

Development of hibiscus hybrids ‘Women in Public Service Series II’ and propagation studies on *Hibiscus rosa-sinensis* ‘Cynthia A. Villar’

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The breeding and selection of hibiscus have been conducted since 1995 at the breeding nursery of the Institute of Plant Breeding (IPB), Crop Science Cluster (CSC), University of the Philippines Los Baños (UPLB), to continuously develop new hybrids. Seven hybrids with unique and new flower traits plus suitable plant growth habit were selected. The seven hybrids, collectively called the ‘Women in Public Series II’, were named after outstanding and dedicated Filipina public servants. These hybrids are: i) *Hibiscus rosa-sinensis* ‘Domini M. Torevillas’, a dark orange (RHCC 28 A) flower with dark red eye zone and light red blushes radiating to the petals; ii) *H. rosa-sinensis* ‘Cynthia A. Villar’, an orange (RHCC 28B) flower with red eye zone (RHCC 45B) surrounded by pinkish halo; iii) *H. rosa-sinensis* ‘Marilyn D. Marañon’, a lemon yellow (RHCC 8 A) flower with white eye zone (RHCC 25 A) surrounded by pinkish halo; iv) *H. rosa-sinensis* ‘Maria Rosario O. Montejo’, a red orange (RHCC 45 B) flower with pinkish red eye surrounded by

yellow edges; v) *H. rosa-sinensis* ‘Arlene B. Arcillas’, a carmine rose (RHCC 52C) flower with cardinal red eye (RHCC 53C); vi) *H. rosa-sinensis* ‘Connie S. Angeles’, an orpiment orange (RHCC 25 A) flower with cardinal red eye (RHCC 53 A) surrounded by pinkish halo; and vii) *H. rosa-sinensis* ‘Sylvia P. Lina’, a neyron rose (RHCC 56A) flower with magenta eye (RHCC 66A). These hibiscus hybrids have been registered with the Germplasm and Technology Release and Registration Office (GTRRO) of the IPB-CSC.

Propagation studies on *Hibiscus rosa-sinensis* ‘Cynthia A. Villar’ were conducted to explore the use of techniques that could enhance rapid propagation of the new variety. Among the three hibiscus varieties tested, the var. ‘Wilcox’ had significantly the highest percent success for use as rootstock in comparison to var. ‘Reddy or Not’ and ‘Petite Peach’. Among the three propagation methods used, marcotting had significantly the highest percentage (95.83%) of success in producing asexually propagated plants compared to cleft-grafting and budding. In addition, marcots treated with Biospark *Trichoderma* significantly produced a higher number of adventitious roots than marcots treated with the rooting hormone or the combination of rooting hormone and Biospark *Trichoderma*.

KEYWORDS

Hibiscus rosa-sinensis, breeding, hybrid, gumamela, propagation

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INTRODUCTION

The hibiscus or gumamela (*Hibiscus rosa-sinensis*), a member of the Malvaceae family, is a diploid species with a chromosome number $x = 7, 8-39$ (Purseglove 1987). It was introduced into the Philippines by the Chinese traders long before the coming of the Spaniards. It was the American colonizers who introduced new forms and cultivars into the country in the 1900s. The many splendid hibiscus varieties are closest to the Filipino gardeners' heart. The Westerners referred to the hibiscus as the connoisseur's flower because it has so many fans like the rose and camellia (see, for example, ABC Gardening Australia Magazine, October 2008 issue). The beauty of the hibiscus makes it one of the most widely cultivated flowers in brilliant hues of red, orange, purplish-red, yellow, white, purple, pink and several other color combinations whose petals are either single or double (Howie 1980, Peebles 1998).

The hibiscus has become a very popular ornamental plant in the Philippines and other Asian countries like Malaysia, Thailand, Indonesia and Viet Nam because of its tropical appeal. It is usually used in adorning many home gardens and public places such as schools, parks, golf courses and resorts because of its attractive and big flowers with striking tropical appeal (Magdalita et al 2009). It is also used, either as a potted plant, fence or hedge plant, or as a landscape shrub (Magdalita and Pimentel 2010). It is also used for human consumption such as in the manufacture of food items like jam, jelly, juice and fritters, and as component of fresh vegetable salad (The Australian Hibiscus Society, Inc. 2007, Magdalita et al 2011). The leaves are also used as feed for goats and some Lepidopteran insects like the turnip and nutmeg moth.

The petals and the leaves are also used as herbal tea, which is gaining worldwide popularity because it is associated with health, wellness and longevity. The natives of Southern India use the red hibiscus as remedy for hair-fall and dandruff, and to regulate menstruation, as well as a purgative (Rummel 2005). In addition, the root decoction of the white hibiscus is used to treat various ailments such as

bronchitis, cough, colds, fever, sore throat, fever, dysentery, urinary tract infection, bladder infection, high blood pressure, constipation, headache, boils, swelling abscesses and mumps (Philippine Herbal Medicine 2006, Sas 1990). In the Dutch Indies, midwives use the mucilage of the hibiscus flower to induce delivery of the baby while a mother is in labor. The juice of the leaves along with that of *Vernonia cinerea* is also used by midwives to stimulate the expulsion of the afterbirth after delivery of the baby (BPI-DA 2006).

The flowers contain the compound hibiscetin (BPI-DA 2006), including benzene and alcohol, which possess antiestrogenic or antifertility properties (Kholkute et al 1977). The hibiscus flower also contains flavonoid aglycones including flavanol quercetin and anthocyanin cyanidin. The application of flower extracts for 20 weeks in experimental mice significantly reduced the number of tumors and delayed the appearance of tumors when mice were pre-treated with the extract (Rummel 2005), suggesting its anti-cancer properties.

The commercial potential of the hibiscus both as a potted

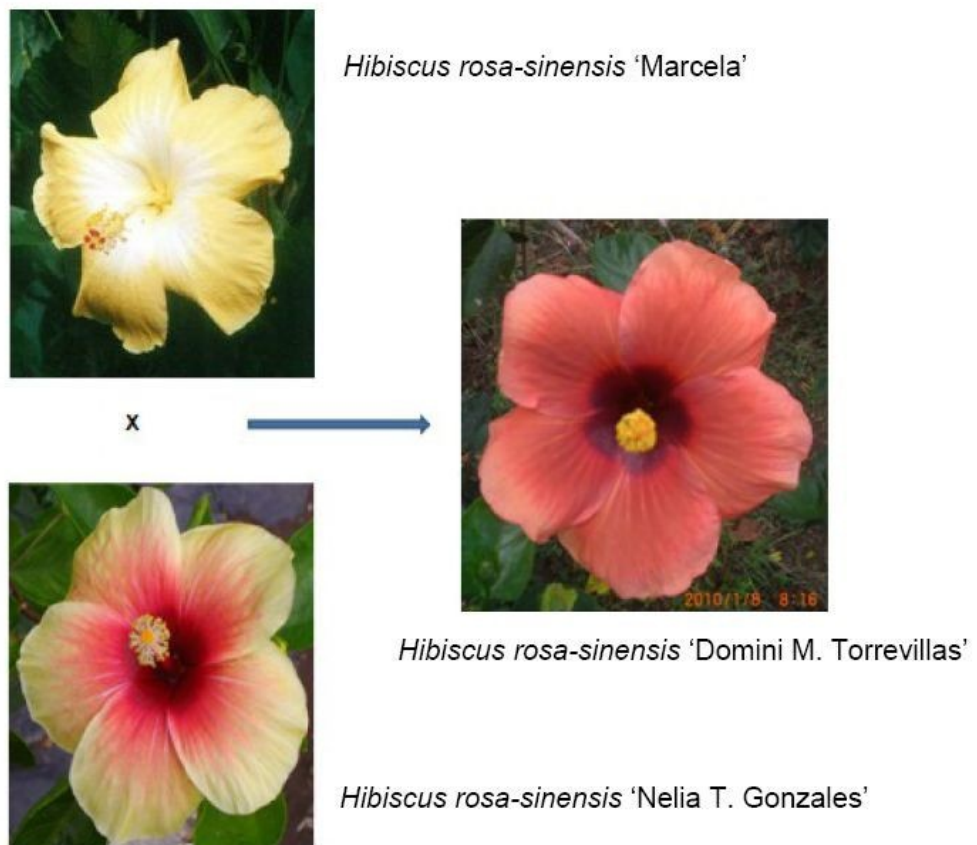


Figure 1. The hybrid *Hibiscus rosa-sinensis* 'Domini M. Torrevillas' and its female parent *H. rosa-sinensis* 'Marcela' and male parent *H. rosa-sinensis* 'Nelia T. Gonzales'.

ornamental and as a garden plant could be exploited, hence the breeding of hibiscus was implemented by the breeders-researchers of the Institute of Plant Breeding in 1994 (Pimentel 1999) and continuing up to the present to develop new idio-type hybrid varieties with multiple flower colors (Magdalita and Pimentel 2010). In addition, mass propagation of the hybrid variety is necessary to disseminate rapidly the hybrid variety to prospective growers and landscapers. Several known propagation methods for hibiscus have been tried, but the success could vary depending on the variety, the method used, season of the year, source of material, and the skills of the propagator (Magdalita 2012).

This study was done to: i) hybridize and select new hibiscus hybrids with unique flower colors, ii) characterize the hybrids, and iii) compare three propagation methods as applied to the hybrid, *Hibiscus rosa-sinensis* 'Cynthia A. Villar', in order to identify the most efficient of the three.

MATERIALS AND METHODS

Development of hibiscus hybrids

In hybridization, the parents that were used were local varieties and introduced cultivars and hybrids that were procured from Hawaii, USA, Queensland, Australia, and Bangkok, Thailand. The pollens from a selected male parent were transferred into the stigma of the chosen female parent during sunny days only. The pollinated stigma was covered with a piece of aluminum foil and the pollinated flower was allowed to develop for a month, and the seeds were extracted and sown in a 1:1 (v/v) mixture of soil and sand. The germinated seedlings were allowed to grow for a month before they were transferred to individual pots containing 1:1:1 (v/v) mixture of soil, coir dust and hog manure, and grown for one year. After this period, they were planted directly in the hibiscus breeding blocks until they flowered. The selected candidate hybrids were further grown for 2-4 years until a sufficient vegetative growth was attained and were ready for clonal propagation.

