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QUALITATIVE AND QUANTITATIVE EVALUATION OF AFFORESTATION ON AGOSTINHO NOHAMA SQUARE, LAUZANE PAULISTA NEIGHBORHOOD, SÃO PAULO CITY, BRAZIL

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ABSTRACT

Urban forests influence the climatic and biological conditions of a particular site, and can provide numerous ecological, economic, and social contributions. The objective of the study was to evaluate quantitatively and qualitatively the afforestation of the Agostinho Nohama Square, located in the northern region of São Paulo City, São Paulo State, Brazil, to ensure the benefits provided by green areas. For that purpose, individuals of all shrubs and trees with diameter at breast height (DBH) ≥ 10 cm were inventoried, and the physical, biological and phytosanitary conditions were evaluated. We quantified 333 individuals, distributed among 85 species belonging to 67 genres of 36 families. We observed the occurrence of exotic species on the square. Regarding the general condition of the individuals sampled, 289 (85.3%) are in good condition, 39 (11.5%) require special attention due to physical and/or biological injuries, and 11 (3.2%) need to be removed for offering risk to visitors of the square. The square plays an important ecological role by providing interaction with lichens, insects, epiphytes, and birds. In order to contribute to regional diversity and enable environmental education activities, the planting of species native to the Cantareira region is recommended.
Key-words: Urban forest; Phytosanitary; Garden design.

AVALIAÇÃO QUALI-QUANTITATIVA DA ARBORIZAÇÃO NA PRAÇA AGOSTINHO NOHAMA, BAIRRO LAUZANE PAULISTA, SÃO PAULO – SP

RESUMO

A vegetação urbana influencia as condições climáticas e biológicas de determinado local, e podem trazer inúmeras contribuições ecológicas, econômicas e sociais. Portanto, objetivou-se avaliar quali-quantitativamente a arborização da Praça Agostinho Nohama, localizada na zona norte do município de São Paulo (SP), para garantir os benefícios proporcionados pelas áreas verdes. Para tanto, foram inventariados todos os indivíduos arbustivos e arbóreos com circunferência a altura do peito (CAP) ≥10 cm, e observaram-se características físicas, biológicas e fitossanitárias. Foram quantificados 333 indivíduos vivos, distribuídos em 85 espécies, pertencentes a 67 gêneros de 36 famílias. Há cultivo de espécies exóticas no local. Sobre as condições gerais dos espécimes amostrados, 289 indivíduos (85,3%) estão em bom estado de conservação, 39 (11,5%) necessitam de cuidados por apresentarem injúrias físicas e/ou biológicas e, 11 (3,2%) precisam ser removidos, por oferecerem risco aos seus frequentadores. A Praça apresenta importante papel ecológico, por interagir com líquens, insetos, epífitas e aves. A fim de contribuir com a diversidade regional e possibilitar atividades de educação ambiental, sugere-se um plantio das espécies nativas do complexo, Cantareira.
Palavras-chave: Arborização urbana; Fitossanidade; Paisagismo.

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INTRODUCTION

Urban development significantly alters the environment. At the end of the 19th century, the municipality of São Paulo underwent major changes and the meadows, fields, and forests gave way to the large metropolis. The disordered population growth brings various environmental problems, such as air, water, sound, and visual pollution, reduction of native forest cover, in addition to soil impermeability (USTERI, 1991 apud TAKIYA, 2002; ROCHA et al., 2004; FILHO and RIBEIRO, 2006; SEADE, 2010).

The environmental map of São Paulo shows that 48% of the São Paulo Metropolitan Region (SPMR) suffers from significant shortage of vegetation cover. Studies show the issue of inefficient monitoring of land use, where clandestine buildings invade green areas and suppress vegetation cover (TAKIYA, 2002) characterize the urbanization of SPMR.

The urban forests in the woods, parks, among others, represent a positive aspect for the psychological aspect of urban citizens due to their relationships with recreational activities and proximity with nature (SANCHOTENE, 1994).

Urban tree planting influences climatic and biological conditions of a given place (ABREU, 2008). Its importance is linked to aesthetic, ecological, economic and social functions (PAIVA, 2006) as an example, arboreal species can be used as low-cost bio-monitors, by retaining and absorbing air pollutants (MOREIRA, 2010). Urban trees contribute to capturing carbon gas, mainly native trees of moderate and fast growth, turning it into plant biomass (MUNEROLI and MASCARÓ, 2010), The tree crowns intercept part of precipitation, which helps flood control (SILVA, 2008). Urban trees influence the temperature and the air relative humidity, acting on a microclimate scale, where they can provide a sensation of thermal comfort (ABREU and LABAKI, 2010).

