Poisonous flora at IFSULDEMINAS – Machado Campus, in Machado city, state of Minas Gerais

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Abstract

Brazil has a high index of intoxications due to toxic plants, which are organisms known by their potential to synthetize active principles capable of causing changes in human and animal organisms. The research aimed to locate toxic plants present at Campus of Instituto Federal do Sul de Minas Gerais, in Machado city, because of its high daily transit of workers, students and local residents in general that can be exposed to those plants. For such, it was made expeditions throughout the campus for the tabulation of species found at the urbanized areas of the *Campus*. It was identified, registered and geo-referenced 39 toxic plants belonging to 19 botanical families as well as their popular names and their toxic principles.

Keywords: Plants toxicology. Intoxications. Active toxic principles. Public health.

Introduction

There are many species of plants that are poisonous and can cause injuries in the human body, and many of them are found in gardens and urban spaces for landscaping purposes without people fully knowing the toxic potential and the effect of those plants in the human body (TAMILSELVAN et al., 2014). Those species provoke intoxication symptoms in human beings (HARAGUCHI, 2003). These symptoms are derived from toxic substances capable of causing death, heavy injuries and many other health damages. The substances are produced by the secondary metabolism of the plants, which act as a defense mechanism against pests and pathogens (SCHWAN-ESTRADA; STANGARLIN; CRUZ, 2003).

Haraguchi (2003) shows that the toxic principle of plants is from one or more substances chemically well defined, which can have an equal or different origin. Among many substances identified as responsible for intoxications in accidents with toxic plants, it is possible to cite the calcium oxalate crystals (CaOx), formed in plants through the union of oxalic acid and calcium. Many are the configurations CaOx crystals can assume in relation to its morphological structures, and the most common in plants are: prismatic crystals, druses and raphide (needle-shaped), the last one is responsible for problems in human health (FRANCESCHI; NAKATA, 2005).

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Doan (2004) shows us that besides CaOx crystals, other substances that outstand as active principles of plant intoxications are the toxalbumins such as the ricin. This toxin is so potent that the United States Center for Disease Control (CDC) listed the ricin derived from the castor bean (*Ricinus communis* L.*)* as the second priority of US national security due its terrorist potential (DOAN, 2004).

In relation to terrestrial plants, Brazil is the world most biodiverse country, 15 to 20 % of all known species of plants are found in the territory (SHEPHERD, 2003). Thus, as pointed by Forzza et al. (2012), the study of Brazilian flora is recognized as the richest in the world, and those studies are constant when it comes to toxic plants and their effects and active principles, either from the phytotherapeutic point of view – as in a research conducted with the purpose to test the subacute toxicity of the ethanolic extract from the aroeira-do-sertão leaves (*Myracrodruon urundeuva* Allem.) (BORELLI et al., 2016) – or from the agronomic point of view – in a study that aimed to test the degrees of intoxication by the leaves of *Crotallaria pallida* Aiton in ovine (sheep) (OLIVEIRA et al., 2016) – besides other studies that analyses those specificities.

Studies which aim to investigate the geographic occurrence of such plants are incessant, being conducted from the North region of Brazil (AGRA; FREITAS; BARBOSA-FILHO, 2007) to its South region (CORREA; MENDEZ, 1996) in addition to many other locations around the globe, such as Mexico (FLORES et al., 2001) or Nigeria (NUHU et al., 2009). Those studies are, normally, correlated to the medicinal potential that some of the toxic plants show (TAMILSELVAN et al., 2014).

Therefore, this study aimed to investigate the diversity and the occurrence of toxic plants at the urbanized area in Instituto Federal do Sul de Minas Gerais (IFSULDEMINAS) - Campus Machado, as well as to point their probable and most important active toxic principles, origin, naturalization degree and places of occurrence inside the study area.

