

## Relationship analysis among intergeneric hybrids of *Ascocentrum* based on floral characters

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### ABSTRACT

A study was undertaken for characterizing 30 intergeneric hybrids of *Ascocentrum* orchid based on floral characters and cluster analysis. The results showed that variety V25 (*Mokara* Syam *Ascocenda* Doung Porn) produced more number of spikes/plant/year (7.86), whereas, variety V11 (*Vascostylis* Blue Bay White) produced more number of florets/spike (40.67). Hybrid V3 (*Ascocenda* Kultana × *Vanda* Bitzs Heartthrob) had highest length (9.33 cm) and width (9.00 cm) of flower. Cluster analysis with 14 floral characters was done by classifying hybrids/varieties into 12 groups. Cluster 2 and 5 had five members, whereas, cluster 11 and 12 with only one member each. The cluster 2 and cluster 5 were less similar to each other with an inter-cluster distance 6.27, whereas highest inter-cluster distance was observed in cluster 6 and cluster 10 (41.47). Cluster 10 had high mean values for spike length (51.12 cm), flower length (7.94 cm) and width of flowers (7.50 cm), whereas cluster 6 which included V6 (*Ascocenda* Sirichi Fragrance) and V11 (*Vascostylis* Blue Bay White) had lowest internodal length with the highest value for number of florets/ spike. This cluster also observed to have low flower length and width (2.52 cm and 2.42 cm, respectively). This indicated that these varieties produce flowers in the dense bunch.

**Key words:** Floral character, Intergeneric hybrid, Cluster analysis, *Ascocentrum*, *Mokara*, *Ascocenda*, *Vascostylis*, *Kagawara*

Monopodials have recently gained popularity due to the availability of a large number of varieties and hybrids involving intergeneric ones that show a wide range of variability in floral characters. *Ascocentrum* is a small flowered monopodial, vandaceous orchid having erect inflorescence and lasting flower. *Vanda* gained more popularity through the bigeneric hybrid *Ascocenda* (*Ascocentrum* × *Vanda*); the bright orange flowers, more number of florets and longevity are contributed by *Ascocentrum*. This was subsequently used for the production of multi-generic vandaceous hybrids, viz., *Mokara*, *Kagawara*, *Vascostylis*, etc. and many other bigeneric and multigeneric hybrids have been evolved in *Ascocentrum* alliance. The species and cultivars/hybrids are visually differentiated on the basis of colour and size of flowers.

### Material and Methods

The study was carried out at College of Horticulture, Kerala Agricultural University, Thrissur during 2016-

2018. Thirty *Ascocentrum* varieties/hybrids were used. The characterisation was done in selected healthy and insect-free varieties of intergeneric hybrids, viz *Ascocenda*, *Vascostylis*, *Mokara*, and *Kagawara*, where in one of the parents was *Ascocentrum*. The thirty selected varieties (Table 1) were grown in even slope span rain shelter having 200 micron UV film and 25 % UV stabilised shade net. Two to three years old, fully grown flower-bearing plants, 5 each of 30 varieties, were arranged in completely randomised design with three replications. The observations on floral characters were made by measuring and counting floral parts as required. Number of spikes produced per year in each variety/hybrid was noted. Other floral parameters such as length of spike, length of rachis, length of floral stalk (length of peduncle), girth of spike at base, intermodal length, length of pedicel (pedicel of single floret), length of flower and width, length of labellum (lip length) and width of labellum (lip width) length of column and length of spur were measured in centimetres. The data collected on these characters were subjected to one way ANOVA using OPSTAT (online based software developed by CCS HAU, Hisar) and cluster analysis was performed using Minitab Version-18.

