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Morphological description of selected breeding line of *Paphiopedilum*: NRCO-*P. lawrenceanum* x *P.* 'Winston Churchill'/2013/29 (IC-0614750)

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ABSTRACT

A superior breeding line (NRCO/PlxPw/2013/29) of Paphiopedilum progeny was identified and characterized that was developed using *P.* 'Winston Churchill' and *Paphiopedilum lawrenceanum* as parents. Inflorescence - solitary type with dominating flower size over the foliage. Moderately dense shiny purple colour hairs present on the surface of the peduncle, which is 20 cm length approximately. Flower size 13.2 x 14.2 cm with dominating yellow-green colour (RHSN144A) and strong dorsal sepal in white colour. Petals size (7.9 - 8.1 cm x 2.8 – 3 cm) broad oblong spathulate shape with roundish lobes at tips, unequal, upper margin undulated gradually from 1 to 6 number and bigger curves (from 7 to 11 no.), glabrous inside, broader tips are recurved upward (similar to *P. villosum*), median vein typical dark brownish purple colour (RHS187A). Lip bigger in size & broader and open type with yellow colour margin (RHS1A) from side lobes to frontal opening of lip that appear like lower beak of a bird (pointed curvature). Column short and staminode in half pentagonal in shape with protruded nose in yellow-orange colour (RHS 23B) in half-triangular shape and pointed downwards. It flowers during mid October to Mid February every year and regular in habit with 106 days potted vase life. The selected breeding line received national identity as IC-0614750 with NBPGR, New Delhi, India.

1. Introduction

Paphiopedilums are the most admired orchids due their distinct floral morphology that make exotic. The genus Paphiopedilum was established by Ernst Pfitzer during 1880, in his Morphologosche Studien uber die Orchideenbluthe (Luckzom 2007). It is popularly known as lady's slipper orchid, due to its resemblance to pouch like lip shape. Nearly 80 – 85 species of *Paphiopedilum* were reported mainly from tropical Asia, ranging from Southern India, Nepal, North-Eastern India, Southern China to South East Asian countries and New Guinea & Solomon Islands (Cribb 1998; http://apps.kew.org/wcsp/qsearch.do). The basic chromosome number of this genus Paphiopedilum is 2n=26. In the sections Barbata and Cochlopetalum of subgenus Paphiopedilum, the chromosome number vary from 2n=26–42 and 2n=30–37. Genome size of these species varied from 24.4 pg in *Phragmipedium longifolium* to 138.1 pg in *Paphiopedilum wardii* (Cox et al. 1998). The other closely related slipper orchid, Cypripedium mostly occurs in Northern Hemisphere, ranging from Northern America to Europe and temperate Asia (Pridgeon et al. 1999, Chowdhery and Agrawala, 2013).Among the lady's slipper orchids, *Paphiopedilum* spp. and *Phragmipedium* spp. are listed in Appendix I of the Convention on International Trade of Endangered Species (CITES) and the remaining taxa from subfamily Cypripedioideae are included under Appendix II (CITES, 2015). Thousands of hybrids were developed, ever since Paphiopedilums were introduced into European countries in mid-1750's (Braem et al. 1998, 1999). The first variety, *Paphiopedilum* 'Harrisianum' was developed in 1869 from *P. villosum* and *P. barbatum*.

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Subsequent journey stated for genetic improvement in various colours (red, white, yellow) and resulted development of complex hybrids by the end of 19th century. Later, the award winning and easy growing Maudiae type Paphiopedilum hybrids were evolved and paved gateway for path-breaking Barbata and Vini type breeding lines. The convergent hybridization programmes led to the development of parent of the century *Paphiopedilum* 'Winston Churchill' for its size and spots in complex standard hybrids with vigour by 1950's. The limited species from subgenus Brachypetalum contributed to produce novelty hybrids (Cash 2009) for next 20 years. The first ever complex hybrid from Parvisepalum subgenus was registered in 1992 as *Paphiopedilum* 'Norito Hasegawa'. The native species of Paphiopedilum from South-East Asia contributed a lot for the development of modern Paphiopedilum hybrids. In case of *Paphiopedilum* 'Winston Churchill', pedigree records indicate the species like *P. insigne* (10 times), *P. villosum* (4 times), *P. spicerianum* (4 times) and *P. villosum* var. Boxalli (4 times) were used as parents in hybridization programmes.

As many as five states in North-East India have orchids as their 'State Flower' indicating the cultural richness associated for centuries with orchids, apart from *Ayurvedic*, *Siddha* and *Tibetean* medicine. The state flower of Meghalaya is Lady's Slipper orchid. An attempt has been made to introduce modern Paphiopedilum hybrids cultivation in India. The selected breeding line developed from progenies of *Paphiopedilum* 'Winston Churchill' and *Paphiopedilum lawrenceanum* (NRCO/PlxPw/29/2013) is presented below and described.

Morphological description of selected superior line *P.* 'Winston Churchill' x *P. lawrenceanum* (NRCO/PlxPw/29/2013)

Figure 1. Flowering Plant (NRCO/PlxPw/29/2013)

The selection of this breeding line was done among the 27 lines during two consecutive flowering seasons (2013 & 2014). It flowers during mid October to Mid February every year in regularly. The bigger flower size with dominating dorsal sepal in white colour with 106 days potted vase life are the attributes of this selected line (Fig 1). The classification of colour is indicated with assistance from colour chart from Royal Horticultural Society (RHS Colour Chart). The comparison of this line (NRCO/PlxPw/29/2013) with other native species of Paphiopedilum is depicted (Fig 6) and registered as IC-0614750 with ICAR-National Bureau of Plant Genetic Resources (ICAR-NBPGR), New Delhi, India.