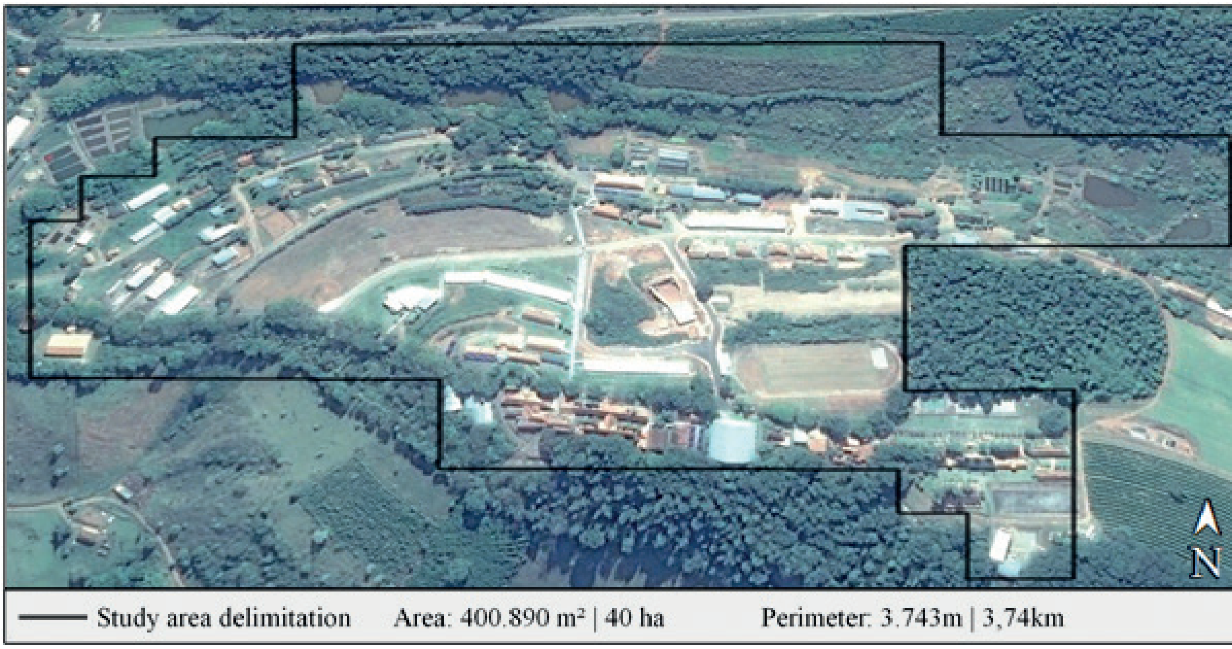
Material and methods

Study area

The study was conducted at the urbanized area of IFSULDEMINAS Campus Machado, located in Machado city, Minas Gerais state. The campus urbanized area is around 40 ha and has a high transit of people which can be exposed to toxic plants. Besides the urbanized area, it was investigated places near to those areas that are sporadically visited by students and workers, such as the pisciculture sectors and the pastures and plantation areas.

The perimeter and the urbanized area of the campus were determined using Google Earth and Earth Point software (FIGURE 1).

Figure 1. Urbanized area where it was made the floristic study of toxic plants located at IFSULDEMINAS - Campus Machado.



Source: Google Earth/Earth Point (2017).

Floristic study and toxic active principles characterization

The floristic study was conducted in May 2015, when it was obtained the location of species that were likely to contain active toxic principles and were present in the urbanized areas at the campus. Expeditions throughout the campus took place weekly, species or populations were registered, collected and georeferenced by UTM coordinates (Universal Transverse Mercator) using Garmin 62s GPS. Following, the individuals and their geographic coordinates were plotted in the study site map. The places where the plants were found were segregated in: flower beds, urban arboriculture, vegetable garden, pasture and plantations. The species were categorized accordingly to their origin in native and exotics, and in relation to their naturalization degree in cultivated and naturalized, in consonance with the terminology provided by Moro et al. (2012).

The toxic plant individuals were identified at the premises of the Geraes Herbarium at the campus by consulting specialized literature and exsiccates collections available online and, after, the scientific nomenclature and their respective botanical families were verified on the websites: *Lista de Espécies da Flora do Brasil* from *Jardim Botânico do Rio de Janeiro*, The Plant List from Royal Botanic Gardens Kew and Missouri Botanical Garden. The collected individuals were incorporated to the collection of the Geraes Herbarium at IFSULDEMINAS – Machado Campus.

The toxic principles present in each species, their popular names and the structures which contained toxins were determined according to the information available in the compilation of Brazilian toxic plants found in Matos et al. (2011) and in Hojo-Souza, Carneiro and Santos (2010) for pteridophytes. The toxic principles were categorized in the following classes of chemical compounds: alkaloids, calcium oxalate crystals, cyanogenic glycosides, steroids glycosides and terpenes. Lastly, the classification system APG IV (THE ANGIOSPERM PHYLOGENY GROUP, 2016) was used in order to arrange the toxic plants floristic list.

Results and discussion

It was identified and registered 39 species belonging to 19 botanical families (TABLE 1). Near to 50 % of the found species belong to four botanical families, which are: seven species of Araceae, six of Euphorbiaceae, four of Leguminosae and four of Solanaceae. For Apocynaceae, Asparagaceae and Moraceae, two species were registered for each. The other 12 species were registered in twelve different botanical families.

It was registered 13 toxic principle groups; they were further organized in descending order of representativity, being: alkaloids, calcium oxalate, cyanogenic glycosides, steroids glycosides, terpenes, phenols, toxalbumins, oxalic acid, cardiac toxic glycosides, flavonic glycosides, histamines, pyrocatechols and quinones.

Table 1. Floristic list of the toxic plants registered at the urban areas of IFSULDEMINAS – Machado Campus containing their popular name, toxic structures and active principles, place where they were found, origin, naturalization degree and UTM coordinates, at which: O/ND = Origin/Naturalization Degree; N = Native; E = Exotic; C = Cultivated; Nat = Naturalized; FB = Flower Beds; PI = Plantations; Pa = Pastures; VG = Vegetable Gardens; UA = Urban Arborization.

