Fruit characteristics of the unconventional food plant *Pereskia aculeata* Mill. (*Cactaceae*) in southeastern Brazil

Características dos frutos da planta alimentícia não convencional Pereskia aculeata Mill. (Cactaceae) no sudeste do Brasil

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Tema gerador: Agroecologia e Agriculturas Urbana e Periurbana

Abstract

Ora-pro-nobis (*Pereskia aculeata* Mill., Cactaceae) is an unconventional food plant whose botanical, agronomical, and cultural characteristics have been studied in Brazil. The present study was conducted in a peri-urban area of Campinas, São Paulo state, and aimed to investigate some of the fruit characteristics yet unknown for ora-pro-nobis. Our results show that this plant has rather uniform fruit morphology, few seeds, low larval infestation, good germination under natural conditions, and low consumption by wild animals. These characteristics make ora-pro-nobis fruits important for use in peri-urban agriculture.

Keywords: PANC; fruit morphology; seed germination; peri-urban agriculture.

Resumo

Ora-pro-nobis (*Pereskia aculeata* Mill., Cactaceae) é uma planta alimentícia não convencional e suas características botânicas, agronômicas e culturais já foram estudadas no Brasil. O presente estudo foi realizado em uma área periurbana de Campinas, estado de São Paulo, e teve por objetivo estudar algumas características ainda desconhecidas para os frutos de ora-pro-nobis. Verificou-se que a planta apresenta certa uniformidade na morfologia dos frutos, poucas sementes, pouca infestação por larvas, boa germinação em condições naturais e pequena taxa de remoção por animais silvestres. Essas características colocam os frutos de ora-pro-nobis como importantes para uso em agricultura periurbana.

Palavras-chave: PANC; morfologia de frutos; germinação de sementes; agricultura periurbana.

Introduction

Unconventional food plants are species whose parts can be used for human consumption, but are not commonly consumed by most of the population (KINUPP; LORENZI, 2014). Brazil's Ministry of Agriculture, Livestock, and Supply (MAPA) defines them as:

"Unconventional vegetables are those with limited distribution - i.e., restricted to particular localities or regions - which exert considerable influence on traditional populations' diet and culture. Moreover, unlike conventional vegetables (potatoes, tomatoes, cabbage, lettuce, etc.), these species are not organized into commercial supply chains, thereby not arousing the interest of seed, fertilizer, or pesticide companies" (MAPA, 2010, pp. 6-7).

Pereskia aculeata Mill. (Cactaceae) - popularly known in Brazil as ora-pro-nobis - is considered an important unconventional food plant (KINUPP; LORENZI, 2014, MAPA, 2010). Native to Brazil, this species is found in the northeast (Alagoas, Bahia, Ceará, Maranhão, Pernambuco, and Sergipe), midwest (Goiás), southeast (Espírito Santo, Minas Gerais, Rio de Janeiro, and São Paulo), and south (Paraná, Rio Grande do Sul, and Santa Catarina) (TAYLOR et al., 2014). It is also grown as an ornamental plant in many countries of the world (MUNIZ, 2008).

Given that the botanical, farming, nutritional, and dietary characteristics of ora-pro-nobis and its cultural importance to traditional communities had already been established in Brazil (see GERMAK et al., 2011; KINUPP; LORENZI, 2014; MAPA, 2010; MUNIZ, 2008; ROSA; SOUZA, 2003; TAKEITI et al., 2009), this study aimed to produce knowledge about some of its yet unknown fruit characteristics. Considering that SOUZA et al. (2009) have indicated the potential of this species for traditional and agroecological farming, the study of the selected fruit characteristics of ora-pro-nobis is justified because is important for peri-urban farmers that: the diameter of its fruits and the size and number of its seeds should not compromise its commercial attractiveness; the rate of larval infestation should be low in ripe fruits so as not to hinder human consumption and marketing; seeds collected from ripe ora-pro-nobis fruits should be capable of producing seedlings that can be sold or used by individual peri-urban farmers to grow this species both within and in the vicinity of agricultural production areas; and wild animals should not be capable of massively removing its ripe fruits, thereby allowing their adequate picking and human consumption.

Methods

This study was carried out on a peri-urban area, at the edge of a fragment of a semi-deciduous forest adjacent to a human settlement (a suburb with a population of low purchasing power and small subsistence farming areas), in Campinas, São Paulo State, Brazil (22°49'S, 47°07'W, 670 m alt.).

All ora-pro-nobis plants found were marked for further observation and analysis of their fruits. Ripe fruits were collected to verify their diameter and the diameter and number of seeds present in each of them. A caliper was used to measure the diameters and the data were analyzed by descriptive statistics. Ripe fruits were cut open for the presence of larvae. The infestation rate was estimated by dividing the total number of larvae by the number of sampled fruits. The seeds of the fruits were manually extracted, rinsed and placed in germination boxes containing soil from the parent plant's site. The germination boxes were shielded (to prevent ants from removing the seeds and to exclude

any possibility of predation), moistened, and placed at the parent plant's site. After one month, the seed germination rate was estimated. Germination tests were carried out with seeds from both larvae-infested and larvae-free fruits, separately, to verify whether the presence of larvae influenced germination, using the chi-square test (GraphPad Software, free available at http://www.graphpad.com/quickcalcs/). As to the rate of removal by frugivorous animals, 300 ripe fruits present in five ora-pro-nobis plants were marked. After 15 days, they were re-counted to verify how many of them had been removed from the plants.