Plant height: 24 - 25.5 cm

Plant width: 38 - 41 cm

Leaf shape, size & colour: 7 – 8 leaves, 29.8 – 32 cm length and width 3.7 - 3.8 cm, green colour oblong elliptic leaves, glossy, many dark green veins (35 - 42 no.) with venation in young leaves, leaf bases laterally compressed with dark purple spots (RHS N186C) at base, leaves curved at tip portion, tip unequal and double notched.

Peduncle (Fig 2): Size 20 x 0.54 cm, emerged from a grown up young leaves, moderately dense deep purple pubescent hair (1 mm long) on light yellow colour peduncle, hairs shiny and glossy with in reflection similar to the peduncle of *P. insigne*.

Floral bract: 6.1 x 1.8 cm size with girth of approximately 10.63 mm and cover only one fourth length of pedicellate ovary, light green colour (RHS145A), greenish veins (16-20 no) with deep purple colour (RHSN77A) spots on veins up to 40 % length from base, tip is unequal & notched and 20 % curved back at tip portion (Fig 2).

Figure 2. Side View of flower, bract & peduncle

Pedicellate ovary: Size 6 - 7 x 1.2 - 1.3 cm, 3 ribbed, purple hairs on light green colour back ground (RHS144B) and brown purple colour spots (RHS176A) in between ribs with glossy purple hairs.

Flower: Size 13.2 x 14.2 cm with dominating yellow-green colour (RHSN144A).

Dorsal sepal (Fig 3) - Size 7.3 – 8.2 cm x 6 – 6.6 cm, elliptic-oblong shape with margin entire, concave orientation with deep median vein, sub-equal & spreading, pure white colour dominating 3/4th of size from margin to mid-central portion, upper surface slightly ciliated along the margin, lower margin curved outside with middle to base portion in yellow green colour (RHAN114C/B), upper margin half spreading like cobra hood and recurved to form larger side of margin to form very broad side hoods on both sides, nerves on both sides (24 – 26 no.) with purple colour spots (RHSN79B) that are 1-3 mm size from base to all along central median vein, smaller size purple spots half along other veins with pale colours at distal ends. Lateral sepal (Fig 3) - Size 6.2 – 6.4 cm x 4 cm, suffused, glossy, light yellowish green colour (RHS150B), broad and oblong shape, out curved at base giving an undulated curve in the middle, inside glabrous with 2 - 3 sporadic purple colour spots on veins, many nerved (18-19 no.), margin and back side hairy in both white & purple colour in the middle portion, tip unequal with tapering at the end (like *P. insigne*).Petals (Fig 3) - 7.9 - 8.1 cm x 2.8 – 3 cm, broad oblong spathulate & roundish lobes at tips, unequal, upper margin undulated gradually from 1 to 6 number and bigger curves (from 7 to 11 no.) towards front side (like petals of *P. insigne*), glabrous inside, broader tips are recurved upward (similar to *P. villosum*), median vein typical dark brownish purple colour (RHS187A), dark brown colour veins (RHS N199C) running on the upper surface with circular spots towards basal portion, light greenish yellow colour with purple spots on ventral side, 3 pointed dents at tip, margin ciliate in white colour, dense purple hairs (2 - 3 mm) at basal portion along with column.

Lip (Fig 4) - Size 6.7 x 4.1 cm (from sides of mid lobe to mid lobe), 3 cm (middle), bigger in size & broader and open type with yellow colour margin (RHS1A) from side lobes to frontal opening of lip that appear like lower beak of a bird (pointed curvature), inside lip in yellow green colour (RHS154B) with small dark brownish spots across side lobes and anterior lobe clear yellow green colour on ventral side with 17 - 18 greenish yellow veins, orientation of lip curved upward to pedicellate ovary from truncated base, lateral lobes – broad in size (2.7 x 1.8 cm) and incurved, purple hairy (1 - 2 mm) at truncated base inside from lateral lobes towards tip of anterior lobe and short purple hairs all along side lobes.

Column – Size 2 cm x 4.93 mm, yellow-greenish colour (RHS 154B) with very small purple hairs (0.25 - 05 mm) at base extending to base of staminode, upward edges on both sides has anthers with half-curved and pointed amber colour triangular anther caps.

Staminode – Size 1.8 x 2 cm across, half pentagonal in shape, base recurved with medium oblong keel undulated one time with very tiny small hairs in purple colour, tridentate pointed tip, surface rough, protruded nose in yellow-orange colour (RHS 23B) with half-triangular shape and pointed downwards (Fig 5).

Figure 3. Floral Parts Front side (L) & Ventral side (R)

Figure 4. Curvature of lip

Figure 5. Staminode with yellow colour nose

Anthers & stigma – Anthers round, amber colour with reddish purple outer layer, Stigma upward down inside narrow lateral lobes, pale whitish colour and bulgy round shape with size 1 – 1.2 cm.

Potted vase life: 106 days with early to mid flowering trait and blooms during winter.

Figure 6. Comparison of selected line with native species

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