The inventory of urban trees is critical to ensure the benefits provided by green areas (TAKAHASHI, 1994). By means of quantitative surveys, we can know, besides the richness, the frequency of individuals and the total number of trees (SOUZA and BUENO, 2000), enabling proper management and monitoring. Santamour Junior (1990) states that to ensure maximum protection against pests and diseases, it is essential to have greater diversity of tree species in the urban landscape, not exceeding more than 10% of the same species, 20% of a genre and 30% of a plant family.

Isolated quantitative figures express part of data on urban vegetation, and to complete the information, combined analyses are necessary (qualitative-quantitative) providing useful considerations, based on results that characterize the distribution and health condition of tree individuals (MILANO et al., 1992).

To prevent phytosanitary problems, proper management of trees is critical. Studies show that inadequate pruning favors the attack of fungi, xylophagous termites and wood-borers in trees of *Caesalpinia echinata* (pau-brasil) and *Caesalpinia pluviosa* (sibipiruna) (AMARAL et al., 2003).

This work aimed to evaluate qualitatively and quantitatively the afforestation on Agostinho Nohama Square (São Paulo, SP), in order to provide relevant results on the environmental quality of the square, and if necessary, propose measures for its improvement.

MATERIAL AND METHODS

This study was conducted on Agostinho Nohama Square (23°28'07"W long; and 46°38'28"S lat) in Lauzane Paulista neighborhood in the northern region of São Paulo City and covering an extension of 458.32 m.

The climate in the region is classified as tropical wet of the Cantareira Hill, where altitudes range from 800-1200 m, which provides a mild thermal condition with average annual temperatures of 17.7-19.3°C, and average annual rainfall between 1400-1590 mm (TARIFA and ARMANI, 2000).

The square is situated a few meters from the Parque Estadual Alberto Löfgren (Horto Florestal), which, in turn, is connected to the Parque Estadual da Cantareira, forming a massive green area in the northern zone of São Paulo City.

To carry out the qualitative-quantitative survey of the afforestation on the square, we used the methodology proposed by Silva Filho (2002) apud Bortoleto (2004), with adaptations.

Quantitative survey

The fieldwork was conducted in September 2011 and all shrubby and tree individuals with DBH greater and/or equal to 10 cm were sampled. The individuals were tagged with ascending numbering, to decrease the probability of sampling errors. The identifications (scientific and popular names) were made with the aid of taxonomists and by surveying specific bibliographies. Only one person estimated the plant height and the DBH was measured with a tape measure.

Qualitative assessment

For all individuals quantified, we evaluated the physical and biological characteristics according to following definitions:

Overall balance: we analyzed the trunk and the crown in terms of balance, which has symmetrical axis or unbalanced, with asymmetrical axis.

Phytosanitary aspects: we analyzed the tree in the naked eye for the presence of “pests”, like insects (ants, caterpillars, aphids, borers, termites, among others), fungi and diseases.

Location of attack: we investigated which part of the tree that was attacked by insects, fungi and/or diseases, whether is the root, trunk, branches, leaves, fruits, and/or flowers.

Injuries: whenever any damage was observed, whether by pathogens or mechanical actions, it was classified as severe (compromising the survival of the individual), medium (the individual can be recovered by means of actions) or light (small injuries). We also investigated injuries caused by vandalism (carving on the trunk bark and/or damages caused by humans).

Ecology: we observed the presence of insects, lichens, epiphytes, and birds.

Phenology: we investigated characteristics regarding seasonality of individuals sampled, that is, the vegetal part during the survey, leaves, flowers, and/or fruits.

General conditions: from the characteristics observed previously, the individuals were classified by the general conditions described as follow:

Good: vigorous and sound individual and may present some sign of surface damage, but in good condition.

Regular: individual in decline, with medium injuries mischaracterizing its design, causing unbalance to the tree.

Bad: individual in advanced and irreversible state of decline, with serious injuries at risk of falling or dying.

Dead: dead individual at risk of falling, losing its role in afforestation, besides causing risks to visitors.

Data analysis

The scientific nomenclature followed the standards proposed by APG II (Angiosperm Phylogeny Group II), according to Souza and Lorenzi (2007). The spelling, synonymization, origin, and phytogeographical distribution of the species were verified using the databases of the List of species of Flora of Brazil (FORZZA et al., 2010) and W3 Tropic (MOBOT, 2008).

For the origin of the species, we adopted the definition proposed by Ziller (2001), and exotic species are those that occur outside the geographical limits historically known, in this case, exotic species are those that naturally occur outside the state of São Paulo and Brazil.

The data was tabulated in the program Microsoft Excel®.