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**Table 1:** Intergeneric hybrids of *Ascocentrum* selected for field evaluation

Variety No.	Varieties
V <sub>1</sub>	<i>Ascocenda</i> Udomochai
V <sub>2</sub>	<i>Ascocenda</i> Kraillerk White × <i>Vanda</i> Sanderiana
V <sub>3</sub>	<i>Ascocenda</i> Kultana × <i>Vanda</i> Bitzs Heartthro
V <sub>4</sub>	<i>Ascocenda</i> Yip Sum Wah × <i>Vanda</i> Josephine Van Brero
V <sub>5</sub>	<i>Ascocenda</i> Suksamran Sunlight
V <sub>6</sub>	<i>Ascocenda</i> Sirichi Fragrance
V <sub>7</sub>	<i>Vascostylis</i> Pine River Blue
V <sub>8</sub>	<i>Vascostylis</i> Pine River Pink
V <sub>9</sub>	<i>Vascostylis</i> Aroonsri Beauty
V <sub>10</sub>	<i>Vascostylis</i> Pine Rivers Fuchsia Delight
V <sub>11</sub>	<i>Vascostylis</i> Blue Bay White
V <sub>12</sub>	<i>Mokara</i> Walter Oumae Pink
V <sub>13</sub>	<i>Mokara</i> Calypso × <i>Vanda</i> Doctor Anek
V <sub>14</sub>	<i>Mokara</i> Rassmatozz
V <sub>15</sub>	<i>Mokara</i> Khaw Piak Suan × <i>Ascocenda</i> Bicentennial Yellow Spot
V <sub>16</sub>	<i>Mokara</i> Khaw Piak Suan × <i>Ascocenda</i> Jiraprapra
V <sub>17</sub>	<i>Mokara</i> Sayan × <i>Ascocenda</i> Bangkuntein Gold
V <sub>18</sub>	<i>Mokara</i> Calypso Pink
V <sub>19</sub>	<i>Mokara</i> Calypso Jumbo
V <sub>20</sub>	<i>Mokara</i> Chao Praya Sunset Yellow Spot
V <sub>21</sub>	<i>Mokara</i> Chao Praya Sunset Orange
V <sub>22</sub>	<i>Mokara</i> Sunspot Orange
V <sub>23</sub>	<i>Mokara</i> Omayaiy Yellow
V <sub>24</sub>	<i>Mokara</i> Omayaiy Orange
V <sub>25</sub>	<i>Mokara</i> Syam <i>Ascocenda</i> Doung Porn
V <sub>26</sub>	<i>Mokara</i> Chark Han Pink
V <sub>27</sub>	<i>Kagawara</i> Youthong Beauty
V <sub>28</sub>	<i>Kagawara</i> Cristae Low
V <sub>29</sub>	<i>Kagawara</i> Boon Rub
V <sub>30</sub>	<i>Kagawara</i> Samrong

## Results and Discussion

High variation was observed in all the varieties and hybrids on spike characters (Table 2). Variety V<sub>25</sub> (7.86) to produced more number of spikes/plant/year which was on a par with V<sub>23</sub> (6.33) and V<sub>27</sub> (6.00). Whereas, V<sub>16</sub> (1.00) produced least number of spike/plant/year which was on apar with V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub>, V<sub>10</sub>, V<sub>11</sub>,