Selection, characterization and propagation of hybrids

The selection of hybrids that are prolific bloomers with the most beautiful and unique flowers from among thousands of progeny plants was done. The parents of each hybrid were also documented for comparison purposes. Seven hybrids that have been established in the breeding blocks at the Crop Science Cluster and Institute of

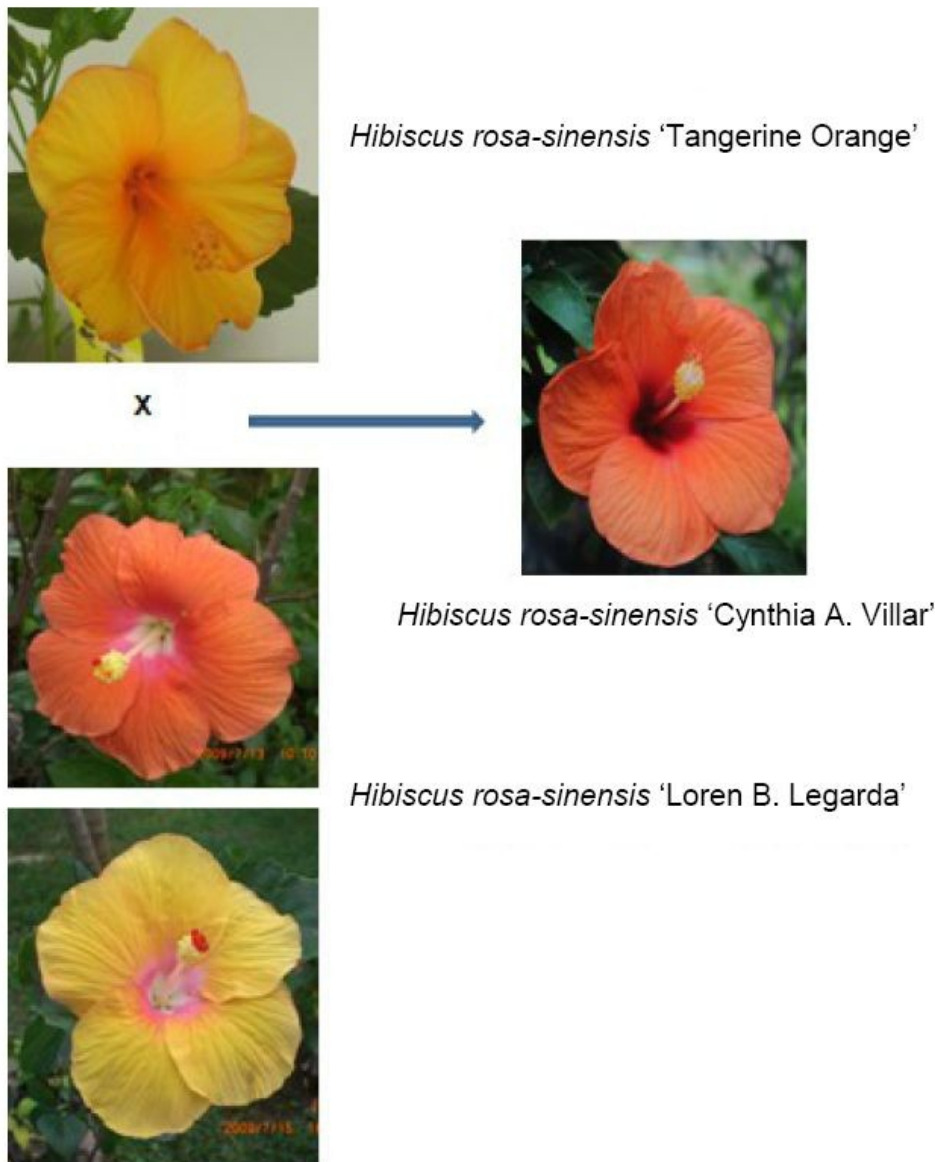


Figure 2. The hybrid *Hibiscus rosa-sinensis* 'Cynthia A. Villar' and its female parent *H. rosa-sinensis* 'Tangerine Orange' and male parent *H. rosa-sinensis* 'Loren B. Legarda'.

Plant Breeding (CSC and IPB), College of Agriculture (CA), University of the Philippines Los Baños (UPLB) were selected based on flower characteristics, growth habit and freedom from pests. The criteria for evaluating flower traits included: uniqueness of flower color, retention of flower color, elegant display of the flower on the plant, petal overlap, flower size and non-folding of the petals. The selection criteria for growth habit included: prolific bloomer, vigor and sturdiness, semi-erect growth habit and bushiness. The hybrids having the most unique flower color and that were vigorous and free from pests were chosen. They were characterized phenotypically based on their individual growth habit and flower characteristics. The flower and leaf colors were described based on the Color Chart of the Royal Horticultural Society (RHS) of London (1966).

After selection of the candidate hybrids, mother plants were produced to be used as source of planting materials. Pencil-sized branches were chosen and marcots were made. A portion of the bark about 1.5-2.0 cm was removed from each stem and the slimy substance (cambium layer) was scraped off and this was allowed to dry for one day. The following day, a boll of moist coir dust was wrapped around the barkless stem to which rooting powder/paste containing indolebutyric acid (IBA) had been applied. The boll of coir dust was encased in a piece of plastic tied with string to secure the marcot. Two months after marcotting, the marcots were harvested and planted in pots containing 1:1:1 (v/v) mixture of soil, coir dust and decomposed hog manure. When luxuriant growth was attained, these plants were re-marcotted to multiply the selected hybrids (Magdalita et al 2011).

Alternatively, cuttings with 3-4 nodes or 15.0 cm in length were severed from the mother plant. They were dipped quickly in rooting powder, inserted in a small piece (1.5 x 1.5 x 3.0 cm) of wet floral foam that was placed in a seedling tray and finally incubated under an intermittent mist. After three weeks, when profuse roots had developed, the cuttings were planted in pots containing 1:1 (v/v) mixture of garden soil and sand. They were

allowed to grow for two months until they flowered.

Registration of the hybrids

The asexually propagated plants of each hybrid were maintained until a luxuriant growth was attained. Initially, 50 asexually plants that were flowering were produced to satisfy one of the requirements for registration. After this number of plants was satisfied, application for registration of each hybrid was prepared based on the requirements set by the Germplasm and Technology Release and Registration Office (GTRRO) of the CSC and IPB, CA, UPLB. As the applications were found valid, an approval was granted by the GTRRO.

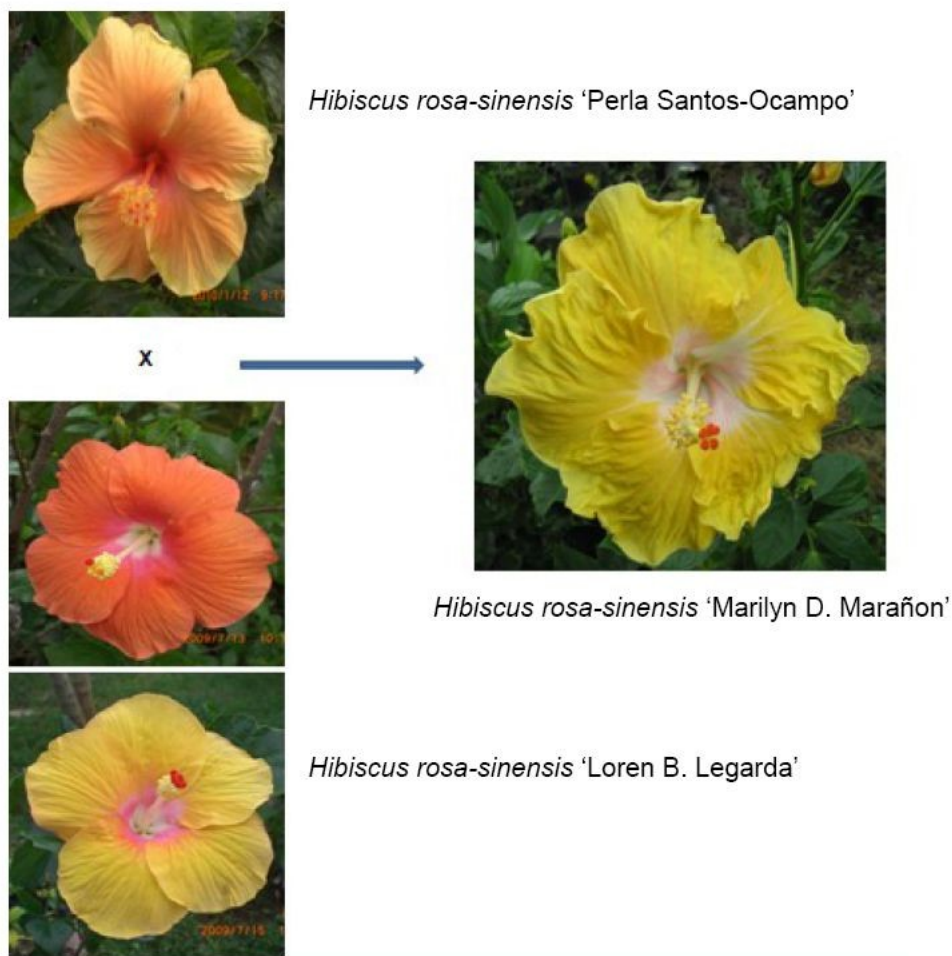


Figure 3. The hybrid *Hibiscus rosa-sinensis* 'Marilyn D. Marañon' and its female parent *Hibiscus rosa-sinensis* 'Perla Santos-Ocampo' and male parent *Hibiscus rosa-sinensis* 'Loren B. Legarda'.