RESULTS AND DISCUSSION

Quantitative survey

We quantified 333 individuals alive and six dead individuals, totaling 339 bushes and trees, distributed in 85 species, belonging to 67 genres of 36 families (Table 1).

Table 1. Species quantified on Agostinho Nohama Square. Origin, Q (Absolute Frequency), F% (Relative Frequency)

Family	Species	Popular name	Origin	Q	F%
Anacardiaceae	*Mangifera indica* L.	mangueira	Native	4	1.18
Anacardiaceae	*Schinus molle* L.	aroeira-salsa	Native	1	0.29

Family	Species	Popular name	Origin	Q	F%
Anacardiaceae	*Schinus terebinthifolius* Raddi	aroeira-vermelha	Native	2	0.59
Apocynaceae	*Nerium oleander* L.	oleandro	Exotic	1	0.29
Araliaceae	*Dendropanax cuneatus* (DC.) Decne. & Planch.	pau-de-tamanco	Nativa	7	2.06
Araliaceae	*Schefflera arboricola* (Hayata) Merr.	cheflera-manchada	Exotic	1	0.29
Araliaceae	*Schefflera heterophylla* (Wall. ex G. Don) Harms	cheflera	Exotic	3	0.88
Araucariaceae	*Araucaria angustifolia* (Bertol.) Kuntze	pinheiro-do-paraná	Native	2	0.59
Arecaceae	*Archontophoenix cunninghamii* H. Wendl. & Drude	palmeira-seafórtia	Exotic	6	1.77
Arecaceae	*Caryota urens* L.	palmeira-rabo-de-peixe	Exotic	2	0.59
Arecaceae	*Dypsis lutescens* (H. Wendl.) Beentje & J. Dransf.	areca-bambu	Exotic	1	0.29
Arecaceae	*Livistona chinensis* (Jacq.) R. Br. ex Mart.	palmeira-leque	Exotic	1	0.29
Arecaceae	*Phoenix roebelenii* O'Brien	tamareira-de-jardim	Exotic	10	2.95
Arecaceae	*Syagrus romanzoffiana* (Cham.) Glassman	jerivá	Native	23	6.78
Asparagaceae	*Dracaena marginata* Hort.	dracena-de-madagascar	Exotic	1	0.29
Asteraceae	*Vernonanthura divaricata* (Spreng.) H.Rob.	cambará	Native	2	0.59
Bignoniaceae	*Handroanthus chrysotrichus* (Mart. ex DC.) Mattos	ipê-amarelo-do-cerrado	Native	1	0.29
Bignoniaceae	*Handroanthus* sp. 1	ipê-amarelo	-	4	1.18
Bignoniaceae	*Handroanthus* sp. 2		-	1	0.29
Bignoniaceae	*Handroanthus* sp. 3		-	3	0.88
Bignoniaceae	*Jacaranda mimosifolia* D. Don	jacarandá-mimoso	Exotic	1	0.29
Bignoniaceae	*Spathodea nilotica* Seem.	bisnagueira	Exotic	19	5.60
Bixaceae	*Bixa orellana* L.	urucum	Native	1	0.29
Casuarinaceae	*Casuarina* sp.		Exotic	6	1.77
Combretaceae	*Terminalia catappa* L.	chapéu-de-sol	Sub-spontaneous	15	4.42
Cupressaceae	*Chamaecyparis* sp.		-	1	0.29
Cupressaceae	*Cupressus sempervirens* L.	cipreste-italiano	Exotic	16	4.72
Cupressaceae	*Cupressus* sp.		Exotic	1	0.29
Euphorbiaceae	*Alchornea sidifolia* Müll.Arg.	tapiá	Native	4	1.18
Fabaceae	*Caesalpinia echinata* Lam.	pau-brasil	Native (BR), Exotic (SP)	3	0.88
Fabaceae	*Delonix regia* (Bojer ex Hook.) Raf.	flamboyant	Exotic	4	1.18

