

# 日長效應對唐菖蒲花期及花品質之影響<sup>1</sup>

蔡宛育<sup>2</sup>、陳彥睿<sup>2</sup>、易美秀<sup>2</sup>、魏芳明<sup>2</sup>

## 摘 要

本試驗利用本省冬季日長(短日照低於8~9 hr)及半夜連續電照4 hr (半夜10時至翌日2時)方式種植唐菖蒲, 探討30個唐菖蒲品種, 評估並篩選適合電照栽植之品種, 以促進植株生育與提高切花品質, 使生產業者獲得更大利潤, 茲將結果簡述如下: 長日與短日處理對唐菖蒲生育情形有顯著之影響, 長日狀況下其花莖長度、花蕾數與切花之開花率、鮮重及瓶插壽命等各項均較短日處理者有極顯著促進效果。惟抽穗期與採收期會延遲而較慢收穫7~12日。但此等結果亦因品種而異, 所以需慎選品種。選拔優良之切花品種, 已篩選適合電照之品種, 如'Hunting Song'、'Wig, s Sensation'、'Fidelio'、'Mascagni'、'Advance Red'、'Invitatie'等, 可供農民栽培時參考, 符合經濟效益。

關鍵字: 唐菖蒲、品種收集、光週期

## 前 言

唐菖蒲(*Gladiolus hybridus* Hort.)為鳶尾科植物, 葉形似劍所以又稱劍蘭<sup>(3)</sup>, 1992年估計世界唐菖蒲栽培總面積約9,000 ha (Cohat, 1993), 為本省僅次於菊花的第二大切花, 民國八十九年之栽培面積達到725 ha, 年產切花11,933千打, 供內外銷, 經濟價值相當高。栽培地區主要分佈於台中縣后里鄉(面積為393 ha), 其次為彰化縣之溪州鄉、北斗及田尾鄉(面積為138 ha)<sup>(1)</sup>。

唐菖蒲在本省週年均可栽培, 但夏季所生產的切花品質不佳, 種球之生長與木子採收率皆差, 且高溫多濕, 病蟲害多, 故夏季種植面積較少, 而集中於秋、冬季栽培<sup>(2,3)</sup>。然此時期栽培唐菖蒲, 許多品種常因日照時數及光線不足且氣溫不穩定, 而造成消蕾現象、花序短小、盲芽或植株生育與切花品質不佳, 根據報告指出, 唐菖蒲在長日狀況下, 雖會延遲收穫, 但可增進開花<sup>(6,11,17,24,31)</sup>增加花蕾數和促進花莖長度, 所以在以色列及澳大利亞等地有人於冬季夜間採行電照處理來促進其開花率、提高切花之品質<sup>(17,18,19,20,25,29,30)</sup>。Imanish<sup>(10)</sup>指出唐菖蒲於4~5葉期對低光照敏感, 若此時期遭遇低光照, 將造成開花率的減少及每花序上小花數減少。Post<sup>(21)</sup>認為高溫弱光下, 碳水化合物供應不足, 使花朵數減少、消蕾數增加, 而Laurie和Poesch<sup>(12)</sup>曾報告指出對8個唐菖蒲品種夜間施行電燈照明進行栽培試驗結果, 植株生育有被促進效果者, 僅三種而已, 其它5種效果不顯著, 品種間對光度之敏感度也有所不同, 對較不敏感的品

<sup>1</sup>台中區農業改良場研究彙報 0518 號。

<sup>2</sup>台中區農業改良場助理、助理研究員、助理、助理。

種弱光只會減少其花穗上的小花數，但對光度敏感的品種，則不僅會減少花穗上的小花數，同時也會使開花率下降<sup>(23)</sup>，而Shill和Halevy<sup>(24)</sup>也有類似報告，因此日長效應或因品種而異。

因此，根據上述情形，針對本省主要栽培經濟品系，進行夜間電照處理，探討日長效應在本省冬季栽培唐菖蒲時對其生育之影響，評估並篩選適合電照之品種，以供農民參考。

## 材料與方法

### 一、品種與日長效應之觀察試驗：

本試驗於1996年10月21日進行，供試品種為'Amsterdam'、'Mascagni'、'Ben Vento'、'Impoter'、'Advance Red'、'Carqueiranne'、'Grurcl Prix'、'Prissilla'、'Rose Supreme'、'Brasilia'、'Hunting Song'、'Pink Perfection'、'Saxony'、'Chrisina'、'Wig's Sensation'、'Red Beauty'、'Invitatie'、'Passion'、'Fidelio'、'Auglia'、'Snow'、'Lady Godiva'、'Anitra'、'Perseus'、'Yellow Gem'、'Whynot'、'Mykonos'、'Dyanito'、'Wonder'、'Eerde'等30個品種球莖大小為8~10 cm，於田間進行試驗。

二、田間試驗設計：每個品種各200個球，分成4區(重覆)，行株距15 cm × 5 cm逢機完全區集排列，每區調查20株。種植後按照慣行方法管理，並適時調查株高、葉片數、抽梗日期、收穫期(花序下部之第一朵小花蕾花瓣露出約0.2 cm 且達50%之日計之)、花梗長度與重量、花苞數、瓶插品質等。

三、日長處理：長日照採電照處理以220V、100W燈炮，距地1.7 m，燈距3.3 m × 3.3 m架設之，光度為100 ± 20 Lux，於植株生長至第2葉時，半夜10時至翌日2時連續電照4 hr，俟30日後，則停止電照工作。短日處理則採本省冬季10月至1月之日長，為對照組。

