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## Contributions of the old urban homegardens for food production and consumption in Rio Claro, Southeastern Brazil

### Contribuições dos quintais urbanos antigos na produção e no consumo de alimentos em Rio Claro, Sudeste do Brasil

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**Abstract:** Urban homegardens are green areas of households within the city limits and they have the potential to provide families with a cheap alternative for diet improvement, and to complement the income of the families who sell cultivated products. This research analyzes the contributions of old urban homegardens on food consumption and household economy. Data related to homegardens composition were collected by interviews and by collecting cultivated plants. Diets were assessed through a retrospective method (last 24 hours food recall) and administered every two months, during a year, to include seasonal variations. The diet of the sampled population was found to be dependent on certain foods, indicating a narrow food niche (Levins index = 25.9; Levins standardized index = 0.23). Variations in interviewees' diet are related to the consumption of fruits and vegetables, which are partly supplied by homegardens. Spices and teas consumed were obtained from homegardens, revealing its importance in food consumption and health. Among the 98 species found in homegardens, only 38% appeared in the interviewees' diet, indicating an under-exploitation of these homegardens. Our study found that the main role of homegardens is to supply variation in the diet, contributing to the consumption of different types of products.

**Keywords:** Diet. Ethnobotany. Food niche. Urban agriculture.

**Resumo:** Os quintais urbanos correspondem às áreas verdes domiciliares dentro dos limites urbanos e têm o potencial de fornecer às famílias uma alternativa barata para a melhoria da dieta e complementação da renda familiar, pela venda de itens produzidos nesse espaço. Este estudo analisa a contribuição dos quintais urbanos antigos na alimentação e na economia doméstica. Os dados sobre a composição dos quintais foram obtidos por meio de entrevistas e pela coleta de plantas presentes nos quintais. As dietas foram levantadas pelo método recordatório das últimas 24 horas, aplicado bimensalmente, durante um ano, para incluir variações sazonais. Verificou-se que a dieta da população amostrada é dependente de alguns alimentos, indicando um nicho alimentar estreito (índice de Levins = 25,9; Levins padronizado = 0,23). As variações nas dietas dos informantes estão relacionadas com o consumo de frutas e hortaliças, em parte fornecidas pelo quintal. Temperos e chás consumidos foram obtidos dos quintais, revelando sua importância para alimentação e saúde. Das 98 espécies alimentares encontradas nos quintais, apenas 38% apareceram na dieta dos entrevistados, indicando uma subexploração dos quintais. Em nosso estudo, a principal função relatada para os quintais foi proporcionar variações da dieta, contribuindo para o consumo de itens diversificados.

**Palavras-chaves:** Dieta. Etnobotânica. Nicho alimentar. Agricultura urbana.

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## INTRODUCTION

Homegardens can be defined as areas associated to households where small-scale mixed production helps residents meet food, aesthetic, medical and leisure needs (Zaldivar *et al.*, 2002; Wezel and Bender, 2003; Kumar and Nair, 2004; Amaral and Guarim Neto, 2008). Their richness and diversity is strongly related to their age – old gardens are richer and more diverse, as new species are added along the time (Coomes and Ban, 2004; Pinho *et al.*, 2011). Homegardens also represent a transition between rural and urban areas and between traditional and modern lifestyles that associates agrobiodiversity with the experience and knowledge transmitted by local traditions (Winklerprins, 2002; Semedo and Barbosa, 2007). This *continuum* between rural and urban areas is revealed by the fact that homegardens are a site of food production and conservation of the agrobiodiversity (Florentino *et al.*, 2007; Kabir and Webb, 2008; Huai and Hamilton, 2009); a social network of the donation, exchange and sale of products, and a heritage endowed with aesthetic and social value (Winklerprins, 2002).

Urban homegardens are a type of urban agriculture (UA) where growing “crops and raising small livestock or milk cows for self-consumption or sale in neighborhood markets” (FAO, n.d.) take place within small areas in the city and offer availability of fresh, perishable food and non-market access to food for poor consumers. In fact, the production in these places can guarantee food to about millions of poor people, contributing for food security (FAO, n.d.).