Family	Species	Popular name	Origin	Q	F%
Fabaceae	*Enterolobium contortisiliquum* (Vell.) Morong	tamboril	Native	5	1.47
Fabaceae	*Erythrina speciosa* Andrews	mulungu-do-litoral	Native	1	0.29
Fabaceae	Indeterminada 1		-	1	0.29
Fabaceae	Indeterminada 2		-	1	0.29
Fabaceae	Indeterminada 3		-	1	0.29
Fabaceae	*Libidibia ferrea* (Mart. ex Tul.) L.P.Queiroz	pau-ferro	Native (BR), Exotic (SP)	4	1.18
Fabaceae	*Machaerium nyctitans* (Vell.) Benth.	bico-de-pato	Native	2	0.59
Fabaceae	*Piptadenia gonoacantha* (Mart.) J.F.Macbr.	pau-jacaré	Native	5	1.47
Fabaceae	*Poincianella pluviosa* (DC.) L.P.Queiroz	sibipiruna	Native (BR), Exotic (SP)	2	0.59
Fabaceae	*Samanea* sp.		-	1	0.29
Fabaceae	*Schizolobium parahyba* (Vell.) Blake	guapuruvu	Native	1	0.29
Fagaceae	*Quercus robur* L.	carvalho-inglês	Exotic	2	0.59
Indeterminada 1	Indeterminada 1		-	1	0.29
Indeterminada 2	Indeterminada 2		-	1	0.29
Lauraceae	*Ocotea pichurim* Kunth	canela	Exotic	1	0.29
Lauraceae	*Persea americana* Mill.	abacateiro	Sub-spontaneous	5	1.47
Lythraceae	*Lafoensia pacari* A.St.-Hil.	dedaleiro	Native	2	0.59
Malvaceae	*Ceiba speciosa* (A.St.-Hil.) Ravenna	paineira	Native	7	2.06
Malvaceae	*Malvaviscus arboreus* Cav.	malvavisco	Exotic	2	0.59
Malvaceae	*Pseudobombax* sp.		-	4	1.18
Melastomataceae	*Tibouchina granulosa* (Desr.) Cogn.	quaresmeira	Native (BR), Exotic (SP)	4	1.18
Melastomataceae	*Tibouchina pulchra* Cogn.	manacá-da-serra	Native	2	0.59
Moraceae	*Ficus benjamina* L.	figueira-benjamina	Exotic	5	1.47
Moraceae	*Ficus insipida* Willd.	guaxinguba	Native	3	0.88
Moraceae	*Morus nigra* L.	amora-preta	Exotic	1	0.29
Morta	Morta		-	6	1.77
Myrtaceae	*Eucalyptus* sp.		Exotic	2	0.59
Myrtaceae	*Eugenia involucrata* DC.	cereja-do-mato	Native	3	0.88
Myrtaceae	*Eugenia uniflora* L.	pitangueira	Native	6	1.77
Myrtaceae	*Psidium cattleianum* Sabine	araçá	Native	1	0.29
Myrtaceae	*Psidium guajava* L.	goiabeira	Sub-spontaneous	3	0.88
Myrtaceae	*Syzygium cumini* (L.) Skeels	jambolão	Sub-spontaneous	40	11.80
Myrtaceae	*Syzygium jambos* (L.) Alston	jambo	Sub-spontaneous	4	1.18
Nyctaginaceae	*Bougainvillea glabra* Choisy	primavera	Native	1	0.29
Nyssaceae	*Camptotheca acuminata* Decne.	árvore-feliz	Exotic	11	3.24
Oleaceae	*Ligustrum lucidum* W.T.	alfeneiro	Sub-spontaneous	1	0.29

Family	Species	Popular name	Origin	Q	F%
	Aiton				
Oxalidaceae	*Averrhoa carambola* L.	carambola	Sub-spontaneous	1	0.29
Pittosporaceae	*Pittosporum undulatum* Vent.	pau-incenso	Sub-spontaneous	4	1.18
Podocarpaceae	*Podocarpus lambertii* Klotzsch ex Endl.	pinho-bravo	Native	3	0.88
Rhamnaceae	*Hovenia dulcis* Thunb.	mata-fome	Sub-spontaneous	11	3.24
Rosaceae	*Eriobotrya japonica* (Thunb.) Lindl.	nespera	Sub-spontaneous	5	1.47
Rosaceae	*Prunus serrulata* Lindl.	cerejeira-ornamental	Exotic	2	0.59
Rosaceae	*Prunus* sp.		-	2	0.59
Rutaceae	*Citrus limon* (L.) Osbeck	limoeiro	Exotic	9	2.65
Rutaceae	*Murraya paniculata* (L.) Jack	murta-de-cheiro	Exotic	2	0.59
Sapindaceae	*Allophylus edulis* (A.St.-Hil. et al.) Hieron. ex Niederl.	fruto-de-pombo	Native (BR), Exotic (SP)	1	0.29
Sapindaceae	*Cupania oblongifolia* Mart.	camboatá	Native	1	0.29
Sapindaceae	*Koelreuteria bipinnata* Franch.	árvore-da-china	Exotic	2	0.59
Solanaceae	*Brunfelsia uniflora* (Pohl) D. Don	manacá-de-cheiro	Native	1	0.29
Solanaceae	*Solanum mauritianum* Scop.	fumo-bravo	Native	1	0.29
Urticaceae	*Cecropia* sp.		-	1	0.29
Urticaceae	*Urera* sp.		-	1	0.29
Verbenaceae	*Citharexylum myrianthum* Cham.	pau-viola	Native	2	0.59
Verbenaceae	*Duranta erecta* L.	pingo-de-ouro	Native (BR), Exotic (SP)	1	0.29

