of tropical metropoles are caused by this species (Courtecuisse and Duhem 1994). Its distribution is indeed mainly tropical-subtropical. In Europe it occasionally appears in hothouses and other artificially heated environments (Dennis 1952: 463, Vellinga 1990, Watling 1991). In America its northernmost occurrence indoors is in south-eastern Canada (Reid and Eicker 1991) and the southernmost occurrence is in the Argentinean province of Buenos Aires (Reid and Eicker 1991, Singer and Digilio 1952). Like many other species with an intercontinental distribution, it has been described under many names and extensive lists of synonyms were supplied by Grgurinovic (1997), Pegler (1977, 1983), Reid and Eicker (1991), Singer (1975), and others. Altogether there are no less then eight or nine epithets for this species, viz. *camporum, congolensis, esculentum, glaziovii, guadelupensis, molybdites, morganii, ochrospora*, and probably also *chlorospora*. It should be noted that *C. globosum* (Mossebo) Vellinga, from western Africa (Mossebo et al. 2000), is indeed a different species (Vellinga and de Kok 2002, Vellinga et al. 2003), though there might be an older name for it.

In South America the species has been reported, south to north - listing all countries - from Argentina (including type of *Annularia camporum* Speg.), Brazil, Venezuela, Guiana (Dennis 1952, Pegler 1983; types of *Chlorophyllum esculentum* Massee and *Lepiota ochrospora* Cooke and Massee), French Guyana (Courtecuisse et al. 1996) and Trinidad (Reid and Eicker 1991 and references therein). We have not seen any published records of Chile, Bolivia, Ecuador and Colombia. In Brazil it is known from the states of Rio Grande do Sul (municipalities of Santa Cruz do Sul and São Leopoldo; Pereira 2001, Rick 1961, Singer 1953b), Paraná (data presented here), São Paulo (São Paulo and Serra de Cantareira; Pegler 1997), Rio de Janeiro (Dennis 1952, Pegler 1983, Singer 1955; all these authors referring to the holotype of *Agaricus glaziovii* Berk.) and Pernambuco (Recife; Reid and Eicker 1991).

The data given in Table 1 show that in *C. molybdites* the basidiocarps have slenderness index < 25, and the spore quotient (Q) normally varies between 1.2 and 1.6 (the measurements of Soto et al. [2000] are likely to include immature and abnormal spores). The basidiocarps thus generally vary between rather stout and relatively slender and the spores between broadly ellipsoid and ellipsoid. A basidiocarp collected by Alfred Möller in Blumenau, in the State of Santa Catarina, and described by Bresadola (1896) as *Lepiota molybdites* is too slim (slenderness index = 47) for *C. molybdites*, the stipe quite long (25 cm) and the spores too long (15-17 x 9 µm) and too oblong (Q = 1.7-1.9).

In the state of Paraná, in the same type of open habitats where *C. molybdites* usually occurs, two much more common and edible species occur, *Macrolepiota bonaerensis* (Speg.) Singer and *Chlorophyllum hortense* (Murrill) Vellinga, that might well be confused with it, but differ in the white spore print. In addition, *M. bonaerensis* shows no reddening of the flesh, as occurs in both of the other species. And in *C. hortense* the inferior edge of the annulus is white and not thickened, whilst it is thickened and brown in both of the others. Microscopically, the species are very easily distinguished: *M. bonaerensis* differs from *C. molybdites* in having much larger spores (13-21 x 8.5-13 µm in the Paraná material), whilst *C. hortense* differs from it in having slightly smaller (in Paraná: 8.5-11 x 6-8 µm) non-truncate spores without a germ pore, 2-spored basidia and usually narrower cheilocystidia (5-10 µm broad in Paraná). *Macrolepiota bonaerensis* is edible (Singer 1953a, Singer and Digilio 1951), and so is *C. hortense* (Boa 2004).

The genus *Chlorophyllum* was considered to differ from *Macrolepiota* in the green spore colour and in the absence of clamp-connections (cf. Singer 1948, 1951). Later however, clamp-connections were found to be present in the type species of *Chlorophyllum* (Heinemann 1968, Natarajan and Manjula 1981, Singer 1969, Sundberg 1971), whilst in some *Macrolepiota* species they are rare of absent (Vellinga et al. 2003). The only difference which then remained between the two genera was the colour of the spore print (green in *Chlorophyllum* and white in *Macrolepiota*), but some authors did not consider this character alone sufficient for maintaining the generic separation and so the former was synonymized with the latter (Moreno et al. 1995).

Table 1 - Overview of some morphological characters of *Chlorophyllum molybdites*, based on collections made in the state of Paraná and on data from literature.

