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ASSESSMENT OF CHLOROPHYLL IN BOUGAINVILLEA GENOTYPES USING THE MINOLTA SPAD-502 METER

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ABSTRACT

Chlorophyll is an essential pigment for the photosynthesis of plants. Leaf chlorophyll concentration (Chl) plays an important role in the photosynthetic capacity of plants. Therefore, the present study was carried out to assess the spad value of chlorophyll (Chl) in different genotypes of bougainvillea using the Minolta Spad-502 Meter. The highest spad value of chlorophyll was recorded in Dr. Harbhajan Singh, V₁₈ (75.60%), followed by Queen Elizabeth, V₄₀ (75.20%), and Celia Braganza, V₁₂ (74.30%), while the lowest spad value of chlorophyll was noted for Abhimanyu, V₁ (48.100%).

Keywords : Bougainvillea, Characters, Identification, Systematics, Species and Taxonomical.

Introduction

Bougainvillea are mostly of the diploid types, possessing $2n = 34$ chromosomes, according to Zadoo *et al.* (1975). Bougainvillea (*Bougainvillea spp.*) are native to South America and belong to the family Nyctaginaceae. In recent years, various efforts have been made for the improvement of different bougainvillea species, including *Bougainvillea glabra*, *Bougainvillea spectabilis*, *Bougainvillea buttiana*, and *Bougainvillea peruviana*, which differ from their diverse nature (Zaddo *et al.*, 1976). The Bougainvillea genus is distributed worldwide and widespread, with groups entirely in the whole world. Bougainvillea is based upon its species distribution throughout the world and contains approximately 18 species, namely (*Bougainvillea buttiana* Holttum & Standl, *Bougainvillea glabra* Choisy, *Bougainvillea peruviana* H & B.Pl. (Syn. *Tricycla peruviana* Poir.), *Bougainvillea spectabilis* Wild, *Bougainvillea beridifolia* Hemimerl, *Bougainvillea campanulate* Hemimerl, *Bougainvillea infesta* Griseb, *Bougainvillea Malmeana* Hemimerl, *Bougainvillea Modesta* Hemimerl, *Bougainvillea Pachyphylla* Bougainvillea pomacea Choisy, *Bougainvillea praecox* Griseb., *Bougainvillea lehmanniana* Hemimerl, *Bougainvillea lehmannianii* Hemimerl, *Bougainvillea trollii* Hemimerl).

The colour of the bracts, along with other traits like leaf and bract size, foliage variegation, floral tube, star, the pubescence of various sections, stamen placements, and flowering behaviour of the kinds, are the main causes of variation in Bougainvillea varieties. The specific benefits of this species are well documented and incorporate its totally sequenced genome, moderate height, and fast ageing time.

Because bougainvillea is an evergreen shrub, and its foliage plays an important role in ornamental horticulture. Chlorophyll content in leaves is important for proper plant growth and development in bougainvillea plants. There has been no research on the chlorophyll (Chl) content of bougainvillea leaves.

Keeping in view of the above facts, this study aimed to detect chlorophyll content in various germplasm of bougainvillea by using the SPAD-502 meter.

Materials and Methods

For the quantification of chlorophyll in several cultivars of bougainvillea, laboratory pigment quantification and portable non-destructive devices (Minolta SPAD-502) have been used (Hawkins *et al.*, 2009; Cassetari *et al.*, 2015; Donnelly *et al.*, 2020). This method becomes time-consuming, and error increases due to variations in solar radiation and photosynthetically active radiation over the day (Padilla *et al.*, 2019). The SPAD index was analyzed using the Minolta SPAD-502 CFL1030 chlorophyll meter for evaluation on 50 genotypes of bougainvillea. The four tagged plants of each plot were used, and the readings per plant were repeated three times, thus obtaining each plot's mean value. This portable device comprises two light-emitting diodes and one silicon photodiode receiver that measure leaves' transmittance in red (650 nm; wavelength absorbed by the chlorophyll) and infrared (940 nm; wavelength practically not absorbed by the chlorophyll, used as a reference to fit non-specific differences among samples) wavelengths of the electromagnetic spectrum (Minolta, 1989). Gomez and Gomez (1984), Panse and Sukhantne (1989), and the online software OPSTAT were used to analyze the data.