The Agostinho Nohama Square has rich diversity of tree species, similar to five squares of the central region of the municipality of Cachoeira do Sul (Rio Grande do Sul State) and Sete de Setembro Square, in Ribeirão Preto, São Paulo (REDIN et al., 2010; GIMENES et al., 2011). The most representative families in both surveys corroborate with those of this study, namely, Fabaceae (14), Myrtaceae (7), Arecaceae (6) and Bignoniaceae (6).

The most frequent species are *Syzygium cumini* with 40 individuals, *Syagrus romanzoffiana* (23), *Spathodea nilotica* (19), *Cupressus sempervirens* (16), and *Terminalia catappa* (15), and of these, only *S. romanzoffiana* is native.

The family Fabaceae (38.9%) and the species *S. cumini* (11.8%) are above the recommended indexes by Santamour Junior (1990), and this condition can affect the health of trees from this site.

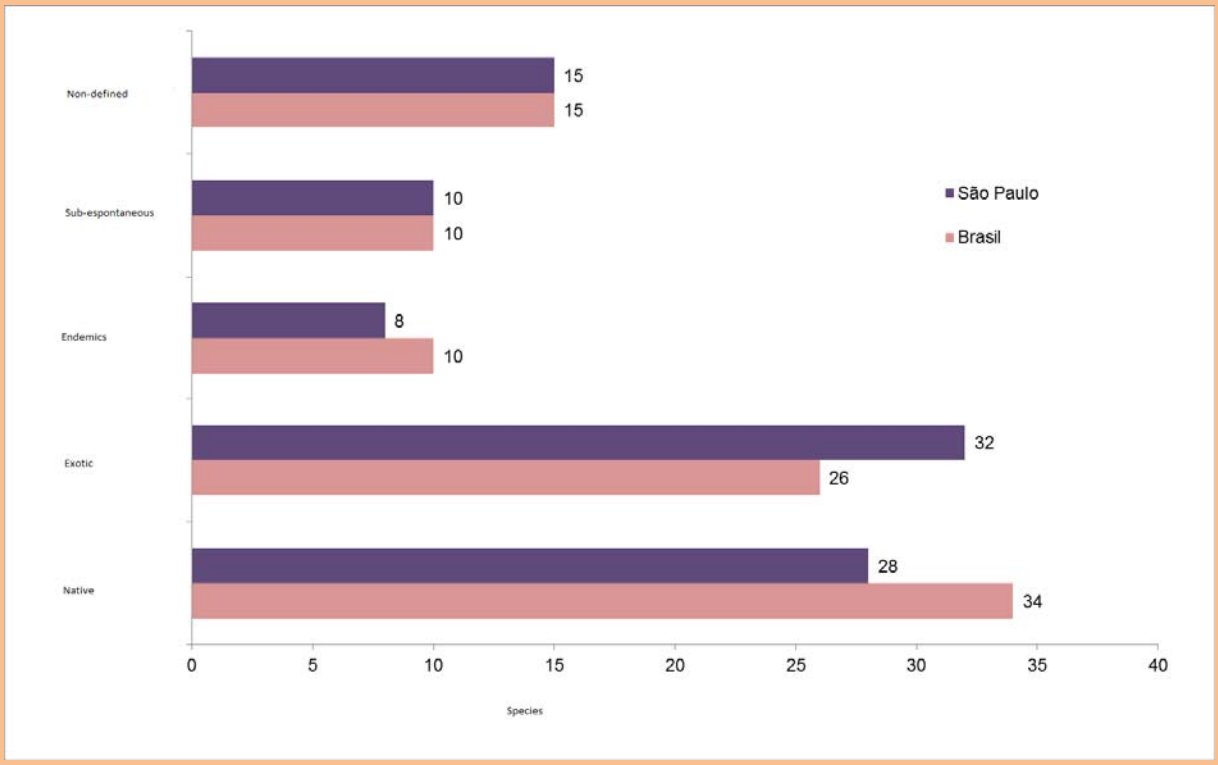
In the city of Uberlândia, Minas Gerais State, Rezende & Santos (2010) observed a different situation. The authors studied five squares, and found that 72.9% of the afforestation is composed of just five species and stated that the practice of cultivating many individuals with no or little variability of species is a common practice in other Brazilian cities, such as Maringá (Paraná State),

Piracicaba (São Paulo State) and Porto Alegre (Rio Grande do Sul).