Mass propagation of *Hibiscus rosa-sinensis* 'Cynthia A. Villar'

Assessment of rootstock varieties for use in grafting *Hibiscus rosa-sinensis* 'Cynthia A. Villar' Three *Hibiscus rosa-sinensis* varieties, namely: 'Wilcox', 'Reddy or Not' and 'Petite Peach', which have been planted in the hibiscus breeding block of the CSC and IPB, CA, UPLB, were pruned and the prunings used as cuttings for the production of rootstocks. The pencil-sized prunings were cut into pieces (15 cm long), the cuttings were dipped quickly in rooting powder containing indole butyric acid (IBA, 35.8 g per 30 mL water), which were then planted in plastic trays with sand and placed inside the mist house. Three months after planting, the rooted cuttings were taken out from the mist bed and were re-planted in pots containing a light mixture of garden soil, coir dust and decomposed hog manure (1:1:1, v/v/v). This mixture also contained slow release fertilizer (Osmocote 14-14-14) and Furadan to control soil-borne pests.

The newly re-potted cuttings were placed under shade in order to recover. The number of cuttings that rooted in each variety and the per cent success were assessed. Two months after re-potting, the established rootstocks were used for grafting the *Hibiscus rosa-sinensis* 'Cynthia A. Villar'.

Asexual propagation techniques tested for *Hibiscus rosa-sinensis* 'Cynthia A. Villar' Pencil-sized stems (15 cm long, 0.5 cm wide) were chosen and about 3.0 cm of bark was removed to expose the cambium layer. The slimy substance (cambium layer) was scraped off with a budding knife and the wood was allowed to dry overnight. A slurry paste of the rooting powder (IBA, 35.8 g per 30 mL water) was placed on the point of marcotting and a boll of moist coir dust placed in a piece of plastic sheet was wrapped around the point of marcotting. This assembly was secured with a piece of string. One to two months after marcotting, when roots had fully developed, the marcots were severed from the mother plant and planted directly in a mixture of garden soil, coir dust and manure (1:1:1, v/v/v). The marcotted plants were allowed to establish under partial shade in the screenhouse for two weeks, then they were exposed to full sun.

Another experiment, in which marcots of the *Hibiscus rosa-sinensis* 'Cynthia A. Villar' were treated with rooting powder, Biospark *Trichoderma*, or a combination of rooting powder and *Trichoderma*, was performed. This was done to assess the effect of root inducers on the promotion of rooting of *Hibiscus rosa-sinensis* 'Cynthia A. Villar'. Three treatments were done to induce rooting of the marcotted plants using: (A) rooting powder (IBA, 35.8 g per 30 mL water), (B) Biospark *Trichoderma* (*Trichoderma* spp.; 1.38%, w/w) and, (C) combination of rooting powder and Biospark *Trichoderma*. For treatment A, the rooting powder was made into a slurry paste (35.8 g rooting powder mixed with 30 mL water). A small amount of the slurry paste was placed on the point of marcotting and then wrapped with moist coir dust covered with plastic sheet and secured with nylon string. For treatment B, the Biospark *Trichoderma* spp. (0.1

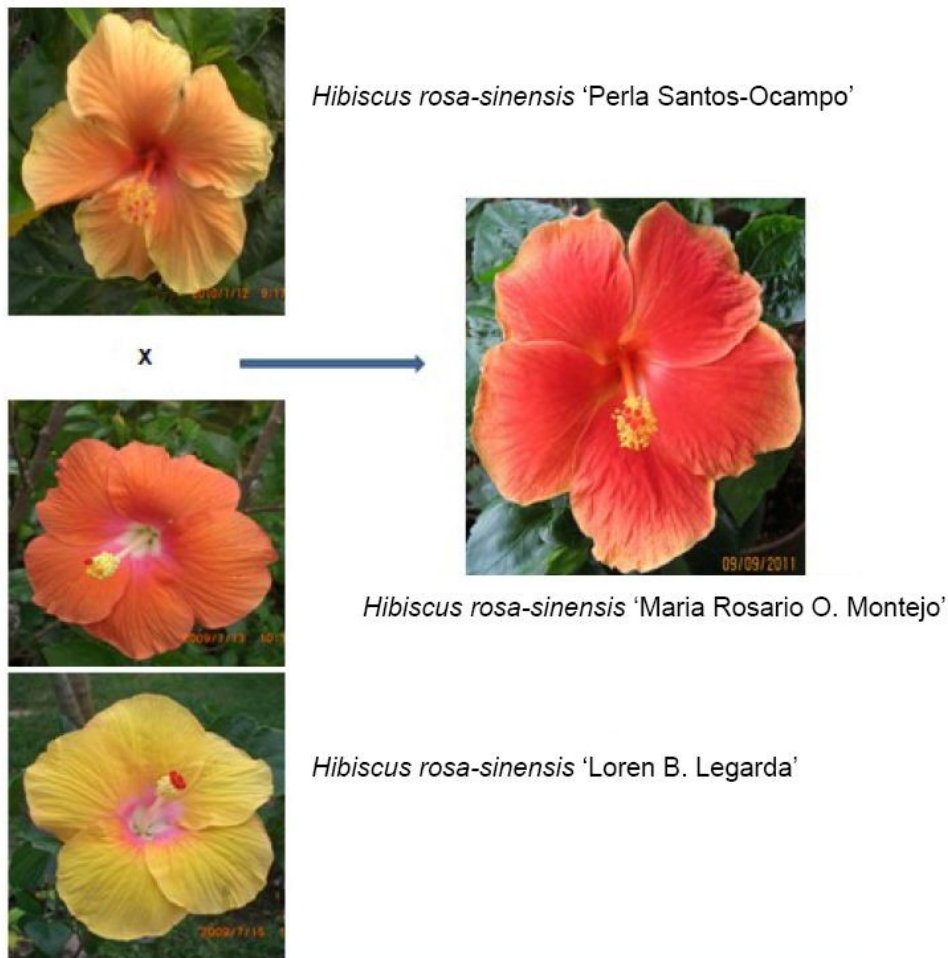


Figure 4. The hybrid *Hibiscus rosa-sinensis* 'Maria Rosario O. Montejo' and its female parent *H. rosa-sinensis* 'Perla Santos-Ocampo' and male parent *H. rosa-sinensis* 'Loren B. Legarda'.

kg) was mixed with the coir dust (7.25 kg, 1.38%, w/w). A boll of this mixture was placed on the point of marcotting, and then covered with a piece of plastic sheet and secured with nylon string. For treatment C, a small amount of the rooting powder/paste was applied on the point of marcotting and this was wrapped with a boll of coir dust previously mixed with the Biospark *Trichoderma* as in Treatment B. The roots were allowed to develop for one to two months and then assessed. The number of successful marcots and the number of main adventitious roots that developed were counted. They were planted in a light mixture of soil, coir dust and decomposed hog manure (1:1:1, v/v/v) and then acclimatized under shade.

Another propagation method using cleft-grafting of scions of *H. rosa-sinensis* 'Cynthia A. Villar' to var. 'Wilcox' rootstocks was done. Scions with two to three nodes of *H. rosa-sinensis* 'Cynthia A. Villar' were severed from the mother plant. These scions were cleft-grafted into the 'Wilcox' rootstocks by making a wedge cut on the scion and inserting the scion into the 'Wilcox' rootstock. The union was secured with a piece of plastic wrapped around the point of grafting. The scions were covered with plastic and, when active buds emerged, the plastic cover was removed to allow the growth of the young shoots. The newly grafted plants were allowed to establish for three months until they flowered.

A third propagation method for budding *H. rosa-sinensis* 'Cynthia A. Villar' to the rootstock var. 'Wilcox' was explored. Dormant buds of *H. rosa-sinensis* 'Cynthia A. Villar' were obtained from the mother hybrid plant growing in the hibiscus breeding block. They were budded by inserting the dormant bud onto the 'Wilcox' rootstock whose bark had previously been slit to accommodate the dormant bud. The point of union between the bud and the 'Wilcox' rootstock was wrapped with a piece of plastic to secure the union. The percent success of budding was assessed two weeks after budding was done.

Statistical design and analyses

Experiments to test i) the suitability of the three hibiscus varieties for use as rootstock, ii) the efficiency of the three propagation methods for multiplying *H. rosa-sinensis* 'Cynthia A. Villar', and iii) the potency of three root inducers in marcots of *H. rosa-sinensis* 'Cynthia A. Villar', were conducted using completely randomized design (CRD). Percentage and count data were transformed accordingly prior to analyses. All data were subjected to analysis of variance (ANOVA) using one-way classification data. The differences between treatment means were detected using least significant difference at a 0.05 level of significance.