Families/ Species	Popular Name	Toxic Structures	Toxic Principles	Local	O/ND	UTM (23K)
ANACARDIACEAE						
Lithraea brasiliensis Marchand	Aroeira-brava	Branches and Leaves	Pyrocatechols (3-pentadecyl-tecol, 3-pentadecyl catecholate, 3-heptadecyl catechol and 3-heptadecylde-nylcatechol)	FB	N	407652/7600334
APOCYNACEAE						
Allamanda cathartica L.	Quatro-patacas	Hole Plant	Cardiac toxic glycosides and toxalbumins	FB	N	408164/ 599943
Plumeria rubra L.	Pluméria	Latex found in stem, leaves and flowers	Alkaloids (agoniadine, plumerine e plumeri-tannic acid)	FB	E	408108/7600180
ARACEAE						
Caladium bicolor (Aiton) Vent.	Tinhorão	Hole Plant	Calcium oxalate	PI	N	408046/7600314
Colocasia antiquorum Schott	Inhame	Hole Plant	Calcium oxalate	VG	E	408394/7600011

(Continua)

Families/ Species	Popular Name	Toxic Structures	Toxic Principles	Local	O/ND	UTM (23K)
Dieffenbachia seguine (Jacq.) Schott	Comigo-ninguém-pode	Hole Plant	Calcium oxalate and saponins	FB	N	407991/7600263
Monstera deliciosa Liebm.	Costela-de-adão	Latex found in stem and leaves	Calcium oxalate and saponins	FB	E	408363/7600165
Philodendron bipinnatifidum Schott	Banana-de-macaco	Hole Plant	Calcium oxalate	FB	N	407832/7600326
Philodendron hastatum K.Koch & Sello	Azaléia	Leaves, flowers and nectar	Terpenes (andromedo-tixin)	Pa	N	408330/7600072
Zantedeschia aethiopica (L.) Spreng.	Copo-de-leite	Hole Plant	Calcium oxalate and saponins	FB	E	408189/7600199
			ASPARAGACEAE			
Agave attenua-ta Salm-Dyck	Agave-dragão	Leaves and Roots	Steroids glycosides (saponins)	Pa	E	408146/7600332
Sansevieria trifasciata Prain	Espada-de-são-jorge	Hole Plant	Steroids glycosides (saponins) and organic acids	FB	E	407898/7599985
			BIGNONIACEAE			
Spathodea campanulata P. Beauv.	Tulipeira	Flores e nectar	Alkaloids	UA	E	407954/7600012
			BORAGINACEAE			
Heliotropium indicum L.	Fedegoso	Hole Plant	Alkaloids (indicin, lasiocarpine, heliotrin e equinatin)	FB	N	408241/7600138
			DENNSTAEDTIACEAE			
Pteridium arachnoideum subsp. *arachnoideum* (Kaulf.) Maxon	Samambaia-do-campo	Leaves and young leaves	Cyanogenic glycosides (type I Thiaminase)	FB	N	407891/7600265
			EQUISETACEAE			
Equisetum giganteum L.	Cavalinha	Stem and strobilus	Flavonic glycosides, aglycone articulatidine (gossipetin)	Pa	N	408389/7600113

(Continua)

Families/ Species	Popular Name	Toxic Structures	Toxic Principles	Local	O/ND	UTM (23K)
			EUPHORBIACEAE			
Codiaeum variegatum (L.) Rumph. ex A. Juss.	Cróton	Seeds, Leaves and Stem	Alkaloids (crotin)	UA	E	407954/7600293
Euphorbia cotinifolia L.	Leiteiro-vermelho	Hole Plant	Toxalbumins	UA	N	408209/7599923
Euphorbia milii Des Moul.	Coroa-de-cristo	Latex found in stem and leaves	Terpenes (diterpenes - milliamines)	FB	E	408005/7600027
Euphorbia pulcherrima Willd. ex Klotzsch	Bico-de-papagaio	Latex found in stem and leaves	Toxalbumins	FB	N	407919/7600024
Joannesia princeps Vell.	Cutieira	Seeds	Alkaloids and neolignans (isoa-mericanine A, americanol A, isoa-mericanol A and (±) 3,3'- bisdeme-thylpinoresinol)	UA	N	407891/7600065
Ricinus communis L.	Mamona	Seeds and Leaves	Alkaloid (ricin)	UA	C	408097/7600246
			HYDRANGEACEAE			
Hydrangea macrophylla (Thunb.) Ser.	Hortência	Hole Plant	Cyanogenic glycosides (hidrangina)	FB	E	408131/7600026
			FABACEAE			
Anadenanthera colubri-na var. *cebil* (Griseb.) Alts-chul	Angico-vermelho	Leaves and Seeds	Cyanogenic glycosides and bufetenin	UA	N	407955/7600177
Crotalaria juncea L.	Gergelim-bravo	Seeds	Alkaloids pyrrolizidine (senecionine, tricodesmin, juncein, senecifylline and riddelliine)	PI	Nat	408135/7600227
Leucaena leucocephala (Lam.) de Wit	Leucacena	Leaves and Seeds	Alkaloids (mimosine, leucenol)	UA	Nat	408275/7599911
Spartium junceum L.	Giesta	Hole Plant	Alkaloids (cytisine)	Pa	E	408149/7600156
			MORACEAE			
Ficus carica L.	Figo	Leaves	Furanocumarins (psoralen e bergapten)	VG	C	408046/7600254