Studies on urban homegardens have primarily emphasized their potential for food security. Because homegardens represent a source of nutrition, particularly from fruits and vegetables, and generate income through the sale of surplus products, they contribute to improving food security and household economy by reducing expenses and increasing income (Niñez, 1984; Rico-Gray *et al.*, 1990; Padoch and De Jong, 1991; Caballero, 1992; Brito and Coelho, 2000; Kumar and Nair, 2004).

Other studies have focused on the importance of growing condiments and medicinal plants (Amorozo, 1981; Da Silva and Silva, 1995; Murrieta, 2001).

In urban areas, homegardens can promote the spread of plant germplasm and play an important role in the *in situ* conservation of native and exotic plants from diverse vegetation communities (Amaral and Guarim Neto, 2008; Albuquerque *et al.*, 2005; Eichemberg *et al.*, 2009), particularly those rarely found in markets and stores, which provide different food sources of vitamins and nutrients as well as alternative medicinal resources (Amorozo, 1981; Madaleno, 2000; Semedo and Barbosa, 2007).

Based on these general considerations, this study assesses how these old urban homegardens in Rio Claro, Brazil, complement diets and generate additional income. It thus characterizes how the sampled homegardens contribute for food production and household economy.

## MATERIALS AND METHODS

### STUDY AREA

Rio Claro is located in the center of the state of São Paulo (22° 24' S; 47° 31' W), Southeastern Brazil, 180 km from the state capital, São Paulo. The climate is subtropical, with two well-defined seasons (winter is the dry season); temperatures in the coldest months vary from 3 °C to 18 °C and presents the warmest month average temperature over 22 °C. In this municipality, large scale industrialized agriculture (sugarcane and orange) is an important economic activity. Smaller crops include corn and rice. Cotton is also cultivated. The population of Rio Claro was 168,087 in 2002 of which 96% live in urban areas (Brasil em números, 2002).

### METHODS

Based on a map of the history of the urban space in Rio Claro (Troppmair, 1992), seven neighborhoods formed around 1945 were selected, making up 380 squares or city blocks, under the assumption that older homes with

preserved gardens would be found in these neighborhoods. Sixty city blocks were randomly selected using a standard table of random numbers. Field observations revealed which dwellings had old homegardens. Only 22 buildings satisfied the criteria for the study: the presence of tree and shrub species that had been maintained for 25 years or more and had inhabitants over 50 years old. During the first two months of field work, five of the households covered their homegardens with cement or cut all the trees. This decision was made mainly because of the difficulty of keeping up the gardens by owners of advanced age, a lack of time to devote to activities in the backyard and a lack of interest among the younger generations. Thus, the final sample was reduced to 17 households.

Vouchers of collected specimens were deposited in the Herbarium of the Department of Botany (HRCB), Instituto de Biociências, Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP), Rio Claro. Species identification was made in herbaria by experts, whose names are listed in the end of the article.

## FOOD SURVEY

All informants agreed to participate in this study, and the consent was oral. The names were absent as a manner of privacy protection. Diets were assessed using the retrospective method, which consists of administering a food survey in which informants reveal what they have eaten in the last 24 hours. This method allows for the characterization of a group's diet and the monitoring of the consumption and origin of their food intake (Dwyer, 1994). The food items surveyed by the retrospective method were classified into six different food groups, following the food pyramid adapted from Welsh *et al.* (1992) and Shuette *et al.* (1996). They are: group 1 - cereals, starches and pastas (breads, rice, pastas, flours, cakes, snacks, cereals, and tubercles); group 2 - fruits (all fruits); group 3 - vegetables (all vegetables, except those already mentioned in the first group); group 4 - dairy products (milk, cheeses, and yoghurts); group 5 - meats and sausages (bovine, pork,

chicken, fish, egg, and sausages); group 6 - fats, sugars and alcohol (oil, margarine, butter, sugars, candies, and honey).

