

VARIABILITIES, CORRELATION AND MORPHOLOGICAL CHARACTERISTICS OF DIFFERENT LOCAL ORCHIDS

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Abstract

An investigation was undertaken at the Orchidarium of Floriculture Division, Horticulture Research Centre, Bangladesh Agricultural Research Institute, Gazipur to study the variabilities, correlation and morphological characteristics. Flower characteristics such as length of inflorescence, flowering area per inflorescence, number of inflorescences per plant, number of flowers per inflorescence, size of flowers, flowering duration were recorded. Analysis of variance showed highly significant variation among the orchid species for all the characters studied. *Aerides multiflora*, *Aerides odorata*, *Rhynchostylis retusa*, *Cymbidium alofolium* and *Phaius tankervilleae* were found to be better in respect of flower characteristics compared to others. The plants of *Aerides multiflora* had the reasonable fragrance of flower and length of inflorescence and flowering duration. *Aerides odorata* had white colour of flower with pink spot having appreciable fragrance item. *Rhynchostylis retusa* had the beautiful colour combination, light pink with maroon spot, with fragrance. The length of inflorescence was reasonable. *Cymbidium alofolium* showed the highest flowering duration. Length of inflorescence was also good. The plants of *Phaius tankervilleae*, almost all characteristics viz. length of inflorescence, flowering duration, size of flower, number of inflorescences per plant was reasonable and it had beautiful and attractive yellowish maroon coloured flower with fragrance.

Key Words: Variabilities, morphological, characteristics, local orchids.

Introduction

Orchids are one of the largest and important group of flowering plants, which belong to the largest and most diverse family Orchidaceae, consists of about 700-800 genera and 25,000 species (Singh and Voleti, 1995). Orchids are known for their lovely blooms and are found in diverse habits and habitats except desert and cold polar region. They grow over a wide range of climatic conditions, ranging from the Equator to Arctic Circle and from low land plains to snow line in mountain areas, covering a wide range of climatic condition (Hatch, 1953). The species of the family vary greatly and they may be terrestrial, epilhytic, lithophytic. Orchids belong to an interesting group of plants known for their intricately fabricated and long lasting clourful flowers, which account for nearly (7%) of the total flowering plant species and have been increasing immensely to the international trade in floriculture.

Orchids vary in their growth habit, foliage and flower characteristics. Knowledge of these characteristics is basic to the understanding of the different orchid genera and species. Like vegetative habits, orchid flowers exhibit a wide range of variations. The largest flower known is that of *Sobralia macrantha*, 15 to 30 cm across, and the tiniest one is that of the *Bulbophyllum minutissimum*, the flower bearing abut the size of a pin head (Rao, 1979). The longest length of inflorescence known is that of *Phaius tankervilleae* 80 cm and the smallest one is that of the *Acumpi*

papilosa, 5 cm (Patil, 2001). Orchids having flowers of wonderful beauty and very good keeping qualities, are of the highest value as cut flowers. Some orchid flowers last for one to three months if remained attached to the plants, and as cut flowers they remain fresh for one to four weeks. *Spathoglottis speciosa* remained fresh for 34 days (Patil, 2001).

Commercial cultivation of orchids both for plant sale as well as cut flower production has developed in to vast industries in many countries and the sale of flowers runs in to millions of dollars. An incredible range of diversity in size, shape and beautiful colour combination of orchid flowers fetch a very high price in the international market. Brazilian *Cattleya*, Japanese *Phalaenopsis*, Indian *Dendrobiums*, *Cymbidiums* and *Vandas* have played a major role in the development of modern orchid industry in the world (Singh, 1986).

In Bangladesh, the environmental conditions required for the survival and culture of orchid are adequately available throughout the year. As such different species of orchids are abundantly distributed in the country both in forest and non-forest areas (Chowdhury, 1975). Orchids are mainly found in Sylhet, Rangamati, Cox's Bazar, Madhupur, Tangail, Bandarban, Sundarban, Chittagong and Hilly areas of Bangladesh. Literature revealed that no research work have been undertaken by the researcher in Bangladesh context to study the comparative performance of different local orchids. But a few research work,

relating this has studied in India and some other foreign countries. With this background information, the present study was undertaken.

Materials and Methods

The experiment was carried out at the Orchidarium, Floriculture Division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur during the period from July 2002 to April 2003. The experimental area was under subtropical climate characterized by heavy rainfall during the month from April to September and scanty rainfall during the rest period of the year. The twenty three local species of orchid were considered as the treatments of the experiment. The sources of 23 local orchid species are summarized in Table 1.

