

***Bryophyllum pinnatum* Kurz. – A NEW CUT FLOWER SPECIES. I. AESTHETIC VALUE**

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SUMMARY

Flowers of succulent plants are seldom being used as cut flowers, although they were appreciated in the past. This report summarizes the results of a five years study conducted upon wild grown plants as weed. *B. pinnatum* (syn. *Kalanchoe pinnata*: common name: los botoncitos) flowering from December till March in the climatic conditions of the state of Puebla, México, forming beautiful groups in the rural landscape. From such stands samples were taken to evaluate the aesthetic value of the inflorescence under ordinary room conditions. Shoots with first flowers opened were used whenever possible. The following data were collected: total length of flowering stalk, length of lateral inflorescences, total initial and final fresh weight, number of lateral inflorescences, number of flowers opened and buds present at weakly intervals, dry weight of the inflorescence components at the end of the experiment (only 1999-2000). Plants giving inflorescences in the shadow or at greenhouse conditions produced greenish buds with fading red-brownish colors on both parts of the inflorescence. Inflorescences from sunny sites placed at room conditions, in few days started fading its red color. Inflorescences kept in water or in dry-vase produced constantly new opened flowers in both the southern and northern windows exposition. The collapse of stalk tissue was more pronounced when kept in dry vase. No collapse of peduncle tissue was noticed. The gradient of fresh mass at the end of experiment was: stalk > flowers > peduncles > opened flowers > closed flowers > calyx. Generally, the vase life and the aesthetic appreciation were better when the inflorescences were kept in southern exposition.

ADDITIONAL KEY WORDS: ornamental plant, inflorescences, size, beauty.

***Bryophyllum pinnatum* Kurz. – UNA ESPECIE NUEVA DE FLOR DE CORTE. I. VALORES ESTÉTICOS.**

RESUMEN

Rara vez las plantas suculentas se utilizan como flor de corte aunque esta forma de uso fue apreciada en el pasado. Este reporte resume los resultados de cinco años de estudios hechos con plantas silvestres. *B. pinnatum* (syn. *Kalanchoe pinnata*: nombre común: los botoncitos) florece desde diciembre hasta marzo en condiciones climáticas del estado de Puebla, México, formando hermosos grupos de flores en las áreas verdes rurales. Los ejemplares para el estudio fueron tomados de sus sitios naturales. Se evaluaron los valores estéticos de las inflorescencias en las condiciones normales de un cuarto. Cuando fue posible se utilizaron los tallos con las primeras flores abiertas. Se tomaron los siguientes datos: largo total del tallo floral, largo de inflorescencias laterales, peso total inicial y final, número de inflorescencias laterales, número de flores y botones abiertos semanalmente; la masa seca de las partes de inflorescencia se tomó al fin del experimento (sólo 1999/2000). Las plantas provenientes de sombra o de condiciones del invernadero presentaron los botones de color verde con unas rayas de color rojo-café en ambas partes de la inflorescencia. Las inflorescencias de pleno sol, ubicadas en ambas partes del cuarto, en pocos días comenzaron a perder su color rojizo. Las inflorescencias ubicadas en agua o en vasos sin agua produjeron constantemente nuevas flores abiertas en ambas condiciones (sur o norte) de exposición de las ventanas. El colapso abajo del tejido del vástago fue mayor en los tallos mantenidos sin agua. No se observó el colapso en los pedúnculos florales. El gradiente de masa fresca al fin del experimento se presentó: tallo > flores > pedúnculos > flores abiertas > flores cerradas > cálices. Generalmente, la vida en postcosecha y las apreciaciones de los valores estéticos fueron mejores cuando las inflorescencias obtuvieron una exposición a la ventana sur.

PALABRAS CLAVE ADICIONALES: planta ornamental, inflorescencias, tamaño, belleza.