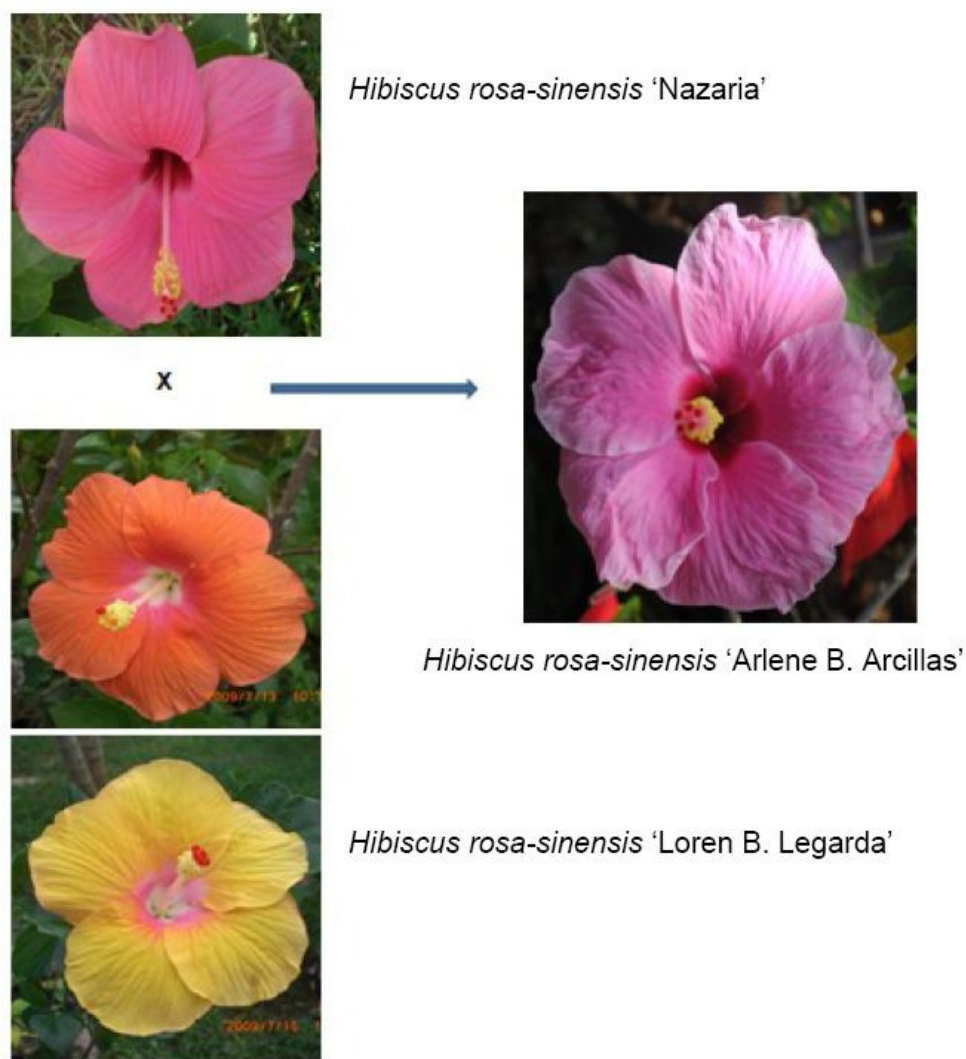


Figure 5. The hybrid *Hibiscus rosa-sinensis* 'Arlene B. Arcillas' and its female parent *H. rosa-sinensis* 'Nazaria' and male parent *H. rosa-sinensis* 'Loren B. Legarda'.

RESULTS AND DISCUSSION

Selection and characterization of hibiscus hybrids

Selection of desirable hybrid plants from out of 2800 hybrid progenies planted in the hibiscus breeding blocks at the Crop Science Cluster and Institute of Plant Breeding resulted in the identification of seven outstanding hybrids having unique combinations of two to three flower colors. The colors of the flower of each hybrid were attractive, striking and stable the whole day. The important traits of the flower, foliage characteristics and growth habit of the selected hibiscus hybrids are presented in Table 1.

The hibiscus hybrids collectively known as the 'Women in Public Service Series II' are a tribute by the University of the

Philippines Los Baños (UPLB) to outstanding women public servants in Philippine society who untiringly devote their time and effort to public service and spirit of volunteerism in meeting the needs of others before their own without material or financial rewards. These hibiscus hybrids are another modest contribution of the Crop Science Cluster-Institute of Plant Breeding, College of Agriculture, University of the Philippines Los Baños, to commemorate the UP Centenary so that the celebration will be more meaningful and memorable.

The seven hibiscus hybrids composing the 'Women in Public Service Series II' are: *H. rosa-sinensis* 'Domini M. Torrevillas', *H. rosa-sinensis* 'Cynthia A. Villar', *H. rosa-sinensis* 'Marilyn D. Marañon', *H. rosa-sinensis* 'Maria Rosario O. Montejo', *H. rosa-sinensis* 'Arlene B. Arcillas', *H. rosa-sinensis* 'Connie S. Angeles' and *H. rosa-sinensis* 'Sylvia P. Lina'.

Hibiscus rosa-sinensis 'Domini M. Torrevillas'

This hibiscus hybrid is a cross between *H. rosa-sinensis* 'Marcela' and *H. rosa-sinensis* 'Nelia T. Gonzales' (Figure 1) with a pedigree as "Hybrid Seedling No. 2". The plant is shrubby, has semi-erect growth habit, medium height 1.67 m tall, 0.97 m wide, floriferous and a fast grower on its own root.

The leaves are simple, ovate, glossy, arranged alternately, 96.5 mm long, 86.8 mm wide and 5-8 veined from the base. The leaf margin is crenate, while the leaf base is reniform. The leaf tip is acute, has petiolate manner of attachment to the stem and stipules are absent. The petiole is 28.9 mm long. The upper leaf surface is light green (RHCC 137 B), while the lower leaf surface is pale green (RHCC 137 C).

Flowers are solitary, funnel-shaped and borne upon a slender stalk. They have five involucral bracts and are continuously produced during the year with a peak of flowering for 8 months from May to December. The bloom type is simple, regular and is 175.4 mm in diameter. The

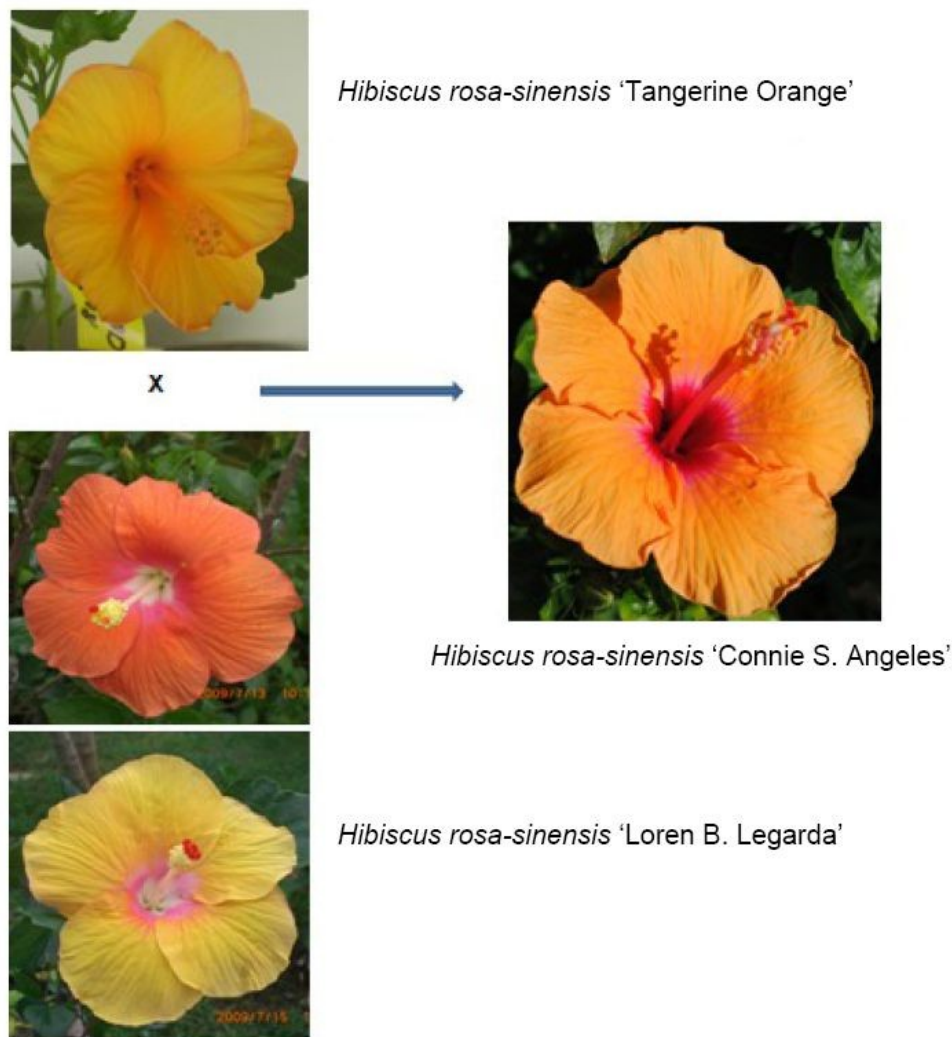


Figure 6. The hybrid *Hibiscus rosa-sinensis* 'Connie S. Angeles' and its female parent *H. rosa-sinensis* 'Tangerine Orange' and male parent *H. rosa-sinensis* 'Loren B. Legarda'.

flowers have a longevity of one day only, both as intact and cut flower, but succeeding flower buds tend to open each day. They are large 90 mm wide, 72 mm long and the calyx is 35 mm long. Flowers are borne in the uppermost axils of the stem. The individual corolla is 115 mm long and 83 mm wide, while the individual calyx lobe is 31 mm long and 28 mm wide.

The corolla is dark orange (RHCC 28 A) with dark red eye zone and light red blushes radiating to the petals. It has yellow edges and yellow vein markings radiating from the center going to the petal. The individual corolla is obovate, thick and imbricate. The bloom on the plant is presented diagonally and semi-upward. The calyx is light green (RHCC 138 B) and it is glabrous.

The staminal tube is slender, 105 mm long and orange red (RHCC 33 B). The stigma is capitate and there are five that are borne upon radiating branches. It is yellow orange (RHCC 21 A), 8 mm long and stigma lobe is 2.8 mm wide. The filament is slender and white (RHCC 11 A), while the androecial type is monadelphous. Ovary is prominent, 11 mm long, 3.4 mm wide and yellow (RHCC 3-C). The receptacle is 15 mm long and the peduncle is 110 mm long.

This *Hibiscus* hybrid honors the outstanding contributions of Ms. Domini M. Torrevillas to the print media in the Philippines by serving as major contributor, principally as Columnist of the Philippine Star (1986 to date), Feature Writer of the Manila Daily Bulletin (1961-1965) and Editor of the Philippine Panorama Magazine (1983-1986). She has published several articles in the Manila Daily Bulletin and the Philippine Star. She has authored three books, including: *Sounds of Silence*, *Sounds of Fury* (1989) and *Vendors of Manila* (1972).