(Continua)

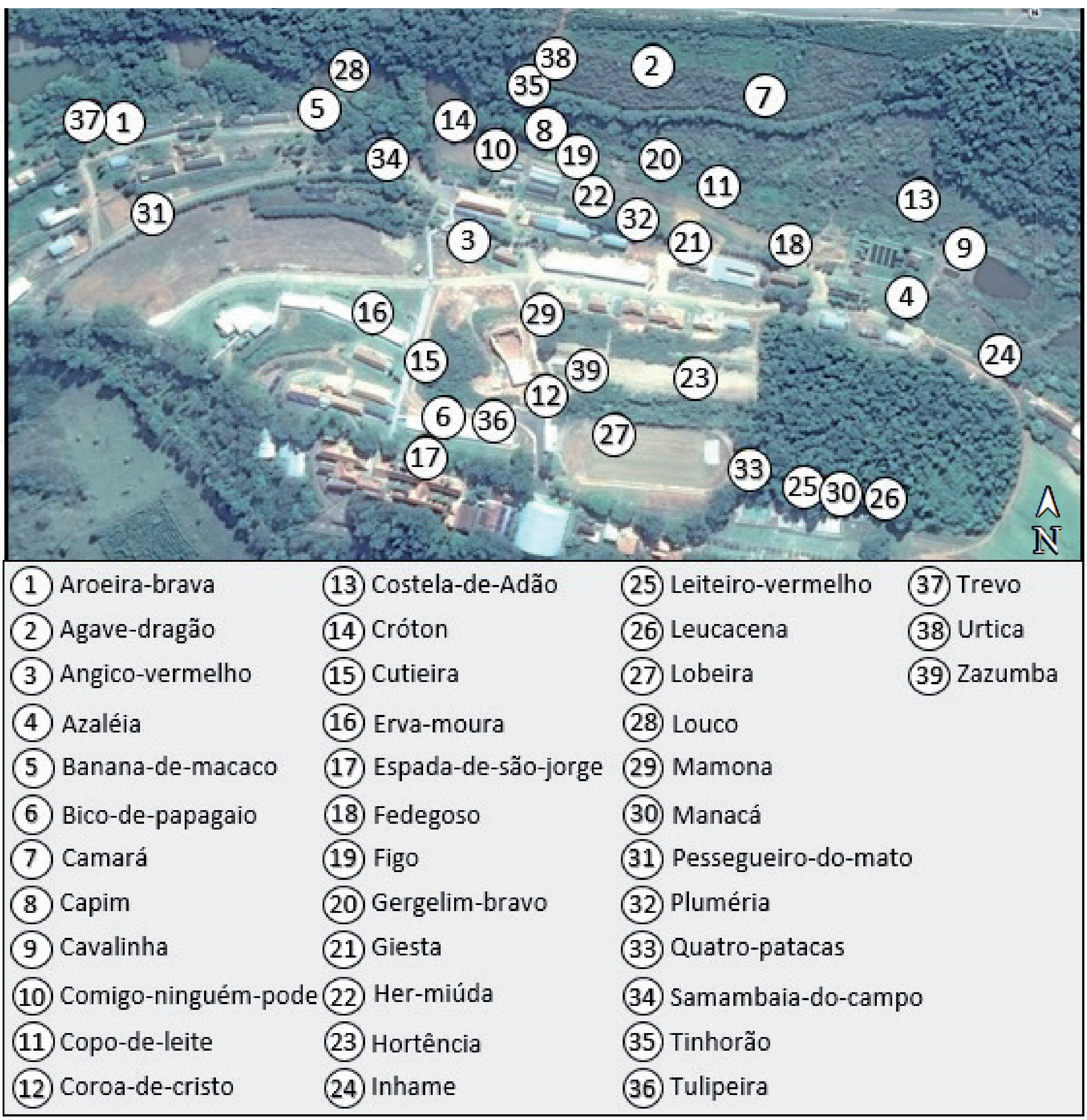
Families/ Species	Popular Name	Toxic Structures	Toxic Principles	Local	O/ND	UTM (23K)
Ficus pumila L.	Hera-miúda	Leaves and latex	Furanocumarins (bergapten)	FB	E	408055/7600224
			OXALIDACEAE			
Oxalis sp.	Trevo	Hole Plant	Oxalic acid	FB	N	407627/7600343
PLUMBAGINACEAE						
Plumbago scandens L.	Louco	Leaves and Roots	Quinones (plumbagin - naphthoquinone)	Pa	N	407866/7600362
			POACEAE			
Urochloa decum-bens (Stapf) R.D.Webster	Capim	Aerial Structures	Steroids glycosides (saponins): protodioscin, dioscin, iamogenin and diosgenin	Pa	N	408238/7600285
			ROSACEAE			
Prunus myrtifolia (L.) Urb.	Pessegueiro-do-mato	Bark, leaves and seeds	Cyanogenic glycosides (cyanide)	FB	N	407673/7600242
			SOLANACEAE			
Brunfelsia uniflora (Pohl) D.Don	Manacá	Hole Plant	Alkaloid brunfelsamedin (hopamidine)	FB	N	408229/7599922
Datura ferox L.	Zazumba	Leaves, Fruits and Seeds	Tropanes alkaloids (hyoscyamine and scopolamine)	UA	E	408041/7600043
Solanum americanum Mill.	Erva-moura	Fruits	Steroidal alkaloids and Assolanine	FB	N	407866/7600122
Solanum lycocarpum A. St.-Hil	Lobeira	Fruits	Indole alkaloids	Pa	N	408059/7599985
			URTICACEAE			
Urtica dioica L.	Urtica	Trichomes in the leaves and stem	Histamine, acetylcholine, serotonin	Pa	Nat	408053/7600346
			VERBENACEAE			
Lantana camara L.	Camará	Fruits and leaves	Hepatotoxic terpenoids (lantadene A and B; lanthanide)	FB	Nat	408037/7600275