V<sub>12</sub>, V<sub>13</sub>, V<sub>17</sub>, V<sub>19</sub>, V<sub>20</sub>, V<sub>21</sub>, V<sub>22</sub>, V<sub>26</sub>, V<sub>28</sub> and V<sub>30</sub>. In spike length, variety V<sub>23</sub> (54.70 cm) recorded maximum value which was on a par with V<sub>24</sub> (47.53 cm). Whereas, V<sub>9</sub> (17.33 cm) recorded minimum spike length which was on a par with V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub>, V<sub>6</sub>, V<sub>7</sub>, V<sub>11</sub>, V<sub>12</sub>, V<sub>13</sub>, V<sub>15</sub>, V<sub>16</sub> and V<sub>17</sub>. Rachis length was higher in V<sub>30</sub> (28.80 cm) It was on a par with V<sub>8</sub>, V<sub>10</sub>, V<sub>18</sub>, V<sub>19</sub>, V<sub>21</sub>, V<sub>23</sub>, V<sub>24</sub>, V<sub>25</sub>, V<sub>26</sub>, V<sub>27</sub>, V<sub>28</sub> and V<sub>29</sub>. However, it was low in V<sub>16</sub> (8.67 cm) which on par with V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub>, V<sub>5</sub>, V<sub>7</sub>, V<sub>9</sub>, V<sub>12</sub>, V<sub>13</sub>, V<sub>15</sub> and V<sub>17</sub>. In case of peduncle length, again V<sub>23</sub> (27.60 cm) had higher value on a par with V<sub>25</sub> (24.40 cm) and V<sub>24</sub> (23.47 cm). Regarding peduncle length, V<sub>3</sub> (8.47 cm) had highest value followed by V<sub>2</sub> (6.63 cm), V<sub>24</sub> (6.53 cm), V<sub>23</sub> (6.43 cm) and V<sub>25</sub> (6.10 cm). In girth, V<sub>3</sub> (8.47 cm) had highest value, followed by V<sub>2</sub> (6.63 cm), V<sub>24</sub> (6.53 cm), V<sub>23</sub> (6.43 cm) and V<sub>25</sub> (6.10 cm). V<sub>6</sub> (2.80 cm) had a minimum value and it was on par with V<sub>8</sub> (2.73 cm), V<sub>10</sub> (2.53cm) V<sub>7</sub> (2.40 cm) and V<sub>11</sub>. The varieties The *Mokara* is the trigeneric hybrid with the parents *Ascocentrum*, *Arachnis* and *Vanda* (Lee 1994). *Arachnis* a tall, climbing and epiphytic orchid (Tan 1976), being one of the parents of *Mokara*, it might have contributed the higher values in the inflorescence characters.

The *Ascocentrum* varieties/hybrids also exhibited considerable variation for flower characters. Variety V<sub>11</sub> (40.67) produced more numbers florets / spike, whereas, V<sub>15</sub> (5.67) produced least number of florets/spike, and was on apar with V<sub>2</sub>, V<sub>3</sub>, V<sub>4</sub>, V<sub>12</sub>, V<sub>13</sub>, V<sub>14</sub>, V<sub>16</sub>, V<sub>18</sub>, V<sub>20</sub>, V<sub>21</sub>, V<sub>24</sub> and V<sub>26</sub>. The intermodal length was highest in V<sub>5</sub> (5.00 cm) and low in V<sub>11</sub> (0.70 cm) which was on par with V<sub>10</sub> (1.07 cm). Hybrid V<sub>3</sub> (8.47 cm) had highest pedicel length, whereas, it was low in V<sub>11</sub> (2.23 cm). Hybrid V<sub>3</sub> (8.47 cm) also recorded highest length of flower (9.33 cm) and width of flower (9.00 cm), whereas lowest length and width of flower (2.27 cm and 2.13 cm, respectively) was observed in V<sub>11</sub>. The lip length and lip width, and less variation were observed as many of hybrids/ varieties had near to similar lip length and width. Lip length ranged from 1.80 cm (V<sub>10</sub>) to 4.80 cm (V<sub>3</sub>), and lip width from 3.77 cm (V<sub>3</sub>) to 1.20 cm (V<sub>9</sub>). Variety V<sub>18</sub> (1.17 cm) and V<sub>21</sub> (1.17 cm) had high column length. The V<sub>29</sub> (0.43 cm) and V<sub>30</sub> (0.43 cm) had less column length. The spur length, high variation was observed. Hybrid V<sub>3</sub> (0.90 cm) and V<sub>27</sub> (0.90 cm) had high value for spur length, whereas, it was low in V<sub>12</sub> (0.23 cm) and V<sub>30</sub> (0.23) The variations in flower characters of *Ascocentrum* varieties and hybrids have been reported (Rajkumar