The information obtained helped measure the food niche of the studied group, providing data on the variation in the diet and on the contribution of food items from the homegarden. These data were analyzed using the Levins index and the Levins standardized index (Krebs, 1989; as discussed by Nascimento *et al.*, 2010). Levins proposed that a means of measuring the amplitude of the niche is in the following numerical relationship (Krebs, 1989):

$$B = 1/[\sum p_j^2]^{-1}$$

$B$  = Levins index for the niche amplitude;

$p_j$  = proportion of individuals who use the resource  $j$ .

In this study,  $p_j$  is the proportion which a given item presents in the diet.

The Levins index value can range from 1 to  $n$ , where  $n$  corresponds to total number of consumed items. The closer to 1, the more specialist is the group studied, and, if the index gain maximum values, more evenly the population uses resources, i.e., more generalist it is.

In order to facilitate the process of direct comparison of the use of resources, it is common to standardize the values of niche amplitude, expressing them on a scale from 0 to 1 using the Hurlbert formula (Krebs, 1989):

$$BA = (B - 1) / (n - 1)$$

$BA$  = Levins index standardized for the food niche amplitude;

$B$  = Levins index for food niche amplitude;

$n$  = number of consumed items.

The niche parameter assessed was the frequency of food items present in the diet (Krebs, 1989). In order to assess the importance of homegardens to the owners' budgets information on the frequency of sale of food or other products from the backyards was gathered along with the food surveys.

The food survey was administered during one week every two months from January to November 2002, totaling 42 feeding days and 714 food recall interviews. Our sample included five men and twelve women who

were interviewed. All of these participants descended from Western European immigrants who came to Brazil to work on coffee plantations around 1840 and were born in the state of São Paulo. Most of the participants (77.3%) came from Rio Claro region or neighboring areas. The interviewees were either of rural origins or were born in urban areas but also had a rural heritage from their parents and grandparents.

Most interviewees (59%) were retired from the service and trade sectors, and the others were housewives (41%). The monthly family incomes of 29% of the interviewees were in class E (Brasil em números, 2002), and the incomes of 52% of the interviewees were in class D. Only 18% of the interviewees were in class C, the medium-to-low economic class. These data are in line with those found for the southeastern region of Brazil, where about 60% of the families are in class D (Brasil em números, 2002). Among the interviewees, education was low: 9% were illiterate, and 64% had not completed their basic education (one to eight years of schooling).

RESULTS

The homegardens studied varied from 428 m<sup>2</sup> to 2,000 m<sup>2</sup> and sheltered various plants, both native and exotic. The main uses of the plants were ornamental, as food or as medicine. In the food category, we found 98 species grown in homegardens, mainly fruits and, to a lesser degree, vegetables, for an average of 21 species per homegarden (Eichemberg *et al.*, 2009).

Although the number of food species grown is high, only 28 of these appeared in the diet of the interviewees. Among different items consumed within the 24 hours

before interviews, 106 were foods, and 30 were tea, coffee and condiments (136 items in total). This very high number indicates that a wide variety of foods are part of the interviewees' diet. However, if we take into account the frequency with which each of these items was cited, only 10% of the total items were consumed in 25% or more of the food recall interviews (Table 1).

The basic composition of the diet can be summarized into the following foods and frequencies: bread (80.3%), milk (79.4%), rice (73.8%), beans (60.7%) and beef (50.4%), all of which are acquired in stores and markets. The variations found in the interviewees' diet concern the consumption of fruits and vegetables, part of which are produced in homegardens.

The foods mentioned in our surveys were classified into six different food groups, following the food pyramid. The Levins index value for the total breadth of the food niche (Table 2) was 25.9, only 23% of the maximum breadth attainable for 106 food items. Of the 106 food items consumed, 28 (26.4%) were produced in homegardens. The most frequently homegrown food group was fruits. Among the 26 types of fruit consumed, 15 were grown in homegardens, accounting for 34% of the total frequency of consumption in that group. Approximately 41% of the times these 15 items were consumed, they came from homegardens (Table 3).