Source: Elaborated by the authors (2017), with information presented in Hojo-Souza, Carneiro e Santos (2010) and Matos et al. (2011).

Regarding toxic principles diversity, 33 % of the catalogued individuals (13 species) have some type of alkaloid, while 16 % (6 species) have calcium oxalate with a crystal conformation in their stems and leaves. The cyanogenic glycosides are present in 10 % (4 species) and the steroids glycosides and terpenes are found in three species, corresponding to 8 % each.

Through the UTM coordinates presented in Table 1, it was possible to georeference the places in which the species were located (FIGURE 2) using Google Earth tool.

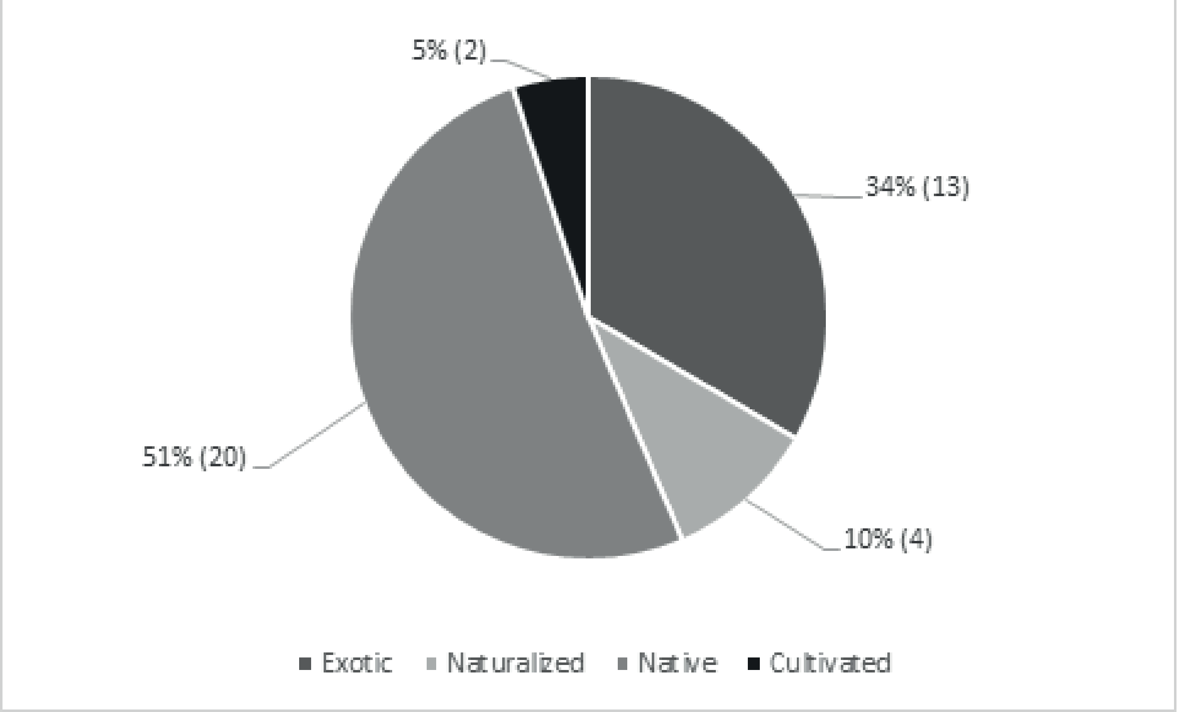
Figure 2. Insertion spots for the toxic plants catalogued from the UTM coordinates obtained and the popular names of the species found at IFSULDEMINAS - Machado Campus



Source: Elaborated by the authors (2017).