Ms. Domini M. Torrevillas holds a Bachelor of Arts in English from Silliman University (1961) and a Master of Science in Journalism from the Northwestern University, Illinois, USA. She was a recipient of several awards in the field of

journalism including: Outstanding Journalist (1985) awarded by the Philippine Bankers Association, Outstanding Women in Media (2003) by the National Council of Women, Outstanding Women Journalist (2004) by the Philippine Women Business Council, Outstanding Public Affairs Service Award (2006) by the Center for the Promotion of Peace and Development in Mindanao, Best Magazine Award for Philippine Panorama (1985) from the Catholic Mass Media, and the Outstanding Silliman Award in Journalism (1980).

She is affiliated with many professional organizations in the media serving as director, member of the advisory committee and board of trustees in different organizations including the Summer Institute of Linguistics, Institute of Social Studies and Action, and the Foundation for Interpreters for the Deaf in the Philippines.



Hibiscus rosa-sinensis 'Nazaria'



Hibiscus rosa-sinensis 'Sylvia P. Lina'



Hibiscus rosa-sinensis 'Loren B. Legarda'



Figure 7. The hybrid *Hibiscus rosa-sinensis* 'Sylvia P. Lina' and its female parent *H. rosa-sinensis* 'Nazaria' and male parent *H. rosa-sinensis* 'Loren B. Legarda'.

Hibiscus rosa-sinensis 'Cynthia A. Villar'

This *Hibiscus* hybrid is a crossbreed between *H. rosa-sinensis* 'Tangerine Orange' and *H. rosa-sinensis* 'Loren B. Legarda', with a pedigree as "Hybrid Seedling No. 120" (Figure 2). The plant is shrubby, has semi-erect growth habit, medium height 1.45 m tall, 1.53 m wide, very floriferous and a fast grower on its own root.

The leaves are simple, ovate, glossy, arranged alternately, 64.4 mm long, 46.5 mm wide and 5-8 veined from the base. Leaf margin is serrate, tip is acute, and the petioles are 8.9 mm long. The leaf has petiolate attachment to the stem and stipules

are absent. The upper leaf surface is green (RHCC 137 A), while the lower leaf surface is light green (RHCC 137 B).

The flowers are solitary, funnel-shaped and borne upon a slender stalk. They have five involucral bracts that are continuously produced during the year with a peak of flowering for 8 months from May to December. The bloom type is simple, regular, with 133.5 mm diameter. Flowers have a longevity of one day only, both as intact and cut flower, but the succeeding flower buds tend to open each day. They are borne in the uppermost axils and are large 90 mm wide, 63 mm long, and the calyx is 26 mm long. Individual corolla is 77 mm long and 63 mm wide, while the individual calyx lobe is 26 mm long and 16 mm wide.

The corolla is orange (RHCC 28B) with red eye zone (RHCC 45 B) surrounded by pinkish halo. The individual corolla is obovate, thick and imbricate. The calyx is light green (RHCC 138 B) and glabrous.

The staminal tube is slender, red, and 75 mm long. There are five capitate stigmas borne upon radiating branches. They are orange red (RHCC 33 A), 7 mm long and the stigma lobe is 1.8 mm wide. The filament is slender, red to white (RHCC 45B), and the androecial type is monadelphous. The ovary is prominent, 10.0 mm long, 3.4 mm wide and green yellow (RHCC 1 C). The receptacle is 25 mm long, while the peduncle is 13 mm long.

This hybrid honors Ms. Cynthia A. Villar's outstanding accomplishments in public service particularly in environmental care and management, community development, poverty alleviation, and promotion of small scale entrepreneurship among the less fortunate. She has been a very popular public servant evidenced by her landslide victory as Representative of Las Piñas City to the Philippine House of Representatives, where she held the position for three terms



Figure 8. The successful rootstocks of *Hibiscus rosa-sinensis* var. 'Wilcox' three months after incubation inside the mist house.

lasting nine years. She served consistently and was elected unanimously as president of the Lady Legislators of the 12th, 13th and 14th Congress, leading the way in initiating activities aimed at advancing and protecting the welfare of women, children and family. She served as Chairperson of the Committee on Higher and Technical Education of the House of Representatives from 2004 to 2010.

Her social and civic concerns are wide and varied. In 1992, she founded and chaired the Villar Foundation, which has won several awards for its tree planting program “Pagtatanim para sa Kinabukasan”, “Sagip Bukas”, a school based movement for a drug-free Las Piñas, and “Manpower on Wheels”, a mobile livelihood program providing training in employable skills. She is a staunch advocate for environmental conservation and preservation. She and her husband, Senator Manny Villar, launched the Las Piñas-Zapote River System Rehabilitation Program in 2002, which was recognized by the Dubai International Award and United Nations Human Settlements Programme for Best Practice in 2006 for its outstanding contributions towards improving the living environment. The program was also awarded the following: a) the Oikos Global Case Writing Competition in March 2009 spearheaded by the OIKOS Foundation in Switzerland for the sustainable livelihood program developed out of river wastes; b) the Green Apple Award for Environmental Best Practice by the London Government, United Kingdom (UK) in November 2009, and c) the United Nations Best Water Management Practices Award in conjunction with the celebration of the water for Life Decade held in Zaragoza, Spain in March 2011.

She was an energetic Chairperson of the Congressional Spouses Foundation from 1998-2000 and during her term she built 11 regional centers for women who are victims of abuse. She also served as President of the Senate Spouses Foundation, Inc. from August 2006 to December 2008 and during her term the



Figure 9. Marcotted (A), grafted (B) and budded (C) planting materials of *Hibiscus rosa-sinensis* 'Cynthia A. Villar'.

Foundation raised PhP 25 M for the rehabilitation of charity wards at the Philippine General Hospital. She is currently the managing director of the Villar Foundation.

On top of all these achievements and awards, Ms. Cynthia A. Villar still considers her family as her most cherished treasure and her well-raised children as her glory. Paolo and Mark are graduates of the University of Pennsylvania-Wharton School of Finance in the USA. Presently, Paolo is the Chief Executive Officer of their publicly-listed housing company Vista Land, while Mark is a member of the Philippine House of Representatives for the Lone District of Las Piñas City. Her only daughter Camille is the Chief Operating Officer of Vista Land's upscale housing subsidiary, Brittany Corporation. They are all role models for hard work and perseverance no matter what one's station in life may be.

Cynthia A. Villar holds a degree of Bachelor of Science in Business Administration from the University of the Philippines Diliman, which recently recognized her as one of its

Distinguished Alumni. She is also a member of the UP Board of Regents, acting as Chairperson of the House Committee on Higher Education since 2008. She also holds a Masters Degree in Business Administration from the New York University, USA.

Hibiscus rosa-sinensis 'Marilyn D. Marañon'

This hybrid is a cross between *Hibiscus rosa-sinensis* 'Perla Santos-Ocampo' and *Hibiscus rosa-sinensis* 'Loren B. Legarda' with a pedigree as "Hybrid Seedling No. 7" (Figure 3). The plant is shrubby, has semi-erect growth habit, medium height 1.03 m tall, .60 m wide, very floriferous and a fast grower on its own root.

Leaves are simple, ovate, glossy, arranged alternately, 95.7 mm long, 78.7 mm wide and 5-8 veined from the base. The leaf margin is serrate, while the leaf tip is acute. The leaf has a petiolate attachment to the stem. The petiole is 29.4 mm long and stipules are absent. The upper leaf surface is green (RHCC 137 B), while the lower leaf surface is light green (RHCC 137 C).

Flowers are solitary, funnel-shaped and borne upon a slender stalk. It has five involucral bracts that are continuously produced during the year with a peak of flowering for 8 months from May to December. Bloom type is simple, regular, with 145.4 mm diameter. Flowers have a longevity of one day only, both as intact and cut flower, but succeeding flower buds tend to open each day. They are borne in the uppermost axils, large 90 mm wide, 65 mm long, and calyx is 29 mm long. Individual corolla is 70 mm long and 65 mm wide, while the individual calyx lobe is 27 mm long and 38 mm wide.

The corolla is lemon yellow (RHCC 8A) with white eye zone (RHCC 25 A) surrounded by pinkish halo. Individual corolla is obovate, thick and imbricate. The calyx is light green (RHCC 138 B) and glabrous.

The staminal tube is slender, 85 mm long and white. There are five capitate stigmas borne upon radiating branches. The stigma is yellow (RHCC 13 A), 7 mm long



Figure 10. Root development in marcots of *Hibiscus rosa-sinensis* 'Cynthia A. Villar' treated with rooting powder (IBA) (A) and Biospark *Trichoderma*, (B). Note that more roots developed on marcots treated with *Trichoderma* than those treated with rooting powder.

and the stigma lobe is 2.1 mm wide. Filament is slender, white (RHCC 11 A), and the androecial type is monadelphous. The ovary is prominent, 14.7 mm long, 2.4 mm wide and green yellow (RHCC 1 C). The receptacle is 15 mm long, while the peduncle is 61 mm long.

This *Hibiscus* hybrid is a tribute to Dr. Marilyn D. Marañon for her untiring and dedicated service to the public by conducting numerous medical missions provided to the needy citizens of the Province of Negros Occidental. She even gave up her career and pharmaceutical business just to attend to the health needs of the less fortunate Negrenses as support for the programs of her husband, Governor Alfredo G. Marañon, Jr.