The consumption of homegarden fruit occurs as occasional snacks, either through the direct ingestion of fruit or in the form of smoothies or juice. Lemons, 'acerolas' (*Malpighia emarginata*) and oranges were among the favorites. 'Acerolas' were exclusively obtained from homegardens, and lemons were purchased only two

Table 1. The primary food items consumed by the studied population in decreasing order of intake.

Frequency of intake (%)	Food items
≥ 50	Coffee, bread, milk, rice, beans, meat
25 —50	Butter, oranges, lettuce, bananas, cheese, parsley, chives, pasta
10 — 25	Potatoes, cabbage, chicken, tomatoes, soda, lemons, lemon grass, papayas, carrots, mint, salt crackers, cakes, eggs

Table 2. Richness, frequency of food items in diet and niche breadth by food groups and total.

Food group	Richness (number of itens)	Total frequency of food items in diet	Richness of the homegardens	Levins' index	Levins' standardized index
Cereals, starches and pastas	19	275	1	4.8	0.21
Fruits	26	165	15	6.6	0.22
Vegetables	25	171	11	9.0	0.33
Dairy products	4	129	0	1.9	0.29
Meats and sausages	11	183	1	4.2	0.32
Fats, sugars and alcohol	21	136	0	5.2	0.21
Total	106	1,059	28	25.9	0.23

of the 17 times they were consumed. 'Mamões' (*Carica papaya*), despite their low frequency of consumption, came from homegardens and were consumed whenever in season. They were common items in homegardens perhaps because they do not require special care; 'mamão' trees grow quickly and are easy to plant. 'Laranja' (*Citrus sinensis*) and 'banana' (*Musa* sp.) were the most consumed foods in this group, but they came from homegardens: 20% and 14% of the time, respectively. In addition to the fruits already mentioned, others were consumed in smaller proportions, among which 'jaboticaba' (*Myrciaria cauliflora*), 'ameixa japonesa' (*Eriobotrya japonica*), 'amora' (*Morus nigra*), 'goiaba' (*Psidium guajava*), and 'pinha' (*Annona squamosa*) came solely from homegardens. Several species of fruits grown in homegardens, such as 'goiabas', 'bananas', 'figos' (*Ficus carica*), 'peras' (*Pyrus comunis*), and 'mamões' are also made into jam. Others are widely used as ingredients to produce liqueurs, including 'jaboticaba' and 'acerola'.

Plant resources also appear to play an important role in the nutritional quality of the interviewees' diets. Vegetables are important elements in salads and to compose side dishes. In this group, among the 25 food items consumed, 11 came from homegardens, accounting for 23% of the total frequency of vegetable consumption. Vegetables came from homegardens approximately 51% of the times they were consumed (Table 3). All of

the 'couve' (*Brassica oleracea* var. *acephala*) consumed, more than 60% of the 'abóbora' (*Cucurbita moschata*) and 'almeirão' (*Cichorium intybus*), 33% of the 'rúcula' (*Eruca sativa*), and 22% of 'abobrinha' (*Cucurbita pepo*) came from homegardens. Although often consumed, lettuce was bought in stores, despite the interest some interviewees showed in cultivating it.

The most consumed condiments from the old urban homegardens of Rio Claro were 'salsinha' (*Petroselinum sativum*), 'cebolinha' (*Allium fistulosum*), 'manjerição' (*Ocimum basilicum*), 'manjerona' (*Origanum majorana*), and 'alfavaca' (*Ocimum* sp.) (Table 4). Other items, such as 'louro' (*Laurus nobilis*) and 'pimenta' (*Capsicum baccatum*), were consumed less often.

Plants primarily used in herbal teas had a special place in homegardens and in the diets of the interviewees (Table 4). Teas can be prepared with one or more plants. This study shows that 'soothing teas' can be made with 'poejo' (*Mentha pulegium*), 'erva cidreira' (*Cymbopogon citratus*), 'solevante' (*Mentha citrata*), 'melissa' (*Lippia alba*), and 'hortelã' (*Mentha* sp.), together or individually, through infusion. Similarly, the "teas good for kidneys" used leaves of 'palitária' (*Parietaria officinalis*) along with 'salsinha' roots and 'quebra-pedra' (*Phyllanthus tenellus*), or only with leaves of 'cana-do-brejo' (*Costus spiralis*).