Out of the 39 found species, 13 (33 %) are exotic – such as the Zazumba (*Datura ferox*), Hortência (*Hydrangea macrophylla)* and Hera-miúda (*Ficus pumila*) – 4 (10 %) are naturalized – like the Urtica (*Urtica dioica*), the Camará (*Lantana camara*) and the Leucacena (*Leucaena leucocephala*) – 2 (5 %) are cultivated – Figo (*Ficus carica*) and Mamona (*Ricinus communis*) – and the others, 20 (51 %), are natives, not necessarily endemics, such as the Lobeira (*Solanum lycocarpum*), the Erva-moura (*Solanum americanum*) and the Manacá (*Brunfelsia uniflora*) (FIGURE 3).

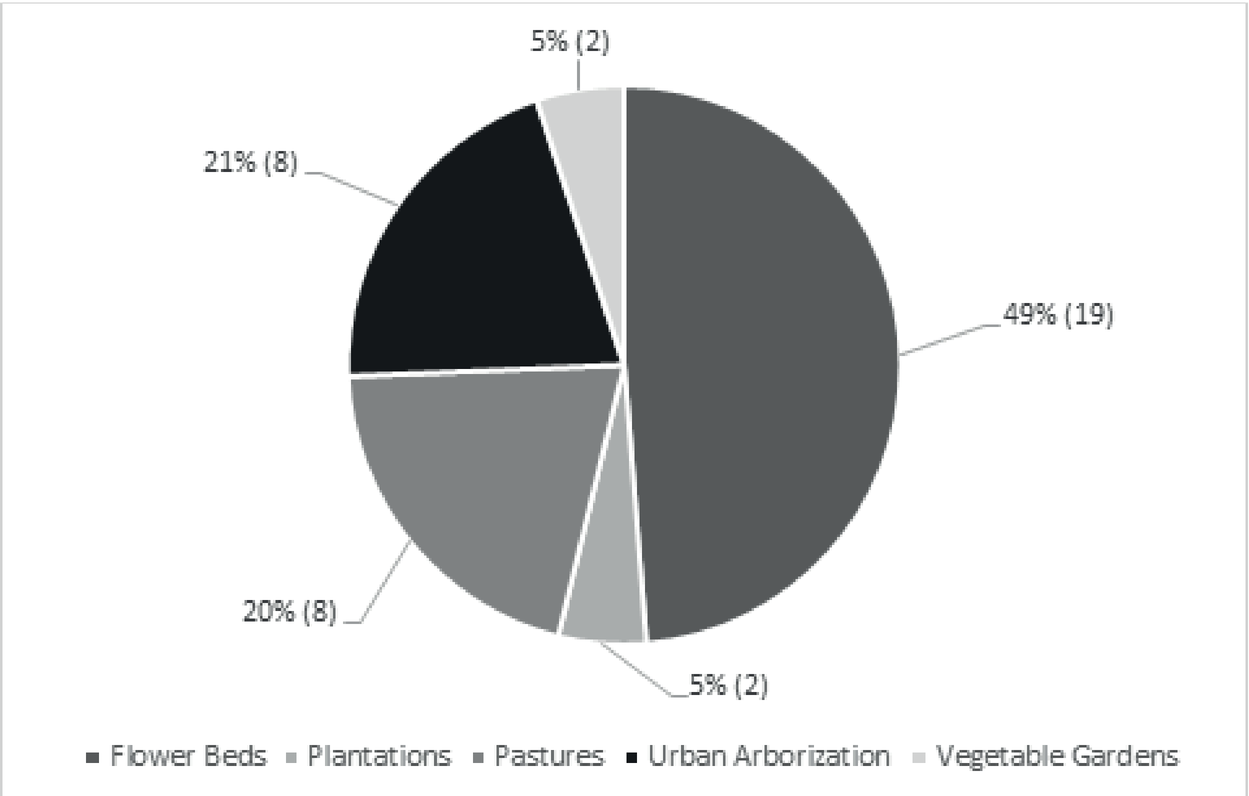
Figure 3. Percentage and number of toxic plants species obtained in the study at IFSULDEMINAS - Machado Campus, grouped in: Exotic, Naturalized, Cultivated and Native.



Source: Elaborated by the authors (2017).

Through the study of Figure 4, it can be observed 29 (74 %) of the toxic species are located in urbanized areas, which lead us to believe their positions were predefined based on their morphological characteristics for landscaping purposes. Another factor that seems to have influenced the location of many plants is the location of Comigo-Ninguém-Pode and Espada-de-São-Jorge species, both found indoors, in areas of high transit of people, probably because of the popular belief that they are able to ward off envy and provide protection, respectively. Moreover, from the 29 species located in urban area, 156 species (51 %) are exotic, cultivated or naturalized; hence, there is a high possibility the species have succeeded in those places because of landscaping choices made by humans.