Table 1. Species number, species name and sources of 23 local orchids

Species No.	Species name	Source of collection
S ₁	<i>Acampe papillosa</i>	Jaintapur, Sylhet
S ₂	<i>Aerides multiflora</i>	Jaintapur, Sylhet
S ₃	<i>Aerides odorata</i>	Hilly areas of Bangladesh
S ₄	<i>Vanda teres</i>	Jaintapur, Sylhet
S ₅	<i>Rhynchostylis retusa</i>	Bandarban & Sylhet
S ₆	<i>Cymbidium alofolium</i>	Hilly areas of Bangladesh
S ₇	<i>Dendrobium bensoniae</i>	Kaptai, Rangamati
S ₈	<i>Dendrobium chrysotoxum</i>	Hwaikong, Cox's Bazar
S ₉	<i>Dendrobium fimbriatum</i>	Kaptai, Rangamati
S ₁₀	<i>Dendrobium farmeri</i>	Shrimangal, Sylhet
S ₁₁	<i>Dendrobium formosum</i>	Rangamati & Cox's Bazar
S ₁₂	<i>Dendrobium lindleyi</i>	Kaptai, Rangamati
S ₁₃	<i>Dendrobium moschatum</i>	Jaintapur, Sylhet
S ₁₄	<i>Dendrobium parishii</i>	Jaintapur, Sylhet
S ₁₅	<i>Dendrobium pierardii</i>	Madhupur, Tangail
S ₁₆	<i>Dendrobium transparency</i>	Shibgonj, Chapainawabgonj
S ₁₇	<i>Eria flava</i>	Jaintapur, Sylhet
S ₁₈	<i>Pholidota imbricate</i>	Jaintapur, Sylhet
S ₁₉	<i>Oberinia iridifolia</i>	Shrimangal, Sylhet
S ₂₀	<i>Phaius tankervilleae</i>	Shibgonj, Chapainawabgonj

S ₂₁	<i>Arundina graminifolia</i>	Shrimangal, Sylhet
S ₂₂	<i>Spathoglottis plicata</i>	Thanchee, Bandarban
S ₂₃	<i>Paphipadilum godefroyae</i>	Jaintapur, Sylhet

The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. One species represents one treatment and each replication contained three plants of a species. Data on the following parameters were recorded from all the studied plants of 23 species during the period from July 2002 to April 2003. The analyses of variances for most of the characters under consideration were performed by F variance test. The significance of the difference between treatment means was evaluated by least significant difference (LSD) test for the interpretation of the results (Gomez and Gomez, 1984).

Results and Discussion

The study was conducted to evaluate the 23 local species of orchids. The variability, correlation and morphological characteristics of 23 local orchids were studied. Flower characteristics pertaining length of inflorescence, flowering area, number of inflorescences per plant, number of flowers per inflorescence, size of flower, flowering duration, colour of flower, origin of inflorescence, period of flowering, shape of sepal, shape of petal, size of column, colour of pollinia, number of sepal, number of petal were studied and shown in different table. Different species of orchids showed significant variations in respect of flowering area. Species 20 showed the highest flowering area (45.30 cm) followed by species 6 (40.12 cm) while, the lowest flowering area (4.10 cm) was observed in species 23 which was statistically similar with the species 1, 14, 10, and 17 (Table 2). As regards length of inflorescence, it ranged from 7.15 to 100.1 cm, significantly varied with the mean value of 29.00 cm among the studied species of orchids, the maximum length of inflorescence (100.1 cm) was observed in the species 20 followed by species 22 (95.30 cm), while, the lowest length of inflorescence (7.15 cm) was recorded in species 1. Number of inflorescences per plant varied significantly among the observed species and ranged from 1.11 to 5.22 with the mean value of 2.85 (Table 4). The maximum number of inflorescences (5.22) was obtained from the species 22 whereas species 12, 9, 21, 18, and 19 had the minimum number of inflorescence (1.1). Number of flowers per inflorescence varied significantly among the observed species and ranged from 3.11 to 69.11

(Table 4). The maximum number of flowers per inflorescence was obtained from species 19 (69.11) followed by species 18 and 22 (52.67 and 51.45 respectively) while the lowest number of inflorescences was observed in the species 23 (3.11) which was statistically similar with the species 7, 11, 4 and 1 (Table 2).

Table 2. Flower characteristics in respect of flowering area, number and size of flower of 23 local orchids.