INTRODUCTION

Bryophyllum pinnatum Kurz. (syn. *Kalanchoe pinnata*) belongs to a group of species introduced to the American Continent (Bailey, 1953). According to Bailey (1953) the *B. pinnatum* "was known to European in the very first years of the 17th century". Actually, it constitutes a part of rural flora of the Sierra Norte de Puebla, México and is regarded as weed (Leszczyńska-Borys, 1993; Leszczyńska-Borys *et al.*, 1996). This species is widely distributed in frost free zones of Mexico, forming beautiful groupings at time of flowering but no horticultural attention has been paid to its use as a cut flower.

Large rural areas covered with *B. pinnatum* constituted easily available stems for sale, which could give the rural communities additional and very needed income. Thus, it was necessary to demonstrate the feasibility of offering such material to consumers under prolonged time of stems transporting and elevated thermal conditions. This was the main reason of using field grown plants, transported 3 to 4 hours in ordinary car and conducting observations and measurements at room conditions.

The attractive beauty of *B. pinnatum* inflorescence encouraged us to characterize its vase value using wild grown plants. The main objective was to study their aesthetic usefulness. The paper constitutes a summary of a few years of observations.

MATERIAL AND METHODS

Flowering stems from wild stands in the region of Cuetzalan, Puebla (1994-1998) and Xalapa, Veracruz (2000), free of frosts, were used for observations and measurements. Plants were cut at the ground level, wrapped in newspaper and transported to Puebla, México. Then they were recut and kept in ordinary water, changing it when necessary. No preservative chemicals were used. Leafy stems were transported in dry to Puebla but in the experiments only the

leafless stems were used, with the exception of 1994 and 1995 materials. The number of flowering stems used to evaluate the aesthetic components varied, with year and site of sampling, from 51 to 75. The descriptive aspects taken into account were: size of flowering stems and the inflorescences (length and fresh mass), number of lateral inflorescences and its size components (length, number of flowers and buds), size of buds and open flowers (length, width) and corolla length. Analysis of variance of the inflorescence length was conducted with Tukey 's pairwise comparison to test the presence of possible effect of the material studied.

The terms used throughout the paper are: closed flowers – the sum of flowers which developed during the observation period, open flowers – flowers at anthesis; bud – unopened structures (calyx stage = "capullos").

RESULTS AND DISCUSSION

Wide areas of the Sierra Norte de Puebla and Veracruz are covered with this species. There, the stems are ready to be harvested by the end of November and till the end of February or March. The species offers beautiful flowering stems.

Visual appreciation

Plants up to 180-190 cm in height were present in large amounts in rural zones, in humid land free of frost. Plants found in partial shade showed large, heavy foliage of deep-green color. Plants from sun-exposed dry sites were somewhat stunted, with pale green foliage. The inflorescence size is quite stable (Table 1), is beautifully armed with very attractive light-green calyces (buds), when grown in shade or giving reddish-brown longitudinal stripes in sun conditions. These attributes make the inflorescence very appealing. The inflorescence's beauty reaches the climax, when first flower opens, and the corolla's red contrasts with the pale-green of its calyx. The reddish, longitudinal stripes of the calyx beautifully harmonize with

TABLE 1. Size attributes of the flowering stem of *Bryophyllum pinnatum* Kurz. from two collection sites.

	Length (cm)			Total of flowers (Per stem)	Fresh mass of flowering stem (g)	Nodes number	
	Stem	Inflorescence	Lateral inflorescence			Stem	Inflorescence
Nauzontla, Puebla							
Minimum	90	40	2.2	31	73	8	6
Maximum	107	76	29.3	141	272	12	8
Mean	97	58.1	8.6	69	166	10.4	6.3
Zapotitlan, Puebla							
Minimum	86	19	1	41			4
Maximum	265	63	23	142			8
Mean	130.5	41.6	5.5	68			5.2

Tukey's pairwise comparison of both sites not significant.

the elongated, hanging flowers. Both characters are underlined by the horizontal ring of red corolla.

The buds from shade grown plants are pale-green, with slightly marked reddish stripes, if any. Locating inflorescences with green buds in the southern exposed windows did not intensify the reddish stripes. The stripes of buds and the reddish tone of stems attained vivid intensity in plants grown in full sun (Figure 1 a, b, c,).