Source	Locality	Material described as having caused a poisoning	Spore size (µm)	Q (estimated by the present authors)
Avizohar-Hershenzon (1967)	Israel	unspecified	(7.5-)8.25-10.5 x (5.25-)6.75-7.5	1.2-1.4
Grgurinovic (1997: 439)	Australia	Yes!	9.6-12.8(-13.9) x 7.2-9.0	given as 1.4
Moreno *et al*. (1995)	Canary Islands	no	9.5-12.0 x 6.0-8.0	1.5-1.6
Natarajan & Manjula (1981)	Southern India	no	9.9-11 .0x 6.6-7.7	1.4-1.5
Pegler (1977, 1983; both descriptions are identical)	Africa and the Americas	unspecified	8-11 x 6.2-8	given as 1.34
Pérez-Silva & Herrera (1986)	Mexico	unspecified	10.0-10.9 x 6.8-8.5	1.3-1.5
Reid & Eicker (1991: 318-320)	South Africa	unspecified	8.0-10.0 x 6.5-7.2	1.3-1.4
Singer (1948: 138)	Florida (U.S.A.)	no	10.2-13.0 x 6.8-8.8	1.5
Singer (1969: 160)	Congo (Africa)	Eaten by the collector. Apparently non-poisonous.	8.7-11.0(-12.5) x 5.8-7.2	1.5(-1.74)
Singer (1969: 160)	Argentina	Yes!	(9.0-)9.5-10.5(-12.0) x 7.0-7.5; from spore print 9.0-10.5(-12.0) x 6.8-7.8	1.5
Soto *et al*. (2000)	Argentina	yes, probably	7-16 x 6-9	1.2-1.8
Sundberg (1968)	California (U.S.A.)	unspecified	(7.7-)10.3-12.2(-13.5) x (6.3-)7.7-9.0(-10.9)	(1.2-)1.35
Watling (1991)	Scotland	no	8-11 x 6-8	1.35
The present paper	Paraná (Brazil)	Yes!	(9-)10-13(-14) x 7.0-8.0(-9.0); from spore print s 10-13 x (7.2-)7.8-8.0(-8.8)	1.3-1.6(-1.8)
ALL SOURCES LISTED (except Soto *et al*. 2000, who apparently included abnormal spores)	All continents		7.5-14.0 x 5.8-9.0	1.2-1.6(-1.8)

Cheilocystidium size (µm)	Pileus diameter (cm)	Stipe size (cm)	Slen-der-ness Index
27-36 x 15-19.5	8-16(-20)	10-20 x 1.5-2.0 (thickness base 2.5-4.0)	8-13
22.0-41.6 x 12.0-20.4	<24	<28 x <2.5	13
25-35 x 10-15	7-20	5-25 x 1-2 (thickness base < 4.0)	3.6-25
24.2-33.0 x 18.7-22.0	7-10	11-14 x 1.3-1.5	12-13
27-45 x 10-20	5-24	11-28 x 1.3-2.5	1.3-19
29-35 x 10-18(-20)	4-15	6-15(-18) x 1.5-2.0 (thickness base 2.5-3.0(-5.0)	6-8(-11)
25-50 x 17-21	<12 (-30)	<12(-25) x <2.0(-2.5)	6(-8)
40-60 x 10-16.5	4.7-19	7-20 x 1.0-1.4 (thickness base 1.1-3.5)	10-15
size not given	size not given	size not given	-
20-34(-50) x 6.5-)11-20	size not given	size not given	-
35-45 x 9-15	6-14	5-14 x 0.7-1.3	6-11
(18.0-)21.9-47.4(-62.4) x (9.5-)10.3-25.5	4.5-15.5	5.7-12 x 0.6-1.5 (apex)	6-12
size not given	(6-)13-20	12-16 x 1.1-1.4 (thickness base 1.5-2.7)	9-10(-22)
33-45 x 14-38	1-23	1.8-18.7 x 0.5-1.5 (thickness base <2.9)	7-24
18.0-62.4 x (6.5-)9.0-38.0	1-24(-30)	1.8-28.0 x 0.5-2.0 (thickness base <3.5)	1.3-25.0

Recently, results of molecular studies have shown that the genera can best be maintained separate (Johnson 1999, Johnson and Vilgalys 1998). Weresub (1971) mentioned a difference in spore wall reactions between *C. molybdites* and *Lepiota brunnea*, but this works only for mature spores; in young spores the same reactions are visible (obscured in mature spores of *C. molybdites* by the colour of the spore wall) (Vellinga 2003a: 26). As a consequence Vellinga (2002, 2003b) incorporated many white-spored species in *Chlorophyllum*, including three of the species cited above: *C. hortense*, *C. rachodes* and *L. brunnea* (*C. brunneem* (Farl. and Burt) Vellinga). In Paraná *C. rachodes* and *C. brunneum* have never been found.