**Table 2:** Floral characters of *Ascocentrum* hybrids /varieties during 2016-18

Variety no.	Spike characters					Flower characters								
	No. of spikes/year/plant	Spike length (cm)	Rachis length (cm)	Peduncle length (cm)	Spike girth (cm)	No. of florets/spike	Internodal length (cm)	Pedicel length (cm)	Length of flower (cm)	Width of flower (cm)	Lip length (cm)	Lip width (cm)	Column length (cm)	Spur length (cm)
V <sub>1</sub>	3.00 (1.99)	24.33 (5.02)	12.17 (3.62)	12.17 (3.62)	1.80 (1.67)	20.67 (4.63)	1.73 (1.65)	3.23 (2.06)	3.70 (2.17)	3.47 (2.11)	2.33 (1.83)	1.77 (1.66)	0.50 (1.22)	0.60 (1.26)
V <sub>2</sub>	2.00 (1.72)	25.00 (5.08)	12.50 (3.66)	12.50 (3.66)	2.57 (1.89)	9.67 (3.26)	1.50 (1.58)	6.63 (2.76)	6.67 (2.77)	6.33 (2.71)	3.43 (2.11)	3.20 (2.05)	0.70 (1.3)	0.53 (1.24)
V <sub>3</sub>	2.67 (1.88)	22.50 (4.81)	10.87 (3.43)	11.63 (3.51)	2.50 (1.87)	8.00 (2.99)	2.17 (1.78)	8.47 (3.08)	9.33 (3.21)	9.00 (3.16)	4.80 (2.41)	3.77 (2.03)	1.10 (1.45)	0.90 (1.38)
V <sub>4</sub>	3.00 (1.99)	31.87 (5.73)	15.00 (4.00)	16.87 (4.22)	2.17 (1.78)	9.00 (3.16)	1.80 (1.67)	5.73 (2.59)	6.30 (2.70)	5.90 (2.63)	2.37 (1.84)	2.50 (1.87)	0.57 (1.25)	0.80 (1.33)
V <sub>5</sub>	3.00 (1.99)	27.33 (5.32)	12.33 (3.64)	15.00 (4.00)	2.20 (1.79)	16.67 (4.20)	5.00 (2.44)	3.37 (2.09)	6.43 (2.73)	6.23 (2.69)	2.53 (1.88)	1.37 (1.54)	0.97 (1.4)	0.80 (1.34)
V <sub>6</sub>	5.00 (2.45)	24.40 (5.03)	14.50 (3.94)	9.90 (3.28)	1.40 (1.55)	37.67 (6.21)	1.27 (1.51)	2.80 (1.95)	2.77 (1.94)	2.70 (1.92)	3.10 (2.03)	2.17 (1.78)	0.90 (1.38)	0.73 (1.32)
V <sub>7</sub>	2.67 (1.91)	22.67 (4.86)	14.00 (3.86)	8.67 (3.11)	1.57 (1.60)	14.67 (3.96)	1.47 (1.57)	2.40 (1.84)	2.53 (1.88)	2.43 (1.85)	2.63 (1.91)	1.63 (1.62)	0.60 (1.26)	0.53 (1.24)
V <sub>8</sub>	3.67 (2.16)	30.00 (5.56)	17.50 (4.25)	12.50 (3.66)	1.67 (1.63)	33.33 (5.85)	1.37 (1.54)	2.73 (1.93)	2.77 (1.94)	2.70 (1.92)	2.63 (1.91)	1.53 (1.59)	0.50 (1.22)	0.63 (1.28)
V <sub>9</sub>	3.00 (1.99)	17.33 (4.28)	11.60 (3.55)	5.73 (2.59)	1.30 (1.52)	17.00 (4.23)	1.33 (1.53)	3.00 (2.00)	2.80 (1.95)	2.53 (1.88)	2.57 (1.89)	1.20 (1.48)	0.53 (1.24)	0.57 (1.25)
V <sub>10</sub>	2.33 (1.82)	34.33 (5.93)	23.00 (4.89)	11.33 (3.49)	1.40 (1.55)	32.67 (5.78)	1.07 (1.44)	2.53 (1.88)	2.73 (1.93)	2.37 (1.83)	1.80 (1.67)	1.33 (1.53)	0.70 (1.30)	0.43 (1.20)
V <sub>11</sub>	3.00 (1.99)	24.33 (5.03)	15.50 (4.06)	8.83 (3.13)	1.17 (1.47)	40.67 (6.45)	0.70 (1.30)	2.23 (1.80)	2.27 (1.81)	2.13 (1.77)	2.43 (1.85)	1.87 (1.69)	0.60 (1.26)	0.37 (1.17)