Orchid species	Flowering area (cm)	Number of flowers per inflorescence	Size of flower (cm)
S ₁	4.16	5.22	5.03
S ₂	22.49	30.33	1.52
S ₃	13.08	25.67	2.07
S ₄	10.16	5.11	5.12
S ₅	30.15	34.33	2.53
S ₆	40.12	30.22	2.11
S ₇	12.23	4.11	2.52
S ₈	12.25	12.22	15.16
S ₉	11.12	10.11	1.05
S ₁₀	6.15	11.44	8.13
S ₁₁	8.22	4.22	2.07
S ₁₂	9.28	11.22	2.08
S ₁₃	11.12	6.11	5.23
S ₁₄	6.13	24.22	2.52
S ₁₅	20.29	12.33	2.29
S ₁₆	18.33	6.11	2.04
S ₁₇	8.12	10.33	2.02
S ₁₈	12.21	52.67	0.52
S ₁₉	32.32	69.11	0.11
S ₂₀	45.30	16.22	6.16
S ₂₁	12.12	30.22	6.03
S ₂₂	30.28	51.45	4.31
S ₂₃	4.11	3.11	9.29
LSD (0.05)	2.324	2.404	0.607
CV (%)	8.56	7.21	9.45

Little difference was observed between phenotypic (325.29) and genotypic (323.16) variance as well as phenotypic (88.99) and genotypic (88.70%) coefficient of variation indicating low environmental influence on this trait (Table 4). In respect of size of flowers, significant variations were observed among the species (Table 4). The largest flower (15.16 cm) were obtained from the species 8. On the other hand, the smallest flower (0.11 cm) were recorded from the species 19 (Table 2). The phenotypic (11.73) and genotypic (11.9) variance as well as phenotypic (87.60%) and genotypic (87.09%) coefficient of variation indicating less environmental influence on this trait (Table 4). As regards to flowering duration it was observed that it varied significantly (Table 4) and ranged from 7.11 days to 30.76 days with the mean value of 17.57 days.

The longest duration of flower (30.67 days) was found in species 6. The shortest flowering duration was found in species 12. Little differences were observed between phenotypic (79.96) and genotypic (77.91) variance as well as phenotypic (50.89%) and genotypic (50.23%) coefficient of variation indicating low environmental effect on this trait (Table 4). As regards to type of inflorescence, the observed species were divided in to two groups; raceme and panicle. Only the inflorescence of species 21 showed panicle type inflorescence and rest of the species showed raceme type of inflorescence (Table 3).

Wide range of variations was observed in respect of colours of flower. The different species showed different colour of flowers. The colours of flower were categorized in to 23 groups. The 23 species showed 23 types of flower colours which were different from each other and were shown in (Table 3). In respect of fragrance of flower, the observed species were categorized in to two groups; absent and present. Species 2, 3, 5, 19 and 20 had fragrance of flower, whereas it was absent in rest of the species (Table 3). Clear cut variation was observed in the shape of sepals of flower of different observed species. The shape of sepals of flower was graded in to four groups viz., ovate, oblong, elliptical and lanceolate. The species 1 and 6 were oblong, species 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 19, 21, 22, and 23 were ovate, species 14, 17 and 20 were lanceolate and only the species 8 was elliptical shaped (Table 3). The sepals obtained from all the species included in this study were three in number (Table 5). No variation was observed in respect of number of petals. The number of petals obtained in all the species were three (Table 5). Variation was observed in the shape of petals of flower among the different observed species (Table 3). The shape of petals of flower was graded in to four groups; ovate, oblong, elliptical and lanceolate. The species 1 and 6 were oblong, species 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, 15, 16, 18, 19, 21, 21, 22, and 23 were ovate, species 14 17, and 20 were lanceolate and only the species 8 was elliptical shaped. As regards to number of pollinia, the observed species were graded in to two groups. The species 1, 2, 3, 4, 5, 18 and 19 had the pollinia of two in number and the rest of the species had four in number (Table 5). Columns of flowers were categorized in to three groups; small, medium and large in respect of its size (Table 3). Columns of flowers of species 2, 5, and 19 were small, it was large in the flowers of species 4, 10, 11, 13, 20, 21, and 23 and medium in the flowers of species 1, 3, 6, 7, 8, 9, 12, 14, 15, 16, 17 and 22. Flowering periods of different observed species were recorded and presented in Table 3. Four different periods of flowering were observed. (February-March, February-April, March-April and September-October). Period of

flowering of the species 1, 2, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 15, 16, and 17 was March-April, the species 7, 10 and 18 was February- March, the species 20, 21, 22 and 23 was February-April and only the species 19 flowered in the month of September-October.

Aerides multiflora had the fragrance of flower and colour of flower was attractive rose pink, *Aerides odorata* had attractive white with pink spotted fragrance flower, *Rhynchostylis retusa* had attractive pink with maroon spotted fragrance flower and *Cymbidium alofolium* had the highest duration of

flower. *Aerides multiflora*, *Aerides odorata*, *Rhynchostylis retusa* and *Cymbidium alofolium* should be used for further breeding programme of orchid in Bangladesh by accumulating their characters like duration, colour and fragrance of flower. However, further collection of orchid germplasm should be continued for getting more variability and desired traits in orchid germplasm and further intensive study should be carried out including more species to find out appropriate local orchid species.