Under her 'Operations Smile Program', she was able to surgically improve the appearance of more than a hundred patients with cleft lip and cleft palate in Negros Occidental. Her continuous efforts as Director of the "Museosang Bata sa Negros" led to the establishment of a museum that serves as an educational venue for many school children and students in the province. She also served as a Board Member of the Girl Scouts of the Philippines (GSP) Negros Occidental Council and Chairperson of the District Association GSP-Sagay City (1975-1990). Because of her committed service to the GSP, she became an Honorary Chairperson of the GSP Negros Occidental Council. She was able to send a Chief Girl Scout Medalist to an International Girl Scout Convention overseas and also granted a scholarship for teacher education among the needy but deserving

Table 1. The important characteristics of hibiscus hybrids 'Women in Public Service Series II'

Hybrid	Parentage	Bloom characteristics	Foliation	Growth habit	Hybrid	Parentage	Bloom characteristics	Foliation	Growth habit
<i>Hibiscus rosa-sinensis</i> 'Domini M. Torrevillas'	<i>H.rosa-sinensis</i> 'Marcela' x <i>H.rosa-sinensis</i> 'Nelia T. Gonzales'	Simple, regular, large size (175.4 mm diameter), single, medium texture, good quantity of blooms, semi-upward presentation of bloom Dark orange petals (RHCC 28-A) with dark red eye zone and light red blushes radiating to the petals	Simple, ovate medium, light green, glossy, smooth, alternate leaf arrangement	Medium height, semi-erect growth habit, shrubby, fast grower on its own root	<i>Hibiscus rosa-sinensis</i> 'Arlene B. Arcillas'	<i>H.rosa-sinensis</i> 'Nazaria' x <i>H.rosa-sinensis</i> 'Loren B. Legarda'	Simple, regular, medium (130.5 mm diameter), single, smooth, good quantity of blooms, semi-upward presentation of bloom Carmine rose (RHCC 52C) petals with cardinal red eye (RHCC 53C).	Medium, green, ovate, smooth, glossy, alternate leaf arrangement	Medium height, shrubby, semi-erect growth habit, fast grower on its own root
<i>Hibiscus rosa-sinensis</i> 'Cynthia A. Villar'	<i>H.rosa-sinensis</i> 'Tangerine Orange' x <i>H.rosa-sinensis</i> 'Loren B. Legarda'	Simple, regular, medium size (137.0 mm diameter), single, medium texture, good quantity of blooms, diagonal and semi-upward presentation of bloom Orange petals (RHCC 28B) with red eye zone (RHCC 45B) surrounded by pinkish halo	Simple, ovate, medium, green, glossy, smooth, alternate leaf arrangement	Medium height, semi-erect growth habit, shrubby, fast grower on its own root	<i>Hibiscus rosa-sinensis</i> 'Connie S. Angeles'	<i>H.rosa-sinensis</i> 'Tangerine Orange' x <i>H.rosa-sinensis</i> 'Loren B. Legarda'	Simple, regular, medium (127.0 mm diameter), single, smooth, good quantity of blooms, semi-upward presentation of bloom orpiment orange (RHCC 25 A) petals with cardinal red eye (RHCC 53 A) surrounded by pinkish halo	Medium, green, ovate, smooth, glossy, alternate leaf arrangement	Medium height, shrubby, semi-erect growth habit, fast grower on its own root
<i>Hibiscus rosa-sinensis</i> 'Marilyn D. Marañon'	<i>H.rosa-sinensis</i> 'Perla Santos-Ocampo' x <i>H.rosa-sinensis</i> 'Loren B. Legarda'	Simple, regular, large size (145.4 mm diameter), single, smooth, good quantity of blooms, semi-upward presentation of bloom Lemon yellow (RHCC 8A) petals with white eye zone (RHCC 25 A) surrounded by pinkish halo	Medium, green, glossy, smooth, alternate leaf arrangement	Medium height, semi-erect habit, shrubby, fast grower on its own root	<i>Hibiscus rosa-sinensis</i> 'Sylvia P. Lina'	<i>H.rosa-sinensis</i> 'Nazaria' x <i>H.rosa-sinensis</i> 'Loren B. Legarda'	Simple, regular, medium (132.5 mm diameter), single, smooth, good quantity of blooms, semi-downward presentation of bloom Neyron rose (RHCC 56A) petals with magenta eye (RHCC 66 A)	Medium, green, ovate, smooth, glossy, alternate leaf arrangement	Medium height, shrubby, semi-erect growth habit, fast grower on its own root
<i>Hibiscus rosa-sinensis</i> 'Maria Rosario O. Montejo'	<i>H.rosa-sinensis</i> 'Perla Santos-Ocampo' x <i>H.rosa-sinensis</i> 'Loren B. Legarda'	Simple, regular, large (145.9 mm diameter), single, smooth, good quantity of blooms, semi-upward presentation of bloom red orange (RHCC 45B) petals with pinkish red eye surrounded by yellow edges	Medium, green, ovate, smooth, glossy, alternate leaf arrangement	Medium height, shrubby, semi-erect growth habit, fast grower on its own root					

students of Negros Occidental. As a Director of the Rural Bank of Sagay, Inc. she was instrumental in the creation of many livelihood projects for the Negrenses.

Dr. Marilyn D. Marañon is a graduate of Doctor of Medicine at the University of the East Ramon Magsaysay Memorial Medical Center. She passed the Medical Board Examination on May 1967.

Hibiscus rosa-sinensis ‘Maria Rosario O. Montejo’

The hybrid is a cross between *Hibiscus rosa-sinensis* ‘Perla Santos-Ocampo’ and *Hibiscus rosa-sinensis* ‘Loren B. Legarda’ with a pedigree as “Hybrid Seedling No. 2007-2” (Figure 4). The plant is shrubby, has semi-erect growth habit, medium height 1.54 m tall, 0.34 m wide, very floriferous and a fast grower on its own root.

Leaves are simple, ovate and glossy, arranged alternately, 80.1 mm long, 67.2 mm wide and 5-8 veined from the base. The

leaf margin is serrate, while the leaf tip is acute. The leaf has petiolate attachment to the stem. The petiole is 25.9 mm long and stipules are absent. The upper leaf surface is green (RHCC 137 A), while the lower leaf surface is light green (RHCC 137 B).

Flowers are solitary, funnel-shaped, borne upon a slender stalk, has five involucral bracts that are continuously produced during the year with a peak of flowering for 8 months from May to December. The bloom type is simple, regular, with 145.9 mm diameter. Flowers have a longevity of one day only, both as intact and cut flower, but succeeding flower buds tend to open each day. They are borne in the uppermost axils, large 183 mm wide, 104 mm long, and calyx is 28 mm long. Individual corolla is 75 mm long and 65 mm wide, while the individual calyx lobe is 29 mm long and 36 mm wide.

The corolla is red orange (RHCC 45B) with pinkish red eye surrounded by yellow edges. The individual corolla is obovate, thick and imbricate. The calyx is avocado green (RHCC 138 B) and glabrous.

The staminal tube is slender, 93 mm long and red orange (RHCC 45 B). There are five capitate stigmas borne upon radiating branches, red (RHCC 45 A), 8 mm long and stigma lobe 2.1 mm wide. Filament is slender, red (RHCC 45 A), and the androecial type is monadelphous. The ovary is prominent, 11 mm long, 2.4 mm wide and green yellow (RHCC 1 C). The receptacle is 15 mm long, while the peduncle is 31 mm long.

This hibiscus hybrid honors Ms. Maria Rosario O. Montejo for her outstanding public service to the constituents of her own town in Pulilan, Bulacan. She worked passionately in the management and governance of community affairs. For transportation, she addressed the lack of accessibility of her community by implementing a self-liquidating shuttle service; while for outreach activities, she developed programs that will harness the resources of her own community to reach out to the less fortunate neighbors. For environmental management, she

Table 2. Three *Hibiscus* varieties tested for use as rootstocks.

Rootstock varieties	Number of cuttings prepared	Number of successfully rooted rootstocks	Success (%) [*]
‘Wilcox’	200	146	73.00 a
‘Reddy or Not’	100	42	42.00 b
‘Petite Peach’	100	49	49.00 b

^{*}Value with different letter is significantly different at 0.05 level.

Table 3. Three propagation methods tested for asexual propagation of *Hibiscus rosa-sinensis* ‘Cynthia A. Villar’.

Method of Propagation	Number of stems prepared	Number of successfully produced materials	Success (%) [*]
Marcotting	120	115	95.83 a
Grafting	150	132	88.00 b
Budding	253	125	65.16 c

^{*}Value with different letter is significantly different at 0.05 level.

Table 4. Root production of marcotted plants of *Hibiscus rosa-sinensis* ‘Cynthia A. Villar’ treated with rooting powder, *Trichoderma* and a combination of rooting powder/paste and *Trichoderma*.

Treatment	Mean [*]	Range
Rooting powder (IBA, 100 mg L ⁻¹)	18.88 b	15-56
Biospark <i>Trichoderma</i> (<i>Trichoderma</i> spp., 1.38%, v/v)	40.51 a	1-123
Combination of rooting powder and Biospark <i>Trichoderma</i> (IBA, 100 mg L ⁻¹ and <i>Trichoderma</i> spp., 1.38%, v/v)	17.88 b	5-52

^{*}Value with different letter is significantly different at 0.05 level.

developed programs that preserved and enhanced the pristine environment; while for maintenance, she implemented an ISO 'type' Quality System that maintained the consistency of existing government programs. Because of her dedication and passion to serve her constituency, she was awarded the following: Outstanding Councilor of Bulacan (2003), Outstanding Woman Leader in Politics in Pulilan, Bulacan (2002), District Director Award for Bulacan North (2002) and the Outstanding Pulileño (1999).

She served in various capacities as public servant including: Councilor of Pulilan, Bulacan 1998-2004; Board Member of the Bulacan Tourism Council 2004 to date; Co-chair of the Municipal Nutrition Council of Pulilan, Bulacan 1998-2005, for which it became a National Awardee of the Green Banner Award for 2004-2005; and President of the Mayor Paquito C. Ochoa Scholarship Foundation from 1998 to date. She is the owner of the NW Steel Technologies, Inc. and the Subic Tree Top Adventure Philippines, Inc. Ms. Montejo holds a Bachelor of Science in Food and Nutrition from the University of Sto. Tomas (UST). She is married to the current Secretary of the Department of Science and Technology (DOST), Engr. Mario G. Montejo.

***Hibiscus rosa-sinensis* 'Arlene B. Arcillas'**

This hybrid is a cross between *H. rosa-sinensis* 'Nazaria' and *H. rosa-sinensis* 'Loren B. Legarda' with a pedigree as "Hybrid Seedling No. 113" (Figure 5). The plant is shrubby, has semi-erect growth habit, medium height 1.24 m tall, 1.31 m wide, very floriferous and a fast grower on its own root.