Table 2 (continued)

V <sub>12</sub>	2.33 (1.82)	25.00 (5.09)	12.00 (3.60)	13.00 (3.74)	1.97 (1.72)	8.33 (3.05)	1.77 (1.66)	3.70 (2.17)	6.83 (2.80)	5.67 (2.58)	2.90 (1.97)	1.23 (1.49)	0.67 (1.29)	0.23 (1.11)
V <sub>13</sub>	2.33 (1.81)	24.80 (5.07)	11.97 (3.59)	12.83 (3.72)	2.10 (1.76)	10.67 (3.41)	1.97 (1.72)	3.67 (2.16)	5.83 (2.61)	5.80 (2.60)	3.17 (2.04)	1.53 (1.59)	0.67 (1.29)	0.30 (1.14)
V <sub>14</sub>	4.33 (2.29)	29.20 (5.50)	14.43 (3.93)	14.77 (3.97)	2.10 (1.76)	7.00 (2.83)	1.90 (1.70)	5.00 (2.45)	6.60 (2.76)	6.47 (2.73)	2.37 (1.84)	1.60 (1.61)	0.80 (1.34)	0.33 (1.16)
V <sub>15</sub>	3.67 (2.14)	24.33 (5.00)	11.33 (3.49)	13.00 (3.72)	1.63 (1.62)	5.67 (2.56)	2.77 (1.94)	3.80 (2.19)	6.40 (2.72)	6.30 (2.70)	2.60 (1.90)	1.30 (1.52)	1.00 (1.41)	0.73 (1.32)
V <sub>16</sub>	1.00 (1.41)	20.00 (4.58)	8.67 (3.09)	11.33 (3.51)	2.30 (1.82)	7.00 (2.83)	2.67 (1.91)	4.87 (2.42)	5.70 (2.59)	5.23 (2.50)	1.83 (1.68)	1.23 (1.49)	0.80 (1.33)	0.57 (1.25)
V <sub>17</sub>	3.00 (1.99)	24.00 (5.00)	13.00 (3.74)	11.00 (3.46)	1.67 (1.63)	13.67 (3.83)	1.83 (1.68)	3.77 (2.18)	7.47 (2.91)	6.23 (2.69)	2.70 (1.92)	1.90 (1.70)	1.07 (1.44)	0.63 (1.28)
V <sub>18</sub>	4.00 (2.23)	28.00 (5.39)	17.60 (4.31)	10.40 (3.38)	2.00 (1.73)	11.33 (3.51)	2.63 (1.91)	4.47 (2.34)	4.93 (2.44)	4.83 (2.41)	2.73 (1.93)	2.33 (1.83)	1.17 (1.47)	0.30 (1.14)
V <sub>19</sub>	1.63 (1.62)	35.53 (6.03)	19.03 (4.46)	16.50 (4.18)	2.70 (1.92)	24.33 (5.01)	2.53 (1.88)	5.97 (2.64)	6.73 (2.78)	6.33 (2.71)	2.90 (1.98)	2.70 (1.92)	1.10 (1.45)	0.67 (1.29)
V <sub>20</sub>	2.33 (1.82)	33.97 (5.89)	16.03 (4.12)	17.93 (4.32)	2.33 (1.83)	10.67 (3.40)	2.37 (1.84)	5.90 (2.63)	5.70 (2.59)	6.50 (2.74)	2.30 (1.82)	2.00 (1.73)	0.87 (1.37)	0.63 (1.28)
V <sub>21</sub>	1.27 (1.50)	35.43 (6.00)	19.00 (4.45)	16.43 (4.15)	2.80 (1.95)	10.43 (3.38)	2.57 (1.89)	5.57 (2.56)	7.57 (2.93)	7.37 (2.89)	3.20 (2.05)	2.73 (1.93)	1.17 (1.47)	0.40 (1.18)
V <sub>22</sub>	2.87 (1.95)	34.00 (5.89)	16.03 (4.12)	17.97 (4.34)	2.50 (1.87)	13.77 (3.83)	1.87 (1.69)	4.67 (2.38)	6.60 (2.76)	6.20 (2.68)	2.53 (1.88)	1.53 (1.59)	0.80 (1.34)	0.50 (1.22)
V <sub>23</sub>	6.33 (2.70)	54.70 (7.45)	27.10 (5.29)	27.60 (5.33)	2.57 (1.89)	19.33 (4.49)	2.87 (1.97)	6.43 (2.72)	8.10 (3.02)	7.57 (2.93)	2.63 (1.91)	1.67 (1.63)	0.73 (1.32)	0.63 (1.28)
V <sub>24</sub>	5.00 (2.43)	47.53 (6.96)	24.07 (5.00)	23.47 (4.92)	2.73 (1.93)	12.10 (3.62)	3.67 (2.16)	6.53 (2.74)	7.77 (2.96)	7.43 (2.90)	2.40 (1.84)	1.70 (1.64)	1.03 (1.43)	0.50 (1.22)
V <sub>25</sub>	7.87 (2.97)	42.60 (6.60)	18.20 (4.38)	24.40 (5.04)	2.73 (1.93)	28.73 (5.44)	3.77 (2.18)	6.10 (2.66)	7.00 (2.83)	6.73 (2.78)	2.40 (1.84)	2.70 (1.92)	0.70 (1.30)	0.43 (1.20)