Another relevant aspect is the use of exotic species in urban forestry. In this study, they represent 37.7% (from São Paulo State) and 30.6% (from Brazil) of the total sampled (Fig. 1). Despite the high percentage, other cities have more critical situations, such as Lavras da Mangabeira (Ceará State), where 92.95% of the urban trees are exotic and Uberlândia (Minas Gerais State), where the percentage exceeds 60% (CALIXTO JÚNIOR et al., 2009; REZENDE and SANTOS, 2010).

According to Blum et al. (2008), invasive exotic species can affect directly the biodiversity, economy and human health, and are the second cause of species extinctions in the world. In Maringá City (Paraná State), the authors concluded that only 24.1% of urban vegetation is native, and on the Agostinho Nohama Square, the rate is 32.9%. Native species should be used to establish regional ecological corridors.

Figure 1. Origins of the species recorded on the Agostinho Nohama Square, considering both Brazil and São Paulo State.

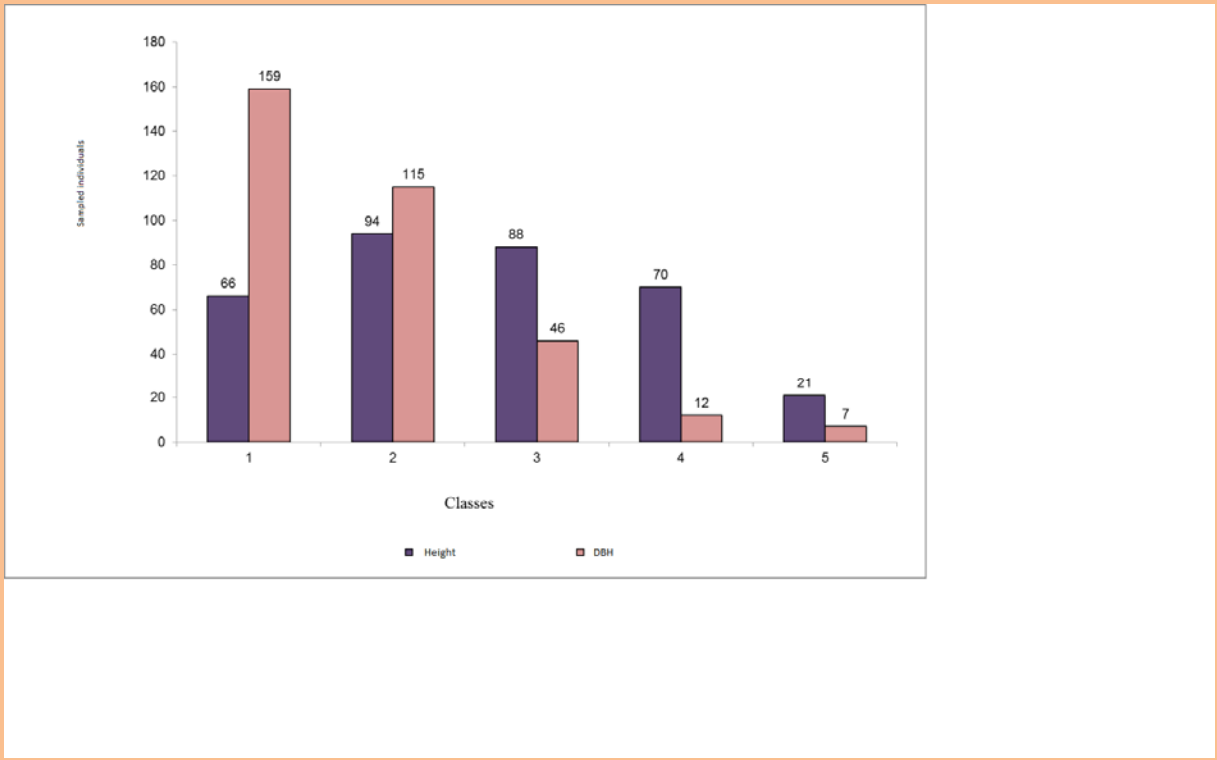


The heights and DBH of the trees were classified (Table 2). The average height is of 11.7 m and the distribution of heights (Fig. 2) shows that only 66 individuals (19.5%) are shorter than 5 m, and more than 80% is taller than 10 meters. Fifty-three percent of individuals have DBH above 50 cm, and these results show that most samples are adult trees.