Leaves are simple, ovate and glossy, arranged alternately, 70.2 mm long, 65.7 mm wide and 5-8 veined from the base. The margin is serrate, while the leaf tip is acute. The leaf has petiolate attachment to the stem. The petiole is 20.5 mm long and stipules are absent. The upper leaf surface is green (RHCC 137 A), while the lower leaf surface is light green (RHCC 137 B).

Flowers are solitary, funnel-shaped and borne upon a slender stalk, has five involucre bracts that are continuously produced during the year with a peak of flowering for 8 months from May to December. Bloom type is simple, regular, with 130.5 mm diameter. Flowers have a longevity of one day only, both as intact and cut flower, but succeeding flower buds tend to open each day. They are borne in the uppermost axils, large 80 mm wide, 95 mm long, and the calyx is 27 mm long. Individual corolla is 85 mm long and 65 mm wide, while the individual calyx lobe is 27 mm long and 34 mm wide.

The corolla is carmine rose (RHCC 52C) with cardinal red eye (RHCC 53C). Individual corolla is obovate, thick and imbricate. The calyx is avocado green (RHCC 138 B) and glabrous.

The staminal tube is slender, 95 mm long and white. There are five capitate stigmas borne upon radiating branches, red (RHCC 46 B), 8 mm long, and stigma lobe is 2.2 mm wide. Filament is slender, spinel red (RHCC 54 B), and the androecial type is monadelphous. Ovary is prominent, 12.7 mm long, 2.3 mm wide and yellow green (RHCC 150 C). The receptacle is 15 mm long, while the peduncle is 65 mm long.

This *Hibiscus* hybrid honors the untiring dedication to public service of Hon. Arlene B. Arcillas. She is the first lady mayor of Sta. Rosa City elected in 2007 and has been serving for 3 terms until 2013. Prior to her mayorship, she was elected Senior Councilor in 2004, elevated to City Vice-Mayor in 2005 and later to Acting City Mayor in 2006. During her term, Sta. Rosa City received several awards and citations including: Most Outstanding City in CALABARZON Region in 2007 by the Department of Health-National Nutrition Council, Exemplary "Pabasa sa Nutrisyon" Awardee by the Philippine Association of Nutrition Inc. in 2008, and a consistent Regional Outstanding Winner in Nutrition by the National Nutrition Council in 2010, among others.

Hon. Arlene B. Arcillas holds a Bachelor of Science in Biology major in Ecology from the University of the Philippines Los Baños in 1992. She was awarded as Outstanding UPLB Alumni in 2008. She was featured by the Philippine Star as one of the 17 Women Allure in 2009 and by the People's Asia as one of the Women of Style and Substance in 2009.

***Hibiscus rosa-sinensis* 'Connie S. Angeles'**

This hybrid is a cross between *H. rosa-sinensis* 'Tangerine Orange' and *H. rosa-sinensis* 'Loren B. Legarda', with a pedigree as "Hybrid Seedling No. 105" (Figure 6). The plant is shrubby, has semi-erect growth habit, medium height 1.54 m tall, 1.46 m wide, very floriferous and a fast grower on its own root.

The leaves are simple, ovate, glossy, arranged alternately, 68.4 mm long, 54.0 mm wide and 5-8 veined from the base. The leaf margin is serrate, while the leaf tip is acute. The leaf has a petiolate attachment to the stem, while the petioles are 12.3 mm long and stipules are absent. The upper leaf surface is green (RHCC 137 A), while the lower leaf surface is light green (RHCC 137 B).

Flowers are solitary, funnel-shaped and borne upon a slender stalk. They have five involucre bracts that are continuously produced during the year with a peak of flowering for 8 months from May to December. The bloom type is simple, regular, with 127.0 mm diameter. Flowers have a longevity of one day only, both as intact and cut flower, but the succeeding flower buds tend to open each day. They are borne in the uppermost axils, large size 80 mm wide, 75 mm long, and the calyx is 24 mm long. Individual corolla is 75 mm long and 56 mm wide, while the individual calyx lobe is 24 mm long and 30

mm wide.

The corolla is orpiment orange (RHCC 25 A) with cardinal red eye (RHCC 53 A) surrounded by pinkish halo. The individual corolla is obovate, thick and imbricate. The calyx is avocado green (RHCC 138 B) and glabrous.

The staminal tube is slender, 77 mm long and delft rose (RHCC 47 C). There are five capitate stigmas borne upon radiating branches, red (RHCC 45 B), 8 mm long, while the stigma lobe is 2.2 mm wide. Filament is slender, delft rose (RHCC 47 C), and the androecial type is monadelphous. The ovary is prominent, 11.1 mm long, 5.2 mm wide and pea green (RHCC 149 C). The receptacle is 15 mm long, while the peduncle is 45 mm long.

This *Hibiscus* hybrid honors Ms. Connie S. Angeles for her untiring dedication to public service as a politician and a TV host. She served for 9 years as two-term City Councilor of Quezon City and later as Vice-Mayor. Ms. Angeles is also known for her integrity as a Public Service Host and a Broadcaster like in her Channel 7 TV program “Kapwa Ko Mahal Ko” with Orly Mercado, in which she also served as Board Member. She has held several positions in civic organizations like Board Member of the SM Foundation, Inc. and the Philippine Registry of Interpreters for the Deaf (PRID), and as a member of the Committee of 100 Purple Rose Campaign Against Sex Trafficking of Filipino Women and Children.

She was a recipient of various local and international awards including: the Most Outstanding Councilor ‘Bantayog Awards’ - “Hall of Fame” in 1993, 1994 and 1996; Most Outstanding Councilor of the National Capital Region (NCR) in 1997; “Gintong Ina” Award in 1990; and Best Public Service Program Host – “Kapwa Ko Mahal Ko” in 1990; among others. In addition, she has received leadership awards in the field of business and in the pursuit of corporate social responsibility, as well as in her innovations and approaches and strategies in the achievement of better health care and service delivery to the public. She is further recognized for her deeply-rooted involvement in various cause-oriented activities, especially for Women and Children’s cause. For instance, she served as chairperson of the Quezon City Drug and Rehabilitation Center and the Philippine Cancer Society. She was also a Philippine delegate to the UNICEF World Alliance on Breastfeeding in Bangkok, Thailand in 1996, the WHO Global Symposium on Women and Health Involvement in City Development in New Zealand in 2000, and the WHO’s Awaji Conference on Women and Health in Japan in 2000. Ms. Angeles holds a Bachelor of Arts (BA) in Philosophy and is presently a candidate for a Master’s Degree in Public Administration at UP Diliman.

Hibiscus rosa-sinensis ‘Sylvia P. Lina’

This hybrid is a cross between *H. rosa-sinensis* ‘Nazaria’ and *H. rosa-sinensis* ‘Loren B. Legarda’ with a pedigree as “Hybrid Seedling No. 58” (Figure 7). The plant is shrubby, has semi-erect growth habit, medium height 1.24 m tall, 1.31 m wide, very floriferous and a fast grower on its own root.

The leaves are simple, ovate, glossy, arranged alternately, 70.2 mm long, 65.7 mm wide, and 5-8 veined from the base. The margin is serrate while the leaf tip is acute. The leaf has a petiolate attachment to the stem, while the petioles are 20.5 mm long and stipules are absent. The upper leaf surface is green (RHCC 137 A), while the lower leaf surface is light green (RHCC 137 B).

Flowers are solitary, funnel-shaped and borne upon a slender stalk. They have five involucre bracts that are continuously produced during the year with a peak of flowering for 8 months from May to December. Bloom type is simple, regular, with 132.5 mm diameter. Flowers have a longevity of one day only, both as intact and cut flower, but succeeding flower buds tend to open each day. They are borne in the uppermost axils, large 90 mm wide, 75 mm long, and the calyx is 25 mm long. Individual corolla is 95 mm long and 75 mm wide, while the individual calyx lobe is 25 mm long and 32 mm wide.

The corolla is neyron rose (RHCC 56A) with magenta eye (RHCC 66A). Individual corolla is obovate, thick and imbricate. The calyx is avocado green (RHCC 138 B) and glabrous.

The staminal tube is slender, 98 mm long and white. There are five capitate stigmas borne upon radiating branches, red (RHCC 46 B), 7.5 mm long, and the stigma lobe is 2.2 mm wide. The filament is slender, spinel red (RHCC 54 B), and the androecial type is monadelphous. Ovary is prominent, 10.8 mm long, 2.2 mm wide and sap green (RHCC 150 C). The receptacle is 10 mm long, while the peduncle is 55 mm long.

This *Hibiscus* hybrid honors the devotion to public service of Ms. Sylvia P. Lina who whole-heartedly supported the livelihood promotion projects in the rural areas of Laguna together with her husband, Joey Lina, the former Governor of Laguna and the former Department of Internal and Local Government (DILG) Secretary during the time of Pres. Joseph E. Estrada. She served as President of the Integrated Waste and Management, Inc. from 2000 to 2005, then as Chairman from 2006 to 2010, and as the Director from 2011 to the present. She was also the President (2000-2005), Chairman (2006-2010) and the current Director (2011 to date) of the Lina Farms and Food Services Corporation. Ms. Sylvia P. Lina is a graduate of Bachelor of Science in Business Administration from the Philippine Women’s University in 1971.