Table 2 (continued)

V <sub>26</sub>	1.33 (1.52)	35.17 (6.00)	18.27 (4.39)	16.90 (4.18)	2.40 (1.84)	7.87 (2.97)	2.33 (1.83)	5.83 (2.61)	7.00 (2.83)	6.67 (2.77)	2.40 (1.84)	1.50 (1.58)	0.90 (1.38)	0.57 (1.25)
V <sub>27</sub>	6.00 (2.62)	39.50 (6.34)	24.37 (5.03)	15.13 (3.96)	2.03 (1.74)	18.43 (4.38)	2.67 (1.92)	5.87 (2.62)	6.23 (2.69)	6.30 (2.70)	2.20 (1.79)	1.50 (1.58)	0.70 (1.3)	1.10 (1.44)
V <sub>28</sub>	3.10 (2.02)	42.87 (6.62)	25.53 (5.14)	17.33 (4.24)	1.90 (1.70)	24.20 (5.01)	1.93 (1.71)	4.60 (2.37)	3.80 (2.19)	3.93 (2.22)	2.63 (1.91)	1.50 (1.58)	0.60 (1.26)	0.50 (1.22)
V <sub>29</sub>	3.33 (2.08)	28.87 (5.46)	17.10 (4.25)	11.77 (3.57)	1.67 (1.63)	20.53 (4.64)	1.73 (1.65)	4.33 (2.31)	3.43 (2.11)	3.33 (2.08)	2.37 (1.84)	1.30 (1.51)	0.43 (1.20)	0.73 (1.32)
V <sub>30</sub>	2.00 (1.72)	40.87 (6.47)	28.80 (5.46)	12.07 (3.61)	1.67 (1.63)	30.07 (5.57)	1.47 (1.57)	3.60 (2.14)	3.33 (2.08)	3.13 (2.03)	1.87 (1.69)	1.87 (1.69)	0.43 (1.20)	0.23 (1.11)
C.D.@5%	0.418	0.712	0.547	0.715	0.071	0.60	0.133	0.125	0.106	0.117	0.097	0.303	0.084	0.073
SE(m) <sup>±</sup>	0.147	0.251	0.193	0.252	0.025	0.211	0.047	0.044	0.037	0.041	0.034	0.107	0.03	0.026
C.V.	12.654	7762	8.029	11.339	2.497	8.828	4.613	3.256	2.577	2.891	3.111	11.025	3.855	3.552

The data in parenthesis indicate square root transformed values

and Sharma, 2010; De *et al.*, 2015; Deepa, 2017; Kasutjianingati and Firgiyanto, 2018).