The sampled population presented seasonal variations in their consumption of foods obtained from

Table 3. Total frequency of food item in diet and their frequency of obtainment from homegardens.

Food groups	Items (records number)	Total frequency of food item in diet	Frequency of homegardens food items in diet
Cereals, starches and pastas	Mandioca/Manihot ( <i>Manihot esculenta</i> Crantz)	7	3
Fruits	Laranja/Orange ( <i>Citrus sinensis</i> (L.) Osbeck); Eichemberg 115, 542	45	9
	Banana/Banana ( <i>Musa</i> sp.)	42	6
	Limão/Lemon ( <i>Citrus limonia</i> (L.) Osbeck); Eichemberg 63, 96 ( <i>Citrus latifolia</i> Tan.); Eichemberg, MT 64, 94	17	15
	Mamão/Papaya ( <i>Carica papaya</i> L.)	16	6
	Acerola ( <i>Malpighia emarginata</i> DC.); Eichemberg 5	8	8
	Goiaba/Guavas ( <i>Psidium guajava</i> L.); Eichemberg 51	4	4
	Lima ( <i>Citrus aurantifolia</i> (Christm.) Swingle); Eichemberg 80	3	2
	Jaboticaba ( <i>Myrciaria cauliflora</i> (Mart.) O. Berg); Eichemberg 13	2	2
	Fruta-do-conde ( <i>Annona reticulata</i> L.); Eichemberg 1, 65	2	1
	Pera/Pear ( <i>Pyrus communis</i> L.); Eichemberg 14, 57, 76	3	2
	Abacaxi/Pineapple ( <i>Ananas comosus</i> (L.) Merr.)	1	1
	Ameixa japonesa/Japanese medlar ( <i>Eriobotrya japonica</i> (Thunb.) Lindl.); Eichemberg 136	1	1
	Amora/Blackberry ( <i>Morus nigra</i> L.); Eichemberg 50, 116	1	1
	Figo/Figs ( <i>Ficus carica</i> L.); Eichemberg 43	1	1
	Pinha ( <i>Annona squamosa</i> L.); Eichemberg 105	1	1
Vegetables	Couve ( <i>Brassica oleracea</i> L. var. <i>acephala</i> ); Eichemberg 594	22	22
	Tomate/Tomato ( <i>Lycopersicon esculentum</i> Mill.); Eichemberg 186	20	1
	Abobrinha/Zucchini ( <i>Cucurbita pepo</i> L.)	9	2
	Almeirão/Chicory ( <i>Cichorium intybus</i> L.); Eichemberg 586	8	5
	Rúcula/Arugula ( <i>Eruca sativa</i> Mill.); Eichemberg 689	6	2
	Feijão/String bean ( <i>Phaseolus vulgaris</i> L.)	4	1
	Abóbora/Pumpkin ( <i>Cucurbita moschata</i> Duch); Eichemberg 61	3	2
	Quiabo/Okra ( <i>Hibiscus esculentus</i> L.); Eichemberg 311	2	1
	Brócolis/Broccoli ( <i>Brassica oleracea</i> Linn var. <i>italica</i> ); Eichemberg 620	1	1
	Espinafre/Spinach ( <i>Spinacia oleracea</i> L.); Eichemberg 589	1	1
	Mostarda ( <i>Sinapis arvensis</i> L.); Eichemberg 231, 687	1	1
Meats, sausage	Ovo/Egg*	1	1

\*Only one interviewed raised chickens in his homegarden.

Table 4. Frequency of spice and tea intake obtained from urban homegardens of Rio Claro with regard to the total frequency of food items in diet during the studied period.