Results and Discussion

The leaf chlorophyll concentration, [chl], is usually determined by extraction from leaf samples and subsequent spectrophotometric measurements (Arnon 1949; Porra *et al.*, 1989). The genotypes of bougainvillea showed a significant difference in chlorophyll [chl] content using spad value (Table-1). The 50 genotypes' different SPAD values can be useful from a plant selection standpoint. A sufficient ranking assessment of genotypes in terms of leaf chlorophyll content per unit area is provided by the average value of a series of SPAD measurements on a single leaf (Castelli *et al.*, 1996). Selection efficiency is increased and measurement and recording times and costs are decreased when multiple measurements are averaged to achieve a mean value (Wahid *et al.*, 2007) and (Hamblin *et al.*, 2014). Mean SPAD values have been used successfully by many researchers in the screening and selection of desirable plants (Almeselmani *et al.*, 2011). Additionally, the assessment of photosynthetic pigments and their relationships is an important indicator of senescence (Brown *et al.*, 1991). In the present study, the highest spad value was noted in the genotype of Dr. Harbhajan Singh, V₁₈ (75.60%), followed by Queen Elizabeth, V₄₀ (75.20%), and Celia Braganza, V₁₂ (74.300%), while the lowest spad value was noted in the genotype of Abhimanyu, V₁ (48.100%). Our results are in close conformity with Barutcular *et al.* (2016) in wheat. Chlorophyll variation in the cultivars might be due to the hereditary constitution of individual plants (Ehsan *et al.*, 2008). Another cause might be due to genotype and environmental interaction, (Lichtenthaler *et al.*, 1983) and (Lichtenthaler *et al.*, 1987). which play a significant part in impacting development and improvement in high leaf biomass, which enhances its pace of photosynthesis (Mulder and Bijma, 2005). Reduced levels of leaf chlorophyll content in the leaf region, on the other hand, may lessen the intensity load at the highest point of cover, reducing water requirements to cool leaves.

Conclusion

This study reported the variation in leaf chlorophyll in different genotypes of bougainvillea. Among the genotypes, the highest spad value of chlorophyll was recorded in Dr. Harbhajan Singh, followed by Queen Elizabeth, and Celia Braganza. Hence, it may be concluded that these genotypes may be used for further improvement programmes.

Table 1 : Chlorophyll [chl] variation in bougainvillea genotypes.

S. No	Varieties	SPAD (Chlorophyll%)
V ₁	Abhimanyu	48.100
V ₂	Abraham Kavoor	56.400
V ₃	Alick Lancaster	71.500
V ₄	Annabella	50.300
V ₅	Arjuna	52.300
V ₆	Aruna	48.500
V ₇	Barbara Karst	62.400
V ₈	Begum Sikander	62.800
V ₉	Blondie	60.433
V ₁₀	Brasiliences	54.200
V ₁₁	Camarillo fiesta	56.900
V ₁₂	Celia Braganza	74.300
V ₁₃	Cherry blossom	50.800
V ₁₄	Chitra	48.200

V ₁₅	Dog star	56.300
V ₁₆	Double delight	54.500
V ₁₇	Dr. H.B Singh	75.600
V ₁₈	Dr.R.R Pal	48.200
V ₁₉	Dr.Rao	48.400
V ₂₀	Dream	71.200
V ₂₁	Enid walker	50.100
V ₂₂	Filoman	56.900
V ₂₃	Formosa	75.200
V ₂₄	Glabra	49.300
V ₂₅	Hawaiian white	48.800
V ₂₆	Jubilee	52.800
V ₂₇	Lao Banos beauty	53.600
V ₂₈	Mahara	71.700
V ₂₉	Mahatma Gandhi	60.800
V ₃₀	Marietta	66.500
V ₃₁	Mary Palmer	56.200
V ₃₂	Odisee	48.200
V ₃₃	Palekar	60.200
V ₃₄	Partha	60.100
V ₃₅	Parthasarathy	71.300
V ₃₆	Pixie	62.400
V ₃₇	Poultoni	52.200
V ₃₈	President	55.967
V ₃₉	President Roosevelt	53.233
V ₄₀	Queen Elizabeth	75.205
V ₄₁	Red September	56.200
V ₄₂	Rose Queen	53.200
V ₄₃	Roseville's Delight	56.400
V ₄₄	Scarlet glory	52.100
V ₄₅	Shubhra	70.800
V ₄₆	Sydney	64.300
V ₄₇	Thai cherry	66.200
V ₄₈	Thimma	65.400
V ₄₉	Tomato Red	52.933
V ₅₀	Wajid Ali Shah	49.700
SEm ±		0.108
CD (p=0.05)		0.303

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