Cluster analysis with 14 different floral characters revealed 12 clusters at 75 % similarity (Table 3 and Fig. 1). Cluster 2 and 5 had five members, whereas cluster 11 and 12 with only one member. The cluster 2 and cluster 5 were less similar with each other with inter-cluster distance of 6.27, whereas, the highest inter-cluster distance was observed in cluster 6 and cluster 10 (41.47) (Table 4).

Cluster 10 had high mean values for spike length (51.12 cm), flower length (7.94 cm) and width of flower (7.50 cm). Cluster 11 had high mean values for a number of spikes/plant/year, intermodal length (3.77 cm) and had high flower length (7.00 cm) and width of flower (6.73 cm) next to cluster 10. Whereas, cluster 6 including V<sub>6</sub> (*Ascda* Sirichi Fragrance) and V<sub>11</sub> (*Vasco* Blue Bay White) had lowest internodal length with the highest value for number of florets/spike. This cluster also had low flower length and width (2.52 cm and 2.42 cm, respectively). This indicates that these varieties produce flowers in the dense bunch.

## Conclusion

It can be concluded that selection based on these traits would be most effective for plant breeders in developing new *Ascocentrum* orchid varieties.

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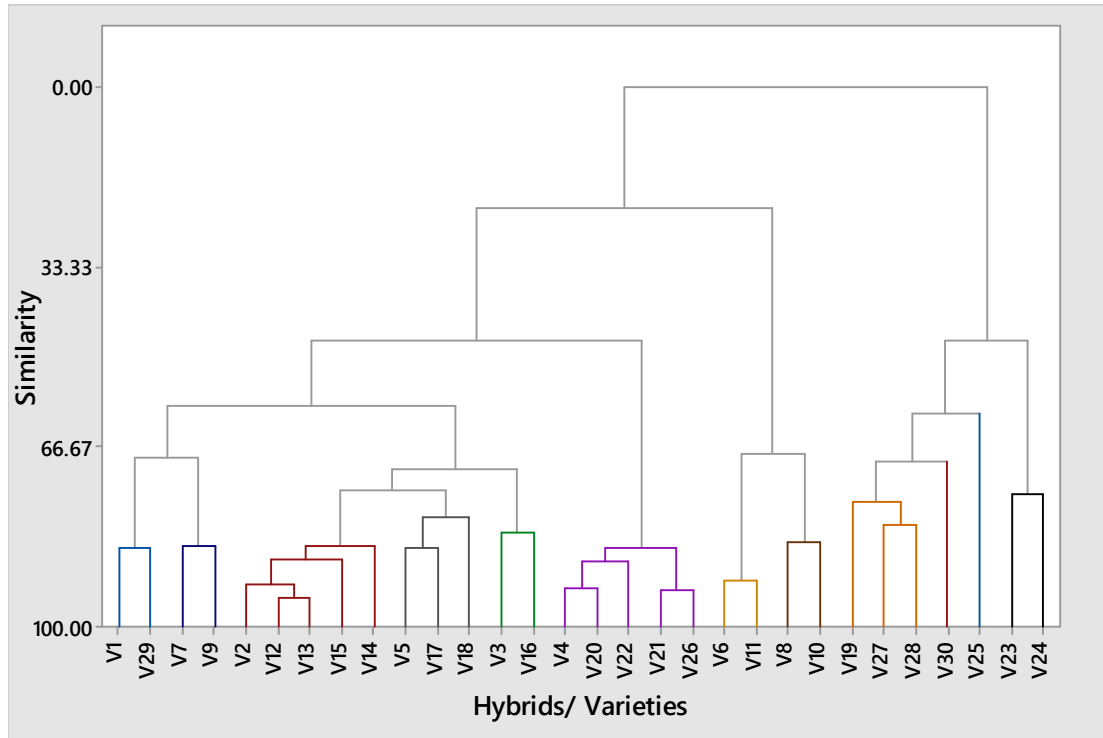
**Table 3:** Inter cluster distance among 12 clusters in *Asocentrum* hybrids /varieties

