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Naomi Poinsettia (*Euphorbia pulcherrima* Willd. ex Klotzsch) variety for indoor spaces

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ABSTRACT

Objective: To evaluate the behavior of the Naomi poinsettia variety and its varietal description applying the guidelines of the Union for the Protection of New Varieties of Plants (UPOV).

Design/Methodology/Approach: The variety was generated through the following methods: plant genetic hybridization, individual selection, and use of the grafting technique. The varietal description was based on the document of the Union for the Protection of New Varieties of Plants (UPOV). A completely randomized experimental design with 10 replications was used. Vegetative and reproductive characteristics of the plant were recorded. The data was subjected to an analysis of variance and Tukey's mean comparison test ($P \leq 0.05$).

Results: The Naomi variety is tall with intermediate width and branching. It has a very intense green color in the middle third of the stem. It has oval-shaped leaves of intermediate size, with a rounded base, and without curvature in the main nerve. Its elliptical bract does not have a torsion, but it has an intermediate roughness between its nerves.

Study Limitations/Implications: The variety is propagated asexually via cuttings and the plants from which the cuts are made are preserved as mother plants. It needs adequate nutrition and light and temperature conditions that hinder floral differentiation.

Findings/Conclusions: The new poinsettia material has phenotypic attributes demanded by the market. The varietal description indicates that it is comparable with other INIFAP varieties and with commercially available varieties. This plant can be considered a competitive candidate for the diversification of the offer of poinsettia plants in the Christmas season.

Keywords: Bract, leaf, archetype.

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INTRODUCTION

Euphorbia pulcherrima Willd. ex Klotzsch —known as nochebuena or poinsettia— is considered a symbol of Christmas around the world. Mexico has a long tradition of growing this ornamental species. Every year, several municipalities of the state of Morelos have been identified as major producers of finished plants; the commercialization of the poinsettias is carried out in the producers' own nurseries.

In Mexico, the annual demand amounts to approximately 20 million poinsettia plants (SIAP, 2018), which are sold in 3–12-inch containers. The whole production is sold from November to mid-December, generating 718 million 372 thousand Mexican pesos. This sector uses a large amount of labor in the management of the crop itself, in post-harvest preparation, and in marketing. Worldwide poinsettia production is close to 500 million plants and is experiencing a constant increase in Europe, Asia, and North America, due to its economic, aesthetic, and commercial potential (Vilperte *et al.*, 2021).

In Mexico, the Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP) has implemented the Programa de Mejora Genética de Nochebuena in the Campo Experimental Zacatepec, Morelos (Canul-Ku *et al.*, 2021). The genetic improvement criteria applied are essentially focused on the characteristics of the leaf, bract, and plant architecture (Canul-Ku *et al.*, 2017). A national germplasm with a broad genetic base (Canul *et al.*, 2013) has provided the bases for the strategies that have been followed: using manual crossing of materials with the best aesthetic attributes demanded by the market (Canul-Ku *et al.*, 2017); reducing plant height; improving the branch growth capacity (Canul-Ku *et al.*, 2018); and using grafting to improve the overall plant architecture (García-Pérez *et al.*, 2017).

The objective of this study was to evaluate the behavior of the Naomi poinsettia variety in the state of Morelos. A local producer cooperated in this research, in which the varietal description was carried out applying UPOV guidelines.

MATERIALS AND METHODS

The Naomi variety was generated in the Campo Experimental Zacatepec (INIFAP), located in Zacatepec de Hidalgo, Morelos, Mexico, at 18° 39' 16" N and 99° 11' 54" W and at an altitude of 910 m. The plant genetic improvement methods used in the generation process were hybridization, individual selection, and the grafting technique.

In 2011, the simple manual crossing between the NIS2P6×NFMOR parents was carried out applying the technique generated by Canul-Ku *et al.* (2015). In 2012, the F_1 progeny was evaluated, and the most promising plants were selected based on their aesthetic attributes; the plants were propagated asexually through cuttings in 2013. Subsequently, four cycles of individual selection were carried out in the 2014-2017 period. In 2018, the new variety was grafted onto a commercial variety using the wedge technique (García-Pérez *et al.*, 2017). The resulting progeny was increased in number by asexual propagation (cuttings) and was evaluated in 2019. This form of propagation maintains the genetic and phenotypic identity of the variety, since the characteristics of the next clonal generation will be stably inherited and maintained in the cuttings used to establish new crop cycles (Islam *et al.*, 2013).

The varietal description was carried out in 2020 applying the guidelines of the Union for the Protection of New Varieties of Plants (UPOV, 2008) in Tetela del Monte (18° 58' N, 99° 15' W, and 2000 m.a.s.l.), municipality of Cuernavaca, state of Morelos, Mexico. For this purpose, 10 plants of the new variety were established in 6-inch pots and the Alhely and Beatriz varieties were used as controls for the varietal comparison. The crop was managed through the technological package generated by INIFAP (García *et al.*, 2017). It should be

pointed out that growth regulators were not applied, in accordance with UPOV guidelines. In the bract pigmentation stage (specifically with three open cyathia), 53 characteristics were documented applying the UPOV criteria (2008).