Table 2. Classes of height and diameter at breast height (DBH)

Classes	Height (m)	DBH (cm)
1	1 – 5	10 – 50
2	>5 – 10	>50 – 100
3	>10 – 15	>100 – 150
4	>15 – 20	>150 – 200
5	>20	>200

Figure 2. Distribution in classes of height and DBH of the quantified trees on Agostinho Nohama Square



Regarding trees with DBH > 200 cm, *Ceiba pentandra* was the most representative, with three individuals, followed by *Eucalyptus* SP. (two individuals), *Jacaranda mimosifolia* (one individual) and *Ficus benjamina* (one individual).

Qualitative assessment

The general conditions of the sampled individuals are shown in Figure 3. We observed that 85.3% of the trees are in good condition, 11.5% requires care, 3.2% represents the total of individuals with serious injuries and the dead trees, which need to be removed from the square, as they pose a risk to visitors of the square. The species that are in bad condition are *Casuarina* SP., *Enterolobium*

contortisiliquum (Fig. 4), *Citharexylum myrianthum*, *Piptadenia gonoacantha*, and *Eucalyptus* sp. The higher rate of individuals in good condition was observed for *Syzygium cumini* with 11.8%, followed by the *Syagrus romanzoffiana* (8%).

We observed that natural predation (Fig. 5) by insects, fungi and/or diseases occurred in 38% of the tree individuals and the intensity varied from mild to severe. Vandalism (Fig. 6) was observed in 19.2% of the sampled trees.

In a study conducted in Águas de São Pedro (São Paulo State), Bortoleto (2004) states that vandalism is rare in the city, which differs from the results of this study, because although most individuals are in good condition, this kind of practice is common in the site.

For Milano (1987) apud Rezende and Santos (2010), vandalism is the result of the lack of interest of the community to participate in afforestation programs and the lack of awareness of the importance of plant individuals.

Figure 3. General condition of the individuals sampled on the Agostinho Nohama Square

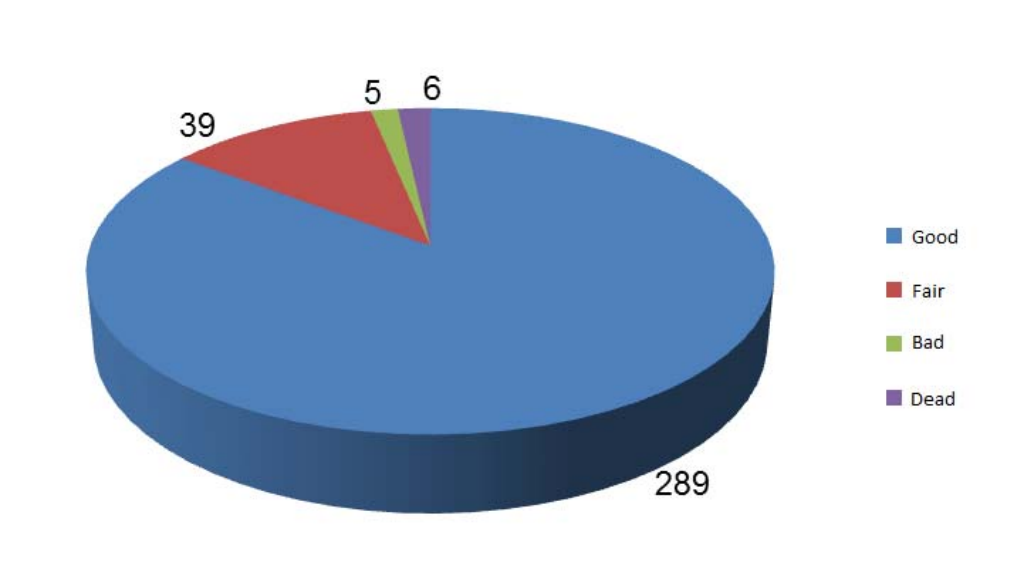


Figure 4. *Enterolobium contortisiliquum* compromised by its conservation condition

Source: Lucas Teixeira Alves da Silva – Sep. 24,2011

Figure 5. Serious injury caused by insects

Source: Lucas Teixeira Alves da Silva – Sep. 24,2011

Figure 6. Carvings on the trunk bark caused by vandalism

Source: Lucas Teixeira Alves da Silva – Sep. 24, 2011

Although there is vandalism caused by humans, other organisms relate to the trees differently. In this case, the square plays an important role in the ecological association. We observed that 282 tree individuals (83.2%) interact with lichens, 264 (77.9%) with insects, and 169 (49.8%) with epiphytes (Fig. 7).

Insects and birds help in pollination and seed dispersal, providing greater gene flow and population control of plant species (FONSECA et al., 2008; LUCCAS et al., 2009). On the square, we observed birds in 30 trees, using them as perches or feeding on fruit and/or seeds, corroborating Brun et al. (2007) and Shams et al. (2009), who report that the use of trees in urban areas helps in maintaining ecology and favor avifauna.