	Items (records number)	Frequency of diet intake	Frequency of homegarden intake
Spice group	Salsinha/Parsley ( <i>Petroselinum sativum</i> Hoffm.); Eichemberg 124	40	40
	Cebolinha/Chives ( <i>Allium fistulosum</i> L.); Eichemberg 583, 611	37	37
	Manjeriço/Basil ( <i>Ocimum basilicum</i> L.); Eichemberg 48, 540	7	7
	Manjerona/Marjoram ( <i>Origanum majorana</i> L.); Eichemberg 74, 122, 355	6	6
	Alfavaca ( <i>Ocimum</i> sp1); Eichemberg 41, 117	4	4
	Alecrim/Rosemary ( <i>Rosmarinus officinalis</i> L.); Eichemberg 28, 68	3	3
	Orégano/Oregano ( <i>Origanum vulgare</i> L.); Eichemberg 123	3	3
	Louro/Bay leaf ( <i>Laurus nobilis</i> L.); Eichemberg 53, 607	2	2
	Pimenta/Pepper ( <i>Capsicum baccatum</i> L.); Eichemberg 46	2	2
Tea group	Capim cidreira/Lemon grass ( <i>Cymbopogon citratus</i> (DC.) Stapf); Eichemberg 580	16	16
	Hortelã/Mint ( <i>Mentha</i> sp1); Eichemberg 31, 69, 75	14	14
	Guaco ( <i>Mikania glomerata</i> Spreng.); Eichemberg 621 Guaco ( <i>M. cordifolia</i> (L.f.) Willd); Eichemberg 36, 630	3	3
	Melissa ( <i>Lippia alba</i> (Mill.) N.E. Br. ex Britton & P. Wilson); Eichemberg 22	3	3
	Cana-do-brejo ( <i>Costus spiralis</i> (Jacq.) Roscoe); Eichemberg 261	2	2
	Palitária ( <i>Parietaria officinalis</i> L.); Eichemberg 128, 585	2	2
	Poejo/Pennyroyal ( <i>Mentha pulegium</i> L.); Eichemberg 70, 121, 323	2	2
	Boldo ( <i>Plectranthus barbatus</i> Andrews); Eichemberg 6, 113	2	1
	Alfavacão ( <i>Ocimum gratissimum</i> L.); Eichemberg 29, 230	1	1
	Amora (folha)/Blackberry (leaf); ( <i>Morus nigra</i> L.); Eichemberg 50, 116	1	1
	Carqueja/Gorse ( <i>Baccharis trimera</i> (Less.) DC.); Eichemberg 34	1	1
	Maçã/Apple ( <i>Malus domestica</i> Borkh.); Eichemberg 118	1	1
	Cidreira-em-folha ( <i>Melissa officinalis</i> L.); Eichemberg 321	1	1
	Gengibre/Ginger ( <i>Zingiber officinale</i> Roscoe); Eichemberg 21	1	1
	Quebra-pedra ( <i>Phyllanthus tenellus</i> Roxb.); Eichemberg 190	1	1
	Solevante ( <i>Mentha citrata</i> Ehrh.); Eichemberg 654	1	1

homegardens during our survey (Figure 1). Although fruit consumption showed no seasonal variation, except for a small decrease in September, vegetable consumption was lower in May and July, which are typically dry months. Spice consumption also decreased in May and July, whereas the frequency of spice consumption increased in January.

This study found that ten food items produced in homegardens were sold. In 76% of these cases, they

were vegetables or condiments: 'couve', 'cebolinha' and 'salsinha'. Among the fruit group only 'laranjas' and 'jaboticabas' were sold on three occasions. We observed that 52 items – 21 herbal teas and condiments, 19 fruits and 11 vegetables – produced in homegardens were donated to neighbors and/or relatives. On average, 19 items were donated every two months: eight condiments and teas, six fruits and three vegetables, particularly



