Development of Pineapple as an Ornamental Potted Plant

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Abstract
Ananas species (Bromeliaceae) are herbaceous monocotyledonous perennial tropical plants. Some of them are grown as ornamental, mainly because of their beautiful, exotic and long-lasting inflorescence and foliage. Some hybrids of Ananas comosus var. bracteatus × A. comosus var. erectifolius are being selected for use as potted plant, landscaping and even as cut flower. The objective of this study was to characterize the development of two ornamental pineapple hybrids as potted plant. Two accessions (‘A’ and ‘D’) of ornamental pineapple from the Pineapple Germplasm Bank of Embrapa Cassava & Tropical Fruits were used. The acclimatization of micropropagated plants lasted 60 days and afterwards plantlets were transferred to 1-L plastic pots containing commercial substrate. Plants were kept under protected environment (50% shading) and were fertilized monthly. Evaluations were made on the morphological plant characteristics (plant height, number of leaves and dry matter content) and response to floral induction. Accession ‘A’ (with predominantly purple-green leaves, green at the leaf base and apex area) had a greater development (higher leaf length, number of leaves and dry matter accumulation) compared to accession ‘D’ which had light green leaves. Accession ‘A’ had also more persistent old leaves and needed pruning. Both accessions were small-sized plants and had no spines on the leaf margins. Slow growth was noticed during the first 90 days of cultivation. The highest need for fertilization was between 90 and 150 days. Plants became responsive to floral induction at 10 months. We concluded that both accessions are suitable for pot cultivation.

INTRODUCTION
Ornamental pineapple cultivation has increased in Brazil due to the exotic and colorful small fruits. The Embrapa Cassava & Tropical Fruits has an ex-situ collection of 678 accessions of the Ananas genus and some other Bromeliaceae (Souza et al., 2009) and has carried out several studies in ornamental pineapple breeding (Souza et al., 2006, 2007, 2009). Souza et al. (2012) evaluated 89 accessions of Ananas comosus and based on 25 morphological descriptors these accessions were classified into the following categories of potential use: landscape plants, cut flowers, potted plants, mini fruits, foliage and hedge. According to these authors, pineapple plants suitable for pot cultivation should have following characteristics: a plant height lower than 65 cm, a canopy diameter less than 80 cm, a leaf length of less than 60 cm, a crown/syncarp ratio close to 1, a syncarp length of less than 5 cm, a syncarp diameter less than 3 cm, a crown length less than 5 cm, a peduncle length less than 30 cm and absence of spines on the leaf margins.

The transition of plants traditionally grown in the field to pots requires a development of a new cultivation system. Plant development is restricted in pots due to the limited substrate volume and restricted root growth. Thus, understanding nutritional requirement is essential to supply the mineral nutrients allowing a normal plant development in this new cultivation system. The objective of this study was to characterize the development of two ornamental pineapple accessions as potted plants.
MATERIALS AND METHODS

The experimental design was completely randomized, in a split plot scheme with five replications, with two ornamental pineapple accessions as plots and ten sampling times as sub-plots. The ornamental pineapple accessions (‘A’ and ‘D’) were collected from the Active Germplasm Bank of the Embrapa Cassava & Tropical Fruits and micropropagated at the Tissue Culture Laboratory of Embrapa Tropical Agroindustry. These accessions were chosen due to the previous selection for potted plants made by Souza et al. (2012).

The acclimatization of ornamental pineapple plants was made in 162 cells polyethylene trays and filled with commercial substrate (mixture of composted pine bark, peat and vermiculite). The trays were kept in a greenhouse and every 15 days the plants received 10 ml of ½ strength modified Hoagland solution (Hoagland and Arnon, 1950). The acclimatization of ornamental pineapple plants lasted 60 days. Afterwards the plants were transferred to plastic pots (1-L capacity), filled with the same commercial substrate as described above. Pots were placed in a greenhouse with black shade cloth of 50% transmittance. The plants were fertilized every 30 days, from 30 to 150 days after planting, and at every fertilization 60, 60, 40, 40, 10, 10, 0.16, 0.3, 1, 0.8, 1 and 0.03 mg per pot of N, P, K, Ca, Mg, S, B, Cu, Fe, Mn, Zn and Mo, respectively, were given. Pots were watered daily through an overhead sprinkler irrigation system during the entire experiment.