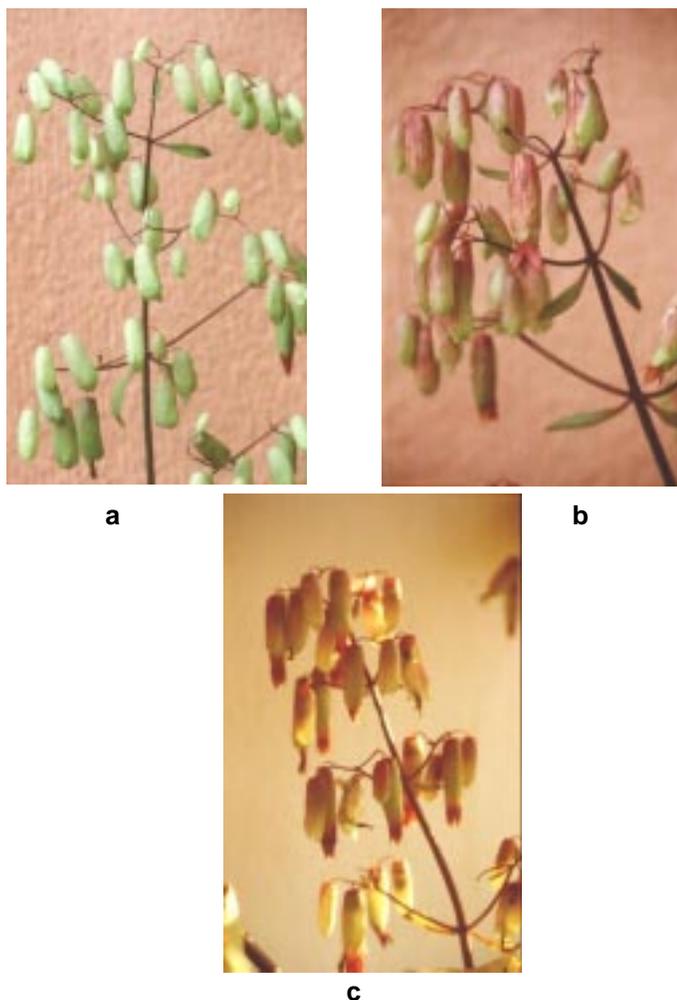


Figure 1 a, b, c. The colors of calyces of *Bryophyllum pinnatum* Kurz. depend upon the plants sun exposition: a) plants grown in the shade, b) plants with partial shade, c) plants grown in full sun light with southern exposition.

Aesthetic qualities of the flowering stem

The size attributes of stems sampled from two wild stands are listed in the Table 1. Both stands gave the number of nodes per stem of similar value. This means that the number of lateral inflorescences is similar. The inflorescence is slightly asymmetrical (Table 2), resulting in an uneven distribution of flowers (Table 3). The inflorescence length in one population of plants varied much from very short to

very large, from 30 to 60 cm (Table 4). This indicates that it is possible to produce inflorescences of varying size. The most frequent number of lateral inflorescences varies from 5 to 6 (Table 5), with the highest number noted of 8 laterals only in one case. The number of flowers per flowering stem obviously varies much (Table 6), which depends upon the length and number of laterals per stem (Table 4, 5). The buds and flower size variation (Table 7) is influenced, in cut stems by the steady appearing buds.

The stem is heavy. Lateral inflorescences are evenly distributed at mean distance of 6 cm. The percent of open flowers is steady and varies from 10 to 15 % of the total. The number of open flowers per lateral inflorescence varies from 0 to 3, with 25 to 77 % of lateral inflorescences giving open flowers at a particular day of observation. The low flower number of open flowers is compensated by large number of buds with its own beauty. The second and the third order of laterals give larger number of flowers, attribute related to their dimensions. No phototropic or geotropic reactions were noted in cut stems. The stems should be cut, when the first flowers start to break through the calyx. The buds of normal size continued to give open flowers for the three weeks period of observations, although the later opening buds were giving flowers of somewhat reduced size.