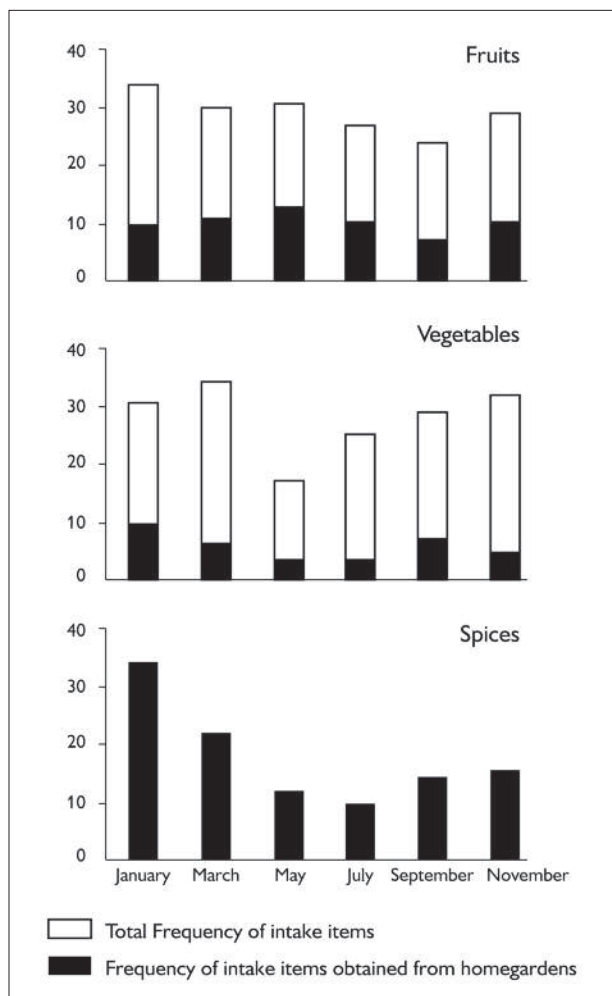


Figure 1. Frequency of food items obtained from homegardens, Rio Claro, Brazil, Jan.-Nov. 2002. The black bar indicates the period corresponding to the dry season.

'cheiro verde' ('cebolinha' and 'salsinha') and 'couve', which accounted for 28% of all the donated items. Fruits rich in vitamin C, such as 'limão' and 'acerola', were donated 17 and 11 times, respectively.

In the months we administered our surveys, 27 items were planted: 15 species of vegetables, seven fruits, four condiments and teas, and one flower species. The groups with the highest frequency of planted items were vegetables at 46% and condiments and teas at 21% of the total frequency. Only two fruit trees were cut because they were old and did not produce anymore,

and one persimmon was replaced by another tree of the same species.

## DISCUSSION

The Levins index shows that although the food items registered were numerous, only a few foods made up the staple diet of our subjects. Among the food groups, a low value of the Levins index was also observed, indicating a narrow food niche dependent on certain items. The production of food items in homegardens, particularly fruits, contributes to the diversification and supplementation of the informants' diets although this could be potentialized. Other studies have found a similar trend of increased consumption of fruits and vegetables produced in urban (Amorozo, 1981; Semedo and Barbosa, 2007; Amaral and Guarim Neto, 2008) and rural homegardens in Brazil (Ambrósio *et al.*, 1996; Nascimento *et al.*, 2005; Valadão *et al.*, 2006).

Some food species are common to these studies, such as 'laranja', 'jaboticaba', 'goiaba' and 'limão'. The consumption of these and other fruits and vegetables provides important sources of vitamins and micronutrients (Amorozo, 1981; Filgueira, 1981). In some cases, for example, in the diet of the Vera Cruz population (Ambrósio *et al.*, 1996), these food items constitute the only sources of retinol (vitamin A) and ascorbic acid (vitamin C). This is not the case in Rio Claro, where the population relies on other sources for these vitamins.

Among the cereals, starches and pastas group, the only item taken from homegardens was 'mandioca' (*Manihot esculenta*), which was consumed on only three occasions. Although seldom mentioned in the surveys, we observed that the presence of 'mandioca' in homegardens was quite significant. Other research conducted on the outskirts of some cities of the state of São Paulo also shows that the cultivation of 'mandioca' in urban homegardens is common and can be found in several varieties from all regions of Brazil (Valle, 2000).