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8	Cluster 9	Cluster 10	Cluster 11	Cluster 12
Cluster1	0.00											
Cluster2	13.28	0.00										
Cluster3	16.32	6.24	0.00									
Cluster4	14.77	10.63	16.11	0.00								
Cluster5	7.80	6.27	10.18	10.47	0.00							
Cluster6	19.04	31.85	33.42	32.24	26.16	0.00						
Cluster7	9.78	12.56	12.79	19.71	10.06	23.98	0.00					
Cluster8	14.81	27.35	30.74	24.47	21.50	11.61	22.82	0.00				
Cluster9	16.33	22.53	27.47	14.60	18.26	25.50	25.11	14.86	0.00			
Cluster10	31.33	32.32	37.73	21.93	30.62	41.47	39.35	30.84	17.08	0.00		
Cluster11	23.34	29.91	34.43	22.35	25.99	27.47	32.91	19.15	12.89	17.45	0.00	
Cluster12	22.27	31.58	36.11	25.14	26.49	23.68	30.35	12.67	11.57	23.87	18.53	0.00

**Table 4:** Mean values of floral characters for clusters in *Asocentrum* hybrids /varieties

Variable	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7	Cluster8	Cluster9	Cluster10	Cluster11	Cluster12
No. of spikes/ year/ plant	3.17	2.93	1.84	2.16	3.33	4.00	2.84	3.00	3.58	5.67	7.87	2.00
Spike length (cm)	26.60	25.67	21.25	34.09	26.44	24.37	20.00	32.17	39.30	51.12	42.60	40.87
Rachis length (cm)	14.64	12.45	9.77	16.87	14.31	15.00	12.80	20.25	22.98	25.59	18.20	28.80
Peduncle length (cm)	11.97	13.22	11.48	17.22	12.13	9.37	7.20	11.92	16.32	25.54	24.40	12.07
Spike girth (cm)	1.74	2.07	2.40	2.44	1.96	1.29	1.44	1.54	2.21	2.65	2.73	1.67
No. of florets / spike	20.60	8.27	7.50	10.35	13.89	39.17	15.84	33.00	22.32	15.72	28.73	30.07
Internodal length (cm)	1.73	1.98	2.42	2.19	3.15	0.99	1.40	1.22	2.38	3.27	3.77	1.47
Pedicel length (cm)	3.78	4.56	6.67	5.54	3.87	2.52	2.70	2.63	5.48	6.48	6.10	3.60
Length of flower (cm)	3.57	6.47	7.52	6.63	6.28	2.52	2.67	2.75	5.59	7.94	7.00	3.33
Width of flower (cm)	3.40	6.11	7.12	6.53	5.76	2.42	2.48	2.54	5.52	7.50	6.73	3.13
Lip length (cm)	2.35	2.89	3.32	2.56	2.65	2.77	2.60	2.22	2.58	2.52	2.40	1.87
Lip width (cm)	1.54	1.67	2.22	2.05	1.87	2.02	1.42	1.43	2.66	1.69	1.50	1.87
Column length (cm)	0.47	0.77	0.95	0.86	1.07	0.75	0.57	0.60	0.80	0.88	0.70	0.43
Spur length (cm)	0.45	0.42	0.74	0.58	0.72	0.55	0.55	0.53	0.76	0.57	0.43	0.23





**Fig. 1:** Dendrogram showing clustering of 30 hybrids/ varieties of *Ascocentrum*

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