We observed birds of the Psittacidae family feeding on seeds of *Spathodea nilotica*. This interaction is beneficial because it reduces the availability of seeds, and consequently, controls the proliferation of these exotic trees.

The reproductive phases of plant individuals are shown in Table 3, and may be represented by flower and/or fruit (cone for Gymnosperms). We observed 122 individuals in fertile phase, belonging to 43 species.

Figure 7. Ecological distribution of life forms on the trees sampled

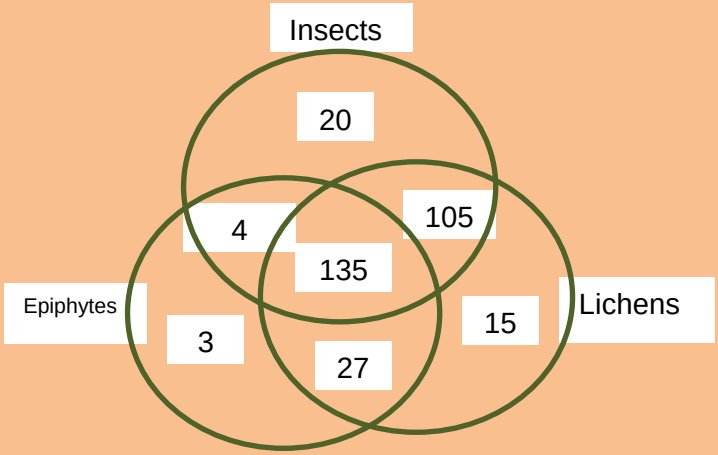


Table 3. Species, reproductive phase (flower, fruit) and absolute frequency (Q). The assessments were carried out in September 2011.

Species	Flower	Fruit	Q
Averrhoa carambola	X		1
Archontophoenix cunninghamii		X	3
Bougainvillea glabra	X		1
Brunfelsia uniflora	X		1
Camptotheca acuminata	X	X	10
Citrus limon	X	X	5
Cupania oblongifolia		X	1

Species	Flower	Fruit	Q
Cupressus sempervirens		X	11
Cupressus sp.		X	1
Delonix regia		X	1
Dendropanax cuneatus		X	1
Duranta erecta	X		1
Dypsis lutescens	X		1
Enterolobium contortisiliquum		X	1
Eriobotrya japonica		X	4
Erythrina speciosa	X		1
Eugenia uniflora	X	X	6
Ficus benjamina		X	1
Hovenia dulcis		X	2
Jacaranda mimosifolia		X	1
Lafoensia pacari	X		2
Livistona chinensis		X	1
Malvaviscus arboreus	X		2
Mangifera indica	X		2
Morus nigra		X	1
Murraya paniculata		X	1
Nerium oleander	X		1
Ocotea pichurim		X	1
Persea americana	X	X	3
Piptadenia gonoacantha		X	4
Pittosporum undulatum	X	X	3
Prunus serrulata		X	2
Prunus sp.		X	2
Pseudobombax sp.		X	1
Schefflera arboricola	X		1
Schinus molle	X		1
Spathodea nilotica		X	13
Syagrus romanzoffiana	X	X	2
Syzygium cumini	X	X	3
Syzygium jambos	X	X	3
Terminalia catappa	X	X	15
Tibouchina granulosa		X	2
Vernonanthura divaricata		X	2

According to meteorological data from the Forestry Institute (2011), we quantified only 2 mm of rainfall in September 2011, and even with little water available in the environment, fertile individuals accounted for 36.6% of the total sampled.

The square plays a very important ecological role for the reasons abovementioned, also because it is close to the Parque Estadual da Cantareira (PEC), where Arzolla (2002) from the Center of Águas Claras describes 194 species. From this total, six species are on the endangered species list, namely *Beilschmiedia emarginata*, *Euplassa cantareirae*, *Ocotea catharinensis*, *Ocotea odorifera*, *Roupala brasiliensis* and *Trichilia silvatica*.

In order to assist the establishment of these species and contribute to the diversity and biological maintenance, we suggest the planting of species reported in Arzolla (2002), for the square to be used as a tool for projects of environmental education.

CONCLUSIONS

The Agostinho Nohama Square is rich in tree species diversity, however the rate of exotic species is high. In general, the tree species show good condition, but we observed physical and biological injuries in some individuals, therefore, we recommended the removal of 11 individuals with serious injuries, offering risk to the population and to the health of tree individuals.

We observe that the square has potential to act as an ecological corridor, for its proximity to the Parque Estadual da Cantareira, therefore, we suggest the planting of native species on the square to contribute to the regional diversity and enable projects of environmental education.

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