Plants were collected at 0, 30, 60, 90, 120, 150, 180, 240, 300 and 360 days after planting. Plant height, leaves number, shoot and roots dry matter were determined at every evaluation time. The number of leaves was determined by counting all living healthy leaves per plant. Plant height was measured from substrate surface to the longest leaf tip. Shoot and roots were separated for dry weight determination and dried in an oven at 65°C until constant weight.

Plants were induced for flowering after 10 months, according the procedures described in Correia et al. (2011). Five ml of the induction solution (0.324 g of ethephon, 0.35 g of calcium hydroxide and 20.0 g of urea per liter of water) were poured into the plant central cup. Thirty days after the treatments the number of induced plants was determined.

The data obtained were subjected to variance analysis using SAS program and means were compared by Tukey test at 5% probability (SAS, 2012).

RESULTS AND DISCUSSION

Pineapple accession ‘A’ had predominantly purple-green leaves (green at the base and apex), while leaves of accession ‘D’ presented a light green color over the entire leaf area (Fig. 1). Both accessions showed no spines on the leaf margins.

Since the evaluation made at 30 days after planting, the accession ‘A’ showed higher plant height than ‘D’. According to Souza et al. (2014) the plant height is a defining characteristic in the selection of ornamental pineapples especially for potted plants, since they must be preferably short, with small and compact canopies. In this experiment, twelve months after planting, accession ‘A’ and ‘D’ had a plant height of respectively 49.8 and 38.8 cm (Fig. 2) and both were considered suitable for cultivation in pots.

The accessions were different in the number of leaves but only from 30 to 150 days of planting (Fig. 3). Accessions ‘A’ and ‘D’ showed 63.6 and 59.8 leaves twelve months after planting in pots. Accession ‘A’ has more persistent old leaves and it was needed to prune these leaves before these plants can be marketed. After pruning 63 and 72% of the leaves remained in the ‘A’ and ‘D’ accessions, respectively (data not shown).

Dry matter accumulation was similar among the accessions evaluated until 180 days of planting (Fig. 4). From 240 days of planting ‘A’ accession accumulated more shoot dry matter than ‘D’. Considering the shoot dry weight accumulation over 360 days of cultivation in pots (Fig. 4), three distinct phases can be described: 1) slow development until day 90; 2) increase in shoot dry weight accumulation from 90 to 150 days; 3) rapid
plant development with marked shoot dry matter accumulation from 150 to 360 days. The results indicate that, due to the slow plant development until 90 days after planting, the response of ornamental pineapple to fertilization is low during this period. Thus, the fertilization of ornamental pineapple in pots should be planned to provide small amount of fertilizer until 90 days after planting and most of nutrients should be applied before the 150 days.

Plants were responsive to flower induction at the age of 10 months after cultivation in pots, and 82 and 54% of ‘A’ and ‘D’ accessions (data not shown), respectively, presented inflorescence formation (Fig. 5).

CONCLUSIONS

Accessions ‘A’ and ‘D’ of ornamental pineapple are both suitable for pot cultivation. Little fertilizer should be provided to ornamental pineapple in pots until 90 days but most of nutrients should be applied before the 150 days.

Literature Cited
Figures

Fig. 1. Leaf coloring of the ornamental pineapple accessions ‘A’ (1A) and ‘D’ (1B).

Fig. 2. Plant height (cm) of two ornamental pineapple accessions over 360 days of cultivation. * and NS: P<0.05 and not significant, respectively, at each sampling time.
Fig. 3. Number of leaves of two ornamental pineapple accessions over 360 days of cultivation. * and NS: P<0.05 and not significant, respectively, in each sampling time.

Fig. 4. Shoot dry matter (g/plant) of two ornamental pineapple accessions over 360 days of cultivation. * and NS: P<0.05 and not significant, respectively, in each sampling time.
Fig. 5. Inflorescence aspects of two ornamental pineapple accessions ‘A’ (left) and ‘D’ (right).