It has always been stated that, whilst *Chlorophyllum molybdites* is usually considered poisonous, some collections are eaten without causing any problems, at least not to certain individuals (cf. Murrill 1910, Graff 1927). Many speculations have been made about the possible reasons. A few authors have suggested that there may be two (or more) morphologically distinguishable taxa (Heinemann 1968, Singer 1955), but such characters that would separate them remain insufficiently elaborated (Dennis 1970, Heim 1978, Singer 1975, 1979). Singer

(1975) considers unlikely the possibility that amongst green-spored Chlorophyllums one would be poisonous and another one edible. Pegler (1977, 1983) distinguishes only one green-spored species and suggests that the toxicity of the fungus could be dependent upon climatic and habitat factors alone or, and this is more widely accepted, upon the susceptibility of the individual (Benjamin 1995, Graff 1927, Reid and Eicker 1991). Floch et al. (1966) have shown that poisonous material from French Guiana contained a toxic, water-soluble substance which was extremely labile with respect to time and temperature. Eilers and Nelson (1974) demonstrated that (one of) the toxin(s) is indeed a thermo-unstable protein molecule that is destroyed when the mushroom is cooked at 70 °C during thirty minutes. So, this particular toxin can apparently be made harmless by cooking the mushroom thoroughly and lastingly (Young 1989). Some studies have suggested that the poison presents cholinergic type effects (Floch et al. 1966), but Eilers and Nelson (1974) concluded that the toxin is probably not a choline derivative (cf. Lehmann and Khazan 1992). The species may as well be poisonous to mice and chicks if administered in high concentration (Eilers and Nelson 1974), and to dogs (Soto et al. 2000).

Edible material belonging to a green-spored *Chlorophyllum* has been reported from French Guiana (Pegler 1977, 1983) and some other American and African countries (Rammeloo and Walleyn 1993, Reid and Eicker 1991, Singer 1969), but in Asia green-spored *Chlorophyllum* is apparently consistently considered poisonous (Avizohar-Hershenzon 1967, Chang and Xiaolan 1995, Graff 1927, Imazeki et al. 1988).

In this connection it may be important to add the following information. The senior victim of the poisoning case in Araucária, Paraná, had acquired the habit of eating wild mushrooms from his father, who, on his turn, had learned it from his father, an immigrant from Italy. In the 1930s this grandfather used to collect wild mushrooms to sell at local markets nearby the city of Curitiba. Nowadays, no commercial collection of wild mushrooms exists in this area. Since the death of his father, twelve years before the poisoning case, he had collected and consumed edible mushrooms only at one occasion. Curiously enough, he insists that he consumed the same mushroom then, but did not experience ill effects. As he made this collection at a different site it cannot be excluded that that was in fact the edible *Macrolepiota bonaerensis*. The other possibility is that he indeed ate *C. molybdites*, but had either cooked it more thoroughly or that he ate fruitbodies in a more advanced stage of development. A hypothesis exists that this toxic species can sometimes become less toxic, even edible at maturity, when the lamellae have turned green (Reid and Eicker 1991). But this remains to be clarified and no risks should be taken with this species.

Though the symptoms of *C. molybdites* poisoning are serious, consumption of this fungus has only once or twice been fatal, in both cases to toddlers (Benjamin 1995, Lehmann and Khazan 1992, Reid and Eicker 1991). Since this mushroom species occurs frequently in irrigated lawns it is likely to be found there by children, who consider this very attractive looking mushroom 'irresistible' (Arora 1986, 1991). Consequently, it is very important that the Brazilians get warned against it. For this reason in Paraná much publicity has been given to the first poisoning case and it was communicated to the general public through television (*TV Globo*) and press (*Estado do Paraná* newspaper) on October 18 and 19, 2000, when a general warning against the consumption of any wild mushrooms without accurate identification was also given. A communication to the scientific community was also made during the third Brazilian Congress of Mycology (Amazonas et al. 2001). It is fortunate that Guerrero and Homrich (1999) have included this species in their popular field guide, with a coloured picture of it on the front cover.

The three recent cases in Paraná are apparently the first *C. molybdites* poisonings reported for Brazil. Because of the importance of this mushroom as a potential Brazilian health risk we would like to give it a common name in Portuguese. We propose: *guarda-sol-de esporos-verdes*, which is a literal translation of green-spored parasol, as it is aptly called in North-America (Arora 1986, 1991).

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RESUMO

Três casos recentes de envenenamento por *Chlorophyllum molybdites*, incluindo o primeiro caso conhecido para o Brasil, são relatados do Estado do Paraná. Uma descrição morfológica do material que causou o primeiro envenenamento é apresentada, assim como uma narrativa detalhada do respectivo caso clínico. É, ainda, fornecido um panorama da distribuição desta espécie no Brasil.

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