In addition, 11 vegetative and reproductive characteristics of continuous distribution were recorded. This information was used to perform an analysis of variance and Tukey's mean comparison test ($P \leq 0.05$) with the statistical analysis software SAS version 8.1 (SAS, 2000).

RESULTS AND DISCUSSION

The generation of the Naomi variety was a 10-year process. The crossing of the parents and the evaluation of the F_1 progeny was carried out in the Campo Experimental Zacatepec, while the selection and description were carried out in Tetela del Monte —one of the areas with the highest production in the state of Morelos, located in the municipality of Cuernavaca.

Behavior

As shown in Table 1, the morphophenotypic response of Naomi was comparable to that of other varieties generated by INIFAP: bract length, leaf width, and leaf petiole length were statistically similar. Naomi's bract width was equal to the Alhely variety.

The aesthetic and commercial value of poinsettia lies in its architecture, the compact size of the plant, its quantity, and the color of the bract. Naomi had the highest number of branches (Table 1), each one representing a potential bract. Overall, a higher number of bracts entails greater acceptance among the consumers and in the market.

Naomi had an intermediate response in terms of plant height, stem diameter, and bract petiole length. However, it had the lowest leaf length (Table 1).

Table 1. Comparison of the means of the evaluated characteristics of the Naomi poinsettia variety and two controls.

Character	Alhely	Beatriz	Naomi	DMSH	CV%
Plant height (cm)	59.92 a	43.88 c	48.94 b	4.17	7.39
Stem diameter (mm)	14.53 a	10.71 c	12.51 b	1.80	12.93
Leaf length (cm)	12.14 a	12.12 a	9.43 b	1.41	11.38
Leaf width (cm)	7.97 a	7.73 a	7.02 a	1.21	14.47
Leaf petiole length (cm)	4.23 a	3.86 a	3.56 a	0.68	15.91
Number of branches	6.3 b	6.7 b	9.1 a	1.84	22.63
Bract width (cm)	5.66 a	4.3 b	5.83 a	0.74	12.74
Bract length (cm)	9.51 a	10.22 a	9.94 a	1.18	10.78
Bract petiole length (cm)	2.03 b	2.56 a	2.36 ab	0.51	19.91
Bract canopy width (cm)	22.03 b	29.2 a	23.38 b	3.03	11.07
Cyathium diameter (cm)	3.45 ab	5.6 a	3.06 b	2.25	21.6

DMSH=Honest minimal significant difference, CV=Coefficient of variation, Values with different letters within rows indicate significant differences (Tukey, $P \leq 0.05$).

Characteristics

The Naomi variety is a tall plant with intermediate width and branching. It has a very intense green color in the middle third of the stem. The intensity of anthocyanin pigmentation in the middle third and upper third of the stem is likewise strong. It has oval-shaped leaves of intermediate size, with a rounded base, and without curvature in the main nerve. Its elliptical bracts do not have a torsion, but they have an intermediate roughness between their nerves. According to the color chart of the Royal Horticultural Society (RHS, 2007), the color of the upper part of the bract is 53A and that of the lower part 53B. The width of the top is narrow. The cyathium glands are small, yellow, and not deformed. According to its response to the change of season (approximately, September 21), it is considered a late cycle variety (Figure 1).

The production of Naomi is feasible in the various states that produce poinsettias in Mexico. The technological management of the variety by the cooperating producers resulted in a good commercial quality of the plant. Meanwhile, the preventive application of pesticides protected the plants from pests and diseases.

The registration of the Naomi variety before the Servicio Nacional de Inspección y Certificación de Semillas (SNICS–SADER) is pending, with the purpose of obtaining the plant patent and its inclusion in the Catálogo Nacional de Variedades Vegetales (CNVV).

The commercial exploitation of the variety is possible through the signing of a licensing agreement. Mother plants are available at the Campo Experimental Zacatepec, in the state of Morelos. To maintain the varietal identity and genetic purity, it is kept in a vegetative form and is propagated vegetatively through cuttings.

Figure 1. Phenotypic attributes of the Naomi variety.

CONCLUSIONS

The new poinsettia material has phenotypic attributes demanded by the market. The varietal description indicates that it is comparable with other INIFAP varieties and with commercially available varieties. The Naomi variety is tall with intermediate width and branching. It has oval-shaped leaves of intermediate size, with a rounded base, and without curvature in the main nerve. Its elliptical bracts do not have a torsion, but they have an intermediate roughness between their nerves.

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