Mass propagation of *Hibiscus rosa-sinensis* ‘Cynthia A. Villar’

Establishment of *Hibiscus rosa-sinensis* var. ‘Wilcox’ rootstocks for use in grafting *H. rosa-sinensis* ‘Cynthia A. Villar’. The cuttings of three *H. rosa-sinensis* varieties were prepared and tested for the successful production of rootstocks. Significant differences in terms of success of cuttings were detected among the three varieties (Table 2). Significantly, the highest percent success of cuttings among the three varieties tested was obtained using var. ‘Wilcox’. Out of 200 semi-hard wood cuttings of *H. rosa-sinensis* var. ‘Wilcox’, 146 cuttings (73.0%) were successfully made into rootstocks three months after incubation of the cuttings (Table 2). The rootstocks had a vigorous shoot and root system (Figure 8). The results indicate that var. ‘Wilcox’ is a suitable rootstock variety for hibiscus propagation. This is consistent with the previous findings that the var. ‘Wilcox’ is the most suitable variety for the production of rooted cuttings for use as rootstocks of trialing varieties of hibiscus (Johnson, personal communication). Cuttings of two other varieties, namely: *H. rosa-sinensis* var. ‘Reddy or Not’ and ‘Petite Peach’, which were also made into rootstock with 100 cuttings each, also developed into rootstocks but with minimal success. No significant difference was detected between these two varieties. The var. ‘Reddy or Not’ produced 42 (42.0%) successful rootstocks, while var. ‘Petite Peach’ produced 49 rootstocks (49.0%) only (Table 2).

Asexual propagation methods tested for *Hibiscus rosa-sinensis* ‘Cynthia A. Villar’. Significant differences were detected among the three propagation methods used to multiply the *H. rosa-sinensis* ‘Cynthia A. Villar’ (Table 3). Among the three methods used, marcotting significantly gave the highest percentage of success. Out of 120 marcots prepared, 115 (95.83%) were successful (Table 3). This result indicates that marcotting is the most efficient and practical method to mass propagate a new hybrid variety as it can give a high percentage of success. This will avoid the wastage of valuable planting materials of hybrid hibiscus having only limited propagules. Marcotted plants tend to establish quickly in soil after planting and they flower early (Figure 9a). Using cleft-grafting, out of 150 grafts prepared, 132 (88.00%) were successful three weeks after grafting, which is significantly different from budding (Table 3). Cleft-grafted plants tend to develop new buds quicker than marcotted plants but they flower later than marcotted plants (Figure 9b). In addition, using budding, out of 253 dormant buds inserted into the ‘Wilcox’ rootstocks, 120 (65.16%) successfully developed vigorous shoot (Figure 9c). While budding may appear to be of minimal value for propagating hibiscus and its use limited only to experimental purposes, to our knowledge this is the first attempt in the Philippines to use budding in propagating hibiscus. Budding in hibiscus has several disadvantages including the following: a) buds grow very slowly, b) growing buds tend to deteriorate two to three months after budding, c) since buds are weak, the rootstock dominates and produces a lot of side shoots, and d) mother

plants from which buds are obtained tend to weaken as the stems are scarred and exposed to dehydration and are vulnerable to attack by pathogens. However, it is also advantageous since many buds can be obtained at anytime for use in propagation.

The established marcots of the *H. rosa-sinensis* ‘Cynthia A. Villar’ produced using the three treatments, i. e., rooting powder, Biospark *Trichoderma*, and a combination of rooting powder/paste and Biospark *Trichoderma*, significantly differed in the number of roots produced (Table 4). The marcotted plants treated with Biospark *Trichoderma* had significantly the highest mean number of roots of 40.51 with a range of 1-123 (Table 4). The roots produced were profused and healthy two months after marcotting (Figure 10). This result is in accord with the previous report that *Trichoderma* can induce the formation of new lateral roots in cabbage infected with club root disease (Cuevas et al 2011) and promote root elongation in rice infected with *Pythium arrhenomanes* (Banaay et al 2012). The present result on promoting root formation in hibiscus could be explained by the report of several authors on the ability of root-colonizing *Trichoderma* in enhancing root biomass production and root hair development in maize and other plants (Bjorkman et al 1998, Yedidia et al 2001, Harman et al 2004, Contreras-Cornejo et al 2009). This was followed by the marcots treated with rooting powder with a mean number of adventitious roots of 18.88 and a range of 15-56, but it is not significantly different from those marcots treated with a combination of rooting powder/paste and Biospark *Trichoderma* with a mean number of adventitious roots of 17.88 and a range of 5-52.

SUMMARY AND RECOMMENDATION

The breeding and selection of hibiscus utilizing parental germplasm from local sources and those from Hawaii, USA, Queensland, Australia, and Bangkok, Thailand, was conducted to develop new and unique hybrids with attractive flower colors. Modification in the propagation of these hybrids was also done to efficiently multiply them. Selection of thousands of hybrid progenies resulted in the identification of seven hybrids with unique and new flower traits, plus suitable plant growth habit. The seven hybrids were collectively called ‘Women in Public Series II’ and were named after outstanding and dedicated Filipina public servants. These hybrids are described below.

(i) *Hibiscus rosa-sinensis* ‘Domini M. Torevillas’, a cross between *H. rosa-sinensis* ‘Marcela’ and *H. rosa-sinensis* ‘Nelia T. Gonzales’, is a dark orange (RHCC 28 A) flower with dark red eye zone and light red blushes radiating to the petals plus yellow edges and yellow vein markings radiating from the center going to the petals. Ms. Domini M. Torevillas is an Outstanding Columnist of the Philippine Star and a freedom fighter.

(ii) *Hibiscus rosa-sinensis* ‘Cynthia A. Villar’, a hybrid between *H. rosa-sinensis* ‘Tangerine Orange’ and *H. rosa-sinensis* ‘Loren B. Legarda’, is an orange (RHCC 28B) flower

with red eye zone (RHCC 45B) surrounded by pinkish halo. Ms. Cynthia A. Villar is a true-blooded and an outstanding public servant who served as Congresswoman for nine years and who particularly implemented reforms in environmental care and rehabilitation, community development, poverty alleviation, and promotion of small scale entrepreneurship among the less fortunate in Las Piñas City.

(iii) *Hibiscus rosa-sinensis* ‘Marilyn D. Marañon’, a crossbreed between *H. rosa-sinensis* ‘Perla Santos-Ocampo’ and *H. rosa-sinensis* ‘Loren B. Legarda’, is a lemon yellow (RHCC 8 A) flower with white eye zone (RHCC 25 A) surrounded by pinkish halo. Dr. Marilyn D. Marañon is a dedicated public servant who has conducted numerous medical missions to the needy citizens of the Province of Negros Occidental and promoted marine biodiversity protection and conservation.

(iv) *Hibiscus rosa-sinensis* ‘Maria Rosario O. Montejo’, a hybrid between *H. rosa-sinensis* ‘Perla Santos-Ocampo’ and *H. rosa-sinensis* ‘Loren B. Legarda’, is a red orange (RHCC 45 B) flower with pinkish red eye surrounded by yellow edges. Ms. Maria Rosario O. Montejo, an Outstanding Councilor of Bulacan, worked passionately in the management and governance of community affairs of her hometown of Pulilan, Bulacan.

(v) *Hibiscus rosa-sinensis* ‘Arlene B. Arcillas’, a cross between *H. rosa-sinensis* ‘Nazaria’ and *H. rosa-sinensis* ‘Loren B. Legarda’, is a carmine rose (RHCC 52 C) flower with cardinal red eye (RHCC 53 C). Hon. Arlene B. Arcillas, a UPLB graduate is the first lady mayor of Sta. Rosa City who has been serving for three terms and who consistently promoted proper nutrition and health, environmental sustainability and poverty reduction among its constituency.

(vi) *Hibiscus rosa-sinensis* ‘Connie S. Angeles’, a cross between *H. rosa-sinensis* ‘Tangerine Orange’ and *H. rosa-sinensis* ‘Loren B. Legarda’, is an orpiment orange (RHCC 25 A) flower with cardinal red eye (RHCC 53 A) surrounded by pinkish halo. Ms. Connie S. Angeles, a UP Diliman graduate, is a dedicated public servant, politician and television host who helped the needy and disabled through her television program “Kapwa Ko Mahal Ko”.

(vii) *Hibiscus rosa-sinensis* ‘Sylvia P. Lina’, a cross between *H. rosa-sinensis* ‘Nazaria’ and *H. rosa-sinensis* ‘Loren B. Legarda’, is a neyron rose (RHCC 56A) flower with magenta eye (RHCC 66A). Ms. Sylvia P. Lina is a dedicated public servant who whole-heartedly supported the livelihood promotion projects and systematic waste management in the rural areas of Laguna.

These hibiscus hybrids have been registered with the Germplasm and Technology Release and Registration Office of the Crop Science Cluster and Institute of Plant Breeding.

Propagation studies on *H. rosa-sinensis* ‘Cynthia A. Villar’ were conducted to explore the value of different techniques to mass propagate the new hybrid variety. Among the three hibiscus varieties used as cuttings for rootstock purposes, var. ‘Wilcox’ had significantly highest percent success compared to var. ‘Reddy or Not’ and var. ‘Petite Peach’. Among the three propagation methods used, marcotting gave significantly the highest percentage (95.83%) of success in producing asexually propagated plants, followed by cleft-grafting with 88.0% success. Budding had the lowest percentage success of 65.16% in producing asexually propagated plants. Marcots treated with Biospark *Trichoderma* significantly produced more adventitious roots than marcots treated with the rooting hormone (IBA) or a combination of rooting hormone (IBA) and Biospark *Trichoderma*.

It is recommended that the hibiscus hybrids ‘Women in Public Service Series II’ be used as a potted plant, a landscape material and a component of edible landscaping. They can be planted at any time of the year, provided there is enough water and sunlight. These hybrids should be pruned once a year to encourage the growth and development of new branches and shoots where new flower buds have emerged.

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CONFLICTS OF INTEREST

There is no conflict of interest in this article, or in the project on which this article is based or any other research work in the University. To the best of our knowledge, there are no existing breeding researches on hibiscus in the University aside from our project.

CONTRIBUTION OF INDIVIDUAL AUTHORS

Dr. Pablito M. Magdalita is the leader of the projects entitled, “Hibiscus Breeding” and “Mass Production and Propagation of the *Hibiscus rosa-sinensis*”; he wrote this article based on these two projects. Mr. Reynold B. Pimentel started the hibiscus breeding in 1994; he is now retired from the University.

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