Results and discussion

There were found 18 ora-pro-nobis plants growing in the study area. Since it is a vine species, ora-pro-nobis plants grow on trunks of trees and fences. The largest height found in the study area was 4.5 meters, but Muniz (2008) claims that this species grows fast and its branches can reach up to 10 meters long. In this study, ora-pro-nobis produced fruit between May and August. Muniz (2008) reported ora-pro-nobis fruiting from July to September in the south of São Paulo State. Thus, it is possible to affirm that this species produces fruit during the dry season. Ora-pro-nobis fruit is of the berry type, yellowish when ripe, odorless, with tiny, thin thorns, which can be easily removed. Its seeds are black, round, and flat. According to Muniz (2008), the flesh of its fruit tastes "sub-acidic and insipid like weak lemonade".

The mean diameter of ora-pro-nobis fruits in this study measured 18.9 ± 2.4 mm (mean ± SD, n = 151) and the mean seed diameter was 5.9 ± 0.7 mm (mean ± SD, n = 151). The fruits have an average of three seeds each (2.8 ± 1.4 seeds/fruit, mean ± SD, n = 151), ranging from 2 to 6 seeds per fruit. The mean diameter of the ora-pro-nobis fruits studied by Muniz (2008) was 2 cm; they weighed from 3 to 6 g and the diameter of their seeds measured between 3 and 4 mm.

Sixty-five percent of the 151 fruits observed had no larvae inside, 19% had a larva and the remaining 16% had two to four larvae. The infestation rate was 0.18 larvae/fruit. On the outside, there were no differences between larvae-infested and larvae-free fruits. The larvae found in this study were not identified, but the literature reports three species of fruit fly whose larvae make use of ora-pro-nobis fruits, namely, *Anastrepha barbiellinii* (Lima) (Tephritidae), *Ceratitis capitata* (Wiedemann) (Tephritidae), and *Neosilba* sp. (Lonchaeidae) (GARCIA; NORRBOM, 2011; MARSARO JÚNIOR et al., 2011). There is only one information about infestation rate in ora-pro-nobis available in literature, referring to the species *Pereskia grandifolia* Haw., in which Sá et al. (2008) reported no infestation of fruits.

The germination rate for seeds taken from larvae-free ora-pro-nobis fruits was 35.3% (106 out of 300 sown seeds germinated). On the other hand, the germination rate for seeds taken from larvae-infested fruits was 34.3% (103 out of 300 sown seeds germinated). There was no significant difference between germination rates of seeds from larvae-infested and larvae-free fruits (X^2 = 0.032, df = 1, p = 0.85). In a study conducted in vitro, Vasques-Araújo and Joaquim (2014) found a higher germination rate (between 57% and 100%). The lower germination rate found in this study may be due to the fact that the experiment took place under field conditions, where seeds are more prone to colonization by fungi and bacteria (FIGUEIREDO; PERIN, 1995).

The removal rate of ripe fruits by wild animals was 2.7% (8 out of 300 ripe fruits marked). Since *Pereskia aculeata* fruits are mainly consumed by monkeys (SANTOS et al., 2013), the low removal rate found in this study may be due to the studied plants being on the edge of the forest fragment near a peri-urban human settlement, which can reduce the frequency of visits by primates.

Conclusion

It may be concluded that ora-pro-nobis is an unconventional food crop with favorable ecological characteristics for use by peri-urban farmers as a source of income, since it presents reasonable uniformity in fruit morphology, few seeds, low larval infestation, good field germination, and low removal rate by wildlife. In addition, the Ministry of Agriculture, Livestock, and Supply reports that this rustic plant is drought resistant and requires little fertilizer application (MAPA, 2010).

Besides its nutritional importance, ora-pro-nobis can be important to beekeeping and honey production, since its flowers attract many bees (MAPA, 2010). It can also be employed as animal feed and forage, and for medicinal ends, e.g., as emollient (leaves), expectorant (fruit), and dewormer (roots) (MUNIZ, 2008).

Despite its high nutritional value, the use of ora-pro-nobis as food is still insignificant (DIAS et al., 2005, ALMEIDA; CORRÊA, 2012), which asks for the urgent cultural revival of its consumption. Moreover, as has been previously suggested for unconventional food plants as a whole,

“Research and implementation of public policies that promote the use, revival, and appreciation of native species can contribute to nature conservation and sustainable development and increase the number of food sources, thereby expanding Brazil’s agricultural matrix as well as that of the world, increasingly globalized and dependent on very few key species” (KINUPP; BARROS, 2008, p. 846).

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