TABLE 2. Length of the lateral inflorescence of *Bryophyllum pinnatum* Kurz.

Order of lateral	Lateral length (mm) per order and side	
	a	b
1	66.7	74.0
2	95.8	87.9
3	65.3	56.4
4	45.9	41.1
5	34.4	31.4
6	30.5	26.7
7	19.7	20.0

Tukey's pairwise comparison not significant

TABLE 3. Mean frequency of number of flowers of *Bryophyllum pinnatum* Kurz. per order and side of laterals.

Order of lateral	Flowers per order and side			
	a		b	
	Number	Percentage	Number	Percentage
1	8.4	17.36	6.9	15.17
2	11.2	23.14	9.5	20.88
3	9.4	19.42	7.4	16.23
4	7.3	15.08	6.0	13.19
5	6.1	12.60	5.7	12.53
6	4.8	9.92	5.5	12.09
7	1.2	2.48	4.5	9.89

Tukey's pairwise comparison not significant

TABLE 4. Frequency of size of inflorescences of *Bryophyllum pinatum* Kurz. in the population sample (1994-/1995).

Class of inflorescence length (cm)	Number of inflorescence	Percentage (%)
< 20	2	3.92
21-30	9	17.65
31-40	11	21.57
41-50	13	25.49
51-60	11	21.57
>60	5	9.80
Total	51	100

TABLE 5. Frequency number of lateral inflorescences per flowering stem of *Bryophyllum pinnatum* Kurz.

Lateral inflorescences per stem	Stems	
	Number	Percentage (%)
4	12	16
5	27	36
6	23	30.7
7	12	16
8	1	1.3
Total	75	100

TITULO 6. Frequency of flower number per flowering stem of *Bryophyllum pinnatum* Kurz.

Number of flowers	Flowering stems	
	Number	Percentage (%)
26-50	16	21.05
51-75	28	36.84
76-100	17	22.37
101-125	9	11.84
126-150	4	5.26
151-200	1	1.32
>221	1	1.32
Total	76	

TABLE 7. Flower dimensions of *Bryophyllum pinnatum* Kurz.

	Stage of flowering					
	Bud		Open flower			
	Length	Width	Calyx			Corolla length
			Length	Width		
Minimum	18	8	28	13	48	
Maximum	36	14	38	16	60	
Mean	31.7	12.2	35.2	13.9	53.3	

Bryophyllum pinatum...

Perception of stems beauty

The color and shape of bud, the flower and the inflorescence can be appreciated (Figure 2, 3) specially when located in a rustic vase (Figure 4). The warm, red color of the whole stems, placed in a room with northern exposition, gives its warmth to the viewers feelings. The stems with pale green buds, in southern room exposition and/or in a home with elevated temperature, may result in perceiving cooling effects to the habitants.

Bredmose (1987) and Kroon *et al.* (1989) are using the number of open flowers as the only criterium of acceptance of *K. quartiniana* or the genus *Kalanchoe* by the public. At least in the case of *B. pinnatum* the presence of unopened calyces have to be considered as an alternative or compensatory measure of its aesthetic value. The photographs clearly indicate such a possibility.

The presented aesthetic value of unexplored species, its availability in large quantities, offer the communities additional income and to the buyers an aesthetic satisfaction once the decision is taken to offer this stock to the commerce. It is worthwhile to explore this possibility.



Figure 2. The beauty of a lateral inflorescence of *Bryophyllum pinnatum* Kurz. where the shape and color pattern of buds and the open flowers can be appreciated. Note the longitudinal spotting harmonized with elongated shape and cascade form of flowers.



Figure 3. The warmth of flowers and buds is emanating to the viewers mind from the inflorescence.



Figure 4. A bouquet of flowering stems, located in a rustic vase from Amatenango, Chiapas. Both harmonize with the background of the room, transferring the warmth of subtropical or tropical climates to persons of cooler regions.

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