Figure 4. Insertion spots for the toxic plant species obtained in the study at IFSULDEMINAS Machado Campus, grouped in Flower Beds, Plantations, Pasture, Urban Arboriculture and Vegetable Gardens.



Source: Elaborated by the authors (2017).

Out of the eight species found in places away from the urbanized area of the Campus, 4 (50 %) are native and their spatial distribution happened probably in a natural way and not through human selection. However, the fact that those plants are located away from places with a high transit of students and workers does not imply less risks to the human health since they are capable of providing indirect intoxications, for example, through the consumption of products from cattle and caprine that have ingested toxic plants which active principles can be found accumulated in the meat or milk intended for human consumption (MATOS et al., 2011). The plants Urtica, Agave-dragão and Capim were found at the campus, in places of cattle pastures; therefore, indirect intoxication can occur at the campus. However, further studies are necessary to verify this observation.

The compiled data concerning the location and the diversity of the toxic plants at the campus will be useful to prevent accidents and to the human health, as well as for the diffusion of knowledge about the diversity of plants, their active toxic principles and their effects. Moreover, cataloguing provides a better understanding of the environment people are, bringing the toxic plants to their attention.

Conclusions

The study showed at least half of the catalogued toxic species are not native and the majority of them is located in urbanized places defined by their landscaping characteristics. Further studies are necessary to investigate the potential of intoxication the species catalogued here have in their insertion places for different organisms.

Flora de plantas tóxicas do *Campus* Machado do IFSULDEMINAS, Machado, MG

Resumo

O Brasil possui alto índice de intoxicações provenientes de plantas tóxicas, vegetais estes caracterizados pelo potencial de síntese de princípios ativos com capacidade de causar alterações nos organismos humanos e animais. A pesquisa teve o objetivo de realizar o levantamento de plantas tóxicas no *Campus* do Instituto Federal do Sul de Minas Gerais, no município de Machado, tendo em vista que o local possui grande tráfego diário de servidores, alunos e da população em geral que podem ser expostos aos vegetais tóxicos. Para tanto, foram realizadas excursões para catalogação das espécies encontradas nas áreas urbanizadas do *Campus.*Foram identificadas, registradas e georreferenciadas 39 plantas tóxicas pertencentes a 19 famílias botânicas, assim como seus nomes populares e princípios tóxicos.

Palavras-chave: Toxicologia de plantas. Intoxicações. Princípios ativos tóxicos. Saúde pública.

References

AGRA, M. F.; FREITAS, P. F.; BARBOSA-FILHO, J. M. Synopsis of the plants known as medicinal and poisonous in Northeast of Brazil. **Revista Brasileira de Farmacognosia**, v. 17, n. 1, p. 114-140, 2007. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S-0102-695X2007000100021. Acesso em: 27 mar. 2019.

BORELLI, V.; CARDOSO, T. C.; BIFFINI, C. P.; WICPOLT, N.; OGLIARI, D.; SAVARI, T.; TRAVERSO, S. D.; GAVA, A. Intoxicação experimental por folhas de *Crotalaria pallida* (*mucronata*) em ovinos. **Pesquisa Veterinária Brasileira**, v. 36, n. 10, 2016. Disponível em: http://www.scielo.br/scielo.php?pid=S0100-736X2016001000935&script=sci_abstract&tlng=pt. Acesso em: 27 mar. 2019.

BRASIL. MINISTÉRIO DA SAÚDE. Plantas Tóxicas. **Série prevenindo intoxicações: plantas tóxicas**, 2001. Disponível em: http://www.ccs.saude.gov.br/visa/publicacoes/arquivos/plantas.pdf. Acesso em: 27 mar. 2019.

CORREA, F. R.; MENDEZ, M. C. Plantas tóxicas e micotoxicoses no Rio Grande do Sul. Brasília: **ABEAS**, 1996. 38p.

DOAN, L. G. Ricin: Mechanism of Toxicity, Clinical Manifestations, and Vaccine Development. A Review. **Journal of Toxicology**, v. 42, n. 2, p. 201-208, 2004.

FLORA do Brasil 2020 em construção. Jardim Botânico do Rio de Janeiro. Disponível em: http://floradobrasil.jbrj.gov.br/. Acesso em: 12 jan. 2018.

FLORES, J. S.; CANTO-AVILES, G. C. O.; FLORES-SERRANO, A. G. Plantas de la flora yucatanense que provocan alguna toxicidad en el humano. **Revista Biomédica**, v. 12, n. 2, p. 86-96, 2001. Disponível em: http://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=21616. Acesso em: 27 mar. 2019.