Table 3. Flower characteristics in respect of types of inflorescence, origin of inflorescence, colour of flower, flowering period, shape of sepal, size of column and shape of petal

Orchid species	Types of inflorescence	Origin of inflorescence	Colour of flower	Flowering Period	Shape of sepal	Size of column	Shape of petal	Fragrance of flower
S ₁	Raceme	Lateral	Yellow barred with brown	March – April	Oblong	Medium	Oblong	Absent
S ₂	Raceme	Lateral	Rose pink	March – April	Ovate	Small	Ovate	Present
S ₃	Raceme	Lateral	White with pinky spot	March – April	Ovate	Medium	Ovate	Present
S ₄	Raceme	Lateral	White with yellow lip	March – April	Ovate	Large	Ovate	Absent
S ₅	Raceme	Lateral	Light pink with maroon spot	March – April	Ovate	Small	Ovate	Present
S ₆	Raceme	Lateral	Cream with brown markings	March-April	Oblong	Medium	Oblong	Absent
S ₇	Raceme	Lateral	White with yellow inner side	February-March	Ovate	Medium	Ovate	Absent
S ₈	Raceme	Lateral	Golden yellow	March-April	Euiptical	Medium	Euiptical	Absent
S ₉	Raceme	Lateral	Deep yellow	February-March	Ovate	Medium	Ovate	Absent
S ₁₀	Raceme	Lateral	Pale pink with golden lip	February-March	Ovate	Large	Ovate	Absent
S ₁₁	Raceme	Lateral	White with yellow lip	March – April	Ovate	Large	Ovate	Absent
S ₁₂	Raceme	Terminal	Light yellow with golden lip	March – April	Ovate	Medium	Ovate	Absent
S ₁₃	Raceme	Lateral	Pale yellow with purplish markings	March – April	Ovate	Large	Ovate	Absent
S ₁₄	Raceme	Lateral	Pink with maroon lip	March – April	Lanceolate	Medium	Lanceolate	Absent
S ₁₅	Raceme	Lateral	Creamy white	March – April	Ovate	Medium	Ovate	Absent
S ₁₆	Raceme	Lateral	White with violet inner side	March-April	Ovate	Medium	Ovate	Absent
S ₁₇	Raceme	Lateral	Yellow with maroon lip	March-April	Lanceolate	Medium	Lanceolate	Absent
S ₁₈	Raceme	Terminal	Light yellow	February -March	Ovate	Small	Ovate	Absent
S ₁₉	Raceme	Terminal	Yellowish green	September-October	Ovate	Small	Ovate	Present
S ₂₀	Raceme	Lateral	Yellowish with maroon lip	February- April	Lanceolate	Large	Lanceolate	Present
S ₂₁	Panicle	Terminal	Pale pink with deep lip	February- April	Ovate	Large	Ovate	Absent
S ₂₂	Raceme	Terminal	Deep purple pink	February –April	Ovate	Medium	Ovate	Absent
S ₂₃	Raceme	Terminal	Yellow with maroon spot	February—April	Ovate	Large	Ovate	Absent

Table 4. Analysis of variance of the data of different characters of various orchid species

Source of variation (SV)	Degrees of freedom (df)	Means sum of square								
		Number of flower producing pseudobulbs	Length of inflorescence (cm)	Flowering area (cm)	Number of inflorescences per plant	Number of flowers per inflorescence	Flowering duration (days)	Size of flower (cm)	Longest root length (cm)	Longest root diameter (cm)
Replication	2	0.308	11.82	9.771	1.399	18.39	7.740	0.842	1.755	0.008
Orchid species	22	20.316**	1876.77**	404.08**	5.236**	971.62**	235.77**	34.908**	2616.99**	0.061**
Error	44	0.295	5.744	1.995	0.079	2.135	2.058	0.136	9.506	0.001

** Significant at 0.01 level of probability

Table 5. Flowers characteristics in respect of number of sepals, number of petals and number of pollinia

Orchid species	Number of sepals	Number of petals	Number of pollinia
S ₁	3	3	2
S ₂	3	3	2
S ₃	3	3	2
S ₄	3	3	2
S ₅	3	3	2
S ₆	3	3	4
S ₇	3	3	4
S ₈	3	3	4
S ₉	3	3	4
S ₁₀	3	3	4
S ₁₁	3	3	4
S ₁₂	3	3	4
S ₁₃	3	3	4
S ₁₄	3	3	4
S ₁₅	3	3	4
S ₁₆	3	3	4
S ₁₇	3	3	4
S ₁₈	3	3	2
S ₁₉	3	3	2
S ₂₀	3	3	4
S ₂₁	3	3	4
S ₂₂	3	3	4
S ₂₃	2	3	4

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