A highlight of this study was the presence of medicinal plants coming from homegardens in the interviewees'

diets. Among the 26 items included in the group of homegrown teas and condiments, 17 were mentioned in our food survey and were used as medicinal resources by the interviewees. 'Capim cidreira' and 'hortelã' were predominant, followed by 'guaco' (*Mikania glomerata*), 'melissa' (*Lippia alba*) and 'boldo' (*Plectranthus barbatus*). Plants such as 'capim cidreira' and 'hortelã' are known in various parts of the world and are consumed for relaxation (Cruz, 1985), this was also observed in this study. Moreover, at least three more species present in the interviewees' diet are endowed with scientifically proven pharmacological properties: 'capim cidreira' (Onawunmi *et al.*, 1984; Blanco *et al.*, 2009), 'guaco' (Moura *et al.*, 2002) and 'boldo' (Schultz *et al.*, 2007).

The cultivation of medicinal plants in homegardens has been addressed in several studies that highlight its importance as a strategic alternative for the control and cure of some diseases in different cultures (Hanazaki *et al.*, 1996; Silva-Almeida and Amorozo, 1998; Amorozo, 2002; Pilla *et al.*, 2006; Borges *et al.*, 2008). The high cost of medicine and private health care are also factors that stimulate the production of plants with therapeutic properties in urban homegardens (Eichemberg *et al.*, 2009).

Some plants grown for medicinal purposes, such as 'hortelã' and 'salsinha', are also used as condiments. The production of condiments in the homegardens of the sampled interviewees indicated an interest in providing flavor variations to their meals. The condiments cultivated near households ensure an increased diversification of flavors (Murrieta, 2001). These condiments improve the palatability of food and break the repetitiveness and monotony of diets, and their use can be associated with regional cultural factors (Amorozo, 1981; Da Silva and Silva, 1995). For example, 'coentro' (*Coriandrum sativum*) is a widely used spice in the preparation of fish dishes in central-western and northern Brazil, but its presence was not observed in any urban homegarden in Rio Claro. However, to prepare meat, a common meal among these interviewees who are descendants of European

immigrants, spices such as 'manjeriçã', 'manjerona' and 'salsinha', typical of Italian cuisine, are used (Messer, 1984).

Seasonality in the monthly availability of food obtained from homegardens have been observed in another study, with a critical period between September and February (Ambrósio *et al.*, 1996). In Rio Claro, seasonality was greater during the dry and cold period (from May to July), especially for vegetables and spices.

The cultivation of food in urban homegardens provides a cheap option for food consumption and contributes the income of the families who sell such products (Niñez, 1984; Brito and Coelho, 2000; Kumar and Nair, 2004; Amaral and Guarim Neto, 2008). In Rio Claro, the production of fruits, vegetables and condiments in homegardens contributes to a small increase in monthly income. When they produce food items on their properties, informants reduce their expenses on these items. However, only the surplus of plants grown in these gardens is sold. This same situation was observed in the study of Amaral and Guarim Neto (2008), in which donation of food items was more significant than sales. According to Cavallini and Nordi (2005), donating of households products can strengthen ties and increase group cohesion in addition to being an important strategy for a more diverse diet.

To continue the tradition of homegardens mindsets should change, since five houses cemented their backyard during the first two months of field work. Young people, for instance, who usually show disinterest in homegardens, could be taught to recognize the potential benefits of homegardens and to work toward realizing those benefits. Another initiative could be institutional and governmental, with public policies committed to encouraging the production of food in urban homegardens. This stimulation activity would highlight the advantages of this production providing fiscal incentives such as tax reductions and access to credit programs and subsidies to help the population buy seeds and seedlings. Moreover, among other initiatives, it would provide information about the potential productivity and income, encouraging the sale of produce and exchange of

seedlings, and generating specific data on the cultivation of fruits and vegetables and their nutritional benefits.

## CONCLUSION

The diet of the sampled population is monotonous. Therefore, the consumption of condiments, vegetables and fruits produced in homegardens is important both for nutritional enrichment and for the diversification of meal flavors.

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