FORZZA, R. C.; BAUMGRATZ, J. F. A.; BICUDO, C. E. M.; CANHOS, D.; CARVALHO JR., A. A.; NADRUZ-COELHO, M. A.; COSTA, A. F.; COSTA, D .P.; HOPKINS, M.; LEITMAN, P. M.; LOHMANN, L. G.; LUGHADHA, E. N.; MAIA, L. C.; MARTINELLI, G.; MENEZES, M.; MORIM, M. P.; PEIXOTO, A. L.; PIRANI, J. R.; PRADO, J.; QUEIROZ, L. P.; SOUZA, S.; SOUZA, V. C.; STEHMANN, J. R.; SYLVESTRE, L. S.; WALTER, B. M. T.; ZAPPI, D. C. New Brazilian Floristic List Highlights Conservation Challenges. **Biosciense**, v. 62, n. 1, p. 39-45, 2012. Disponível em: http://reflora.jbrj.gov.br/downloads/FUNG1.pdf. Acesso em: 27 mar. 2019.

FRANCESCHI, V. R.; NAKATA, P. A. Calcium oxalate in plants: formation and function. **Annual Review of Plant Biology,** v. 56, p. 41-71, 2005.

HARAGUCHI, M. Plantas Tóxicas de Interesse na Pecuária. **Biológico**, v. 65, n. 1/2, p. 37-39, 2003. Disponível em: http://www.biologico.agricultura.sp.gov.br/uploads/docs/bio/v65_1_2/haraguchi.pdf. Acesso em: 27 mar. 2019.

HOJO-SOUZA, N. S.; CARNEIRO, C. M.; SANTOS, R. C. *Pteridium aquilinum:* o que sabemos e o que ainda falta saber. **Bioscience Journal**, v. 26, n. 5, p. 798-808, 2010. Disponível em: http://www.seer.ufu.br/index.php/biosciencejournal/article/view/7239. Acesso em: 27 mar. 2019.

MATOS, F. J. A. LORENZI, H.; SANTOS, L. F. L.; MATOS, M. E. O.; SILVA, M. G. V.; SOUSA, M. P. **Plantas Tóxicas**: estudo de Fitotoxicologia Química de Plantas Brasileiras. Nova Odessa – SP: Ed. Instituto Plantarum de Estudos da Flora, 2011. 247p.-

MORO, M. F. SOUZA, V. C.; OLIVEIRA-FILHO, A. T.; QUEIROZ, L. P.; FRAGA, C. N.; RODAL, M. J. N.; ARAÚJO, F. S.; MARTINS, F. R. Alienígenas na sala: o que fazer com espécies exóticas em trabalhos de taxonomia, florística e fitossociologia? **Acta Botanica Brasilica**, v. 26, n. 4, p. 991-999, 2012.

NUHU, H. ABDURRAHMAN, E. M.; SHOK, M. Ethnomedical studies of *Crotalaria* species found in Zaria, northern Nigeria. **Nigerian Journal of Pharmacological Sciences**, v. 8, n. 2, p. 46-53, 2009. Disponível em: https://journals.abu.edu.ng/njps/pdf/74.pdf. Acesso em: 27 mar. 2019.

OLIVEIRA, J. M. G.; PEREIRA, L. J. C.; MOURA, E. R.; SOUSA, M. R. S. C.; SALES, P. A. B.; SILVA, S. M. M. S.; LIRA, S. R. S.; COSTA, A. P. R. Toxicidade subaguda do extrato etanólico das folhas de Myracrodruon urundeuva sobre o ciclo estral de ratas Wistar. **Revista Brasileira de Plantas Medicinais**, v. 18, n. 2, 2016. Disponível em: http://www.scielo.br/pdf/rbpm/v18n2/1516-0572-rbpm-18-2-0539.pdf. Acesso em: 27 mar. 2019.

SCHWAN-ESTRADA, K. R. F.; STANGARLIN, J. R.; CRUZ, M. E. S. Uso de plantas medicinais no controle de doenças de plantas. **Fitopatologia Brasileira**, v. 28, p. 554-556, 2003.

SHEPHERD, G. J. **Avaliação do estado do conhecimento da diversidade biológica do Brasil**: plantas terrestres (versão preliminar). Brasília: Ministério do Meio Ambiente, p. 3-4, 2003.

TAMILSELVAN, N.; THIRUMALAI, T.; SHYAMALA, P.; DAVID, E. A review on some poisonous plants and their medicinal values. **Journal of Acute Disease**, p. 85-89, 2014. Disponível em: https://www.sciencedirect.com/science/article/pii/S2221618914600226. Acesso em: 27 mar. 2019.

THE ANGIOSPERM PHYLOGENY GROUP. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. **Botanical Journal of the Linnean Society**, v. 181, p. 1-20, 2016. Disponível em: http://reflora.jbrj.gov.br/downloads/2016_GROUP_Botanical%20Journal%20of%20the%20Linnean%20Society.pdf. Acesso em: 27 mar. 2019.

THE PLANT LIST. Versão 1.1. 2013 [online]. Disponível em: http://www.theplantlist.org/. Acesso em: 31 dez. 2017.

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