四、瓶插品質：為便於調查，將唐菖蒲開花過程參考Ferreira *et al.*<sup>(8)</sup>之報告，人為定義為6級：

第0級：含苞。

第1級：苞片裂開，可見到花瓣。

第2級：筒狀花露出，但尚未張開。

第3級：筒狀花半開。

第4級：筒狀花盛開，花徑最大。

第5級：開始凋萎，花瓣褪色，花徑縮小，至花瓣邊緣反捲為止。

以第2級為開花之標準，超過第5級就丟棄。

## 結果與討論

據研究唐菖蒲生育期適當光照約為1,000 J/m<sup>2(4)</sup>，Mckay<sup>(13)</sup>指出以144 Lux之電照可達97%最大切花採收率，若以100 Lux電照可達97%最多小花數，而以450 Lux之電照可達97%最長種植至開花所需天數。而據本場(台中區農業改良場)農業氣象資料顯示，本省中部產地秋冬季日射量約為822 J/m<sup>2</sup>，平均日照5.8 hr，氣溫19.3℃，總雨量19.1 mm J/m<sup>2</sup> (1996年10月86年2月)，故有部份品種因日照不足而產生消蕾、花莖過短、開花品質不良的現象。很多試驗報告

得知，<sup>(3,5,9,11,16,23,24)</sup>，冬季栽植唐菖蒲，由於日照不佳，養分不足，經常造成植株生育不良與開花率不佳，經栽培結果，30個品種唐菖蒲植株開花率全試驗區調查結果，電照區30個品種全部正常抽蕾開花。但對照區'Brasilla'、'Saxony'、'Amsterdam'三個品種不能正常抽蕾開花。根據Yasuda和Hashimoto<sup>(31)</sup>於夏季種植唐菖蒲，將日長縮短為9 hr，結果有許多品種開花率減少，但日長延長為10~11 hr後，則顯著增加其開花率。本試驗電照處理區，利用暗期中斷方式，其開花率亦得到顯著促進效果。收穫日期方面，根據資料指出唐菖蒲栽培所需日數，因品種而異；在高溫期為50~70日，低溫期為65~85日開花。為改善上述情形，部份農民栽培唐菖蒲時利用夜間電照處理來提高切花品質。但本省現有唐菖蒲之品種間有對光照反應敏感與鈍感之差異尚不明，以致部份品種電照後未顯現出預期效果徒然增加生產成本。

本試驗電照處理區，可切花達50%之天數'Anglia'和'Dyanito'、'Pink Perfection'三個品種電照區於種植後83、93、100日進入採收階段，比對照區延遲13~18日收穫。根據Mckay等人<sup>(18)</sup>對'Oscar'和'Professor Gourdrin'<sup>(11,26)</sup>，兩品種施以長日處理，結果比12 hr之自然日長延遲15日開花；國外報告對許多不同品種唐菖蒲進行試驗，亦有類似結果。本試驗與國外試驗結果相似；各供試品種之花苞數，均隨著長日處理而增加(表一)。

在對照處理中，所有供試品種之花苞數均較少，尤其是'Dyanito'、'Prissilla'及'Rose Supreme'這三個品種，花苞數只有8.43、8.53、8.65朵。而經電照處理後增加為11.38、13.23、13.23朵。在花莖長度方面'Wonder'、'Grurcl Prix'、'Yellow gem'、'Dyanito'等品種長日及短日處理差異顯著，電照區比對照區高15.5~18.88 cm。試驗報告指出<sup>(3,4)</sup>長日處理可以促進花莖長度，經長日處理後增加7~12 cm，且差異程度隨種植密度增加而有降低趨勢，本試驗種植密度為每平方公尺種植50~60球莖，經暗期中斷電照處理，效果亦促進明顯。花梗重只有'Chrisina'、'Lady godira'品種電照區與對照區沒有顯著差異，其餘品種差異顯著。莖粗方面以'Wonder'、'Yellow gem'、'Rose Supreme'品種，長日與短日相差最大，分別為2.03、1.97、1.82 cm，而'Ben Vento'、'Hunting Song'、'Pink Perfection'、'Chrisina'、'Passion'、'Fidelio'、'Snow'、'Perseus'、'Mykonos'品種則沒有顯著差異。日長處理對唐菖蒲子球莖及小球莖方面影響，子球莖在短日較處理較長日重的為'Carqueiranne'、'Pink Perfection'、'Wig's Sensation'、'Lady Godiva'、'Why not'、'Dyanito'、'Wonder'、'Eerde'其餘之品種均長日處理較短日處理為重(表二)。不同品種在長日照下切花時，在花梗長及花梗重、花苞數方面均達顯著差異，以'Wonder'最長，'Hunting Song'最短，至於平均每枝花苞數13.4朵，較其它品種為多，尤以'Chrisina'的16.4朵為最多，而可切花達50%之天數，以'Passion' 107.5天最長，其次是'Pink Perfection' 100.18天最短'*Persens*' 33.3天(表三)。至於長日照下種球與木子方面，'Mascagni'採收之子球莖重為35.3 g，而'Invitatie'之子球莖重為11.05 g，其間差異較其它品種為大，'Red Beauty'之小球莖產量均較其它品種為高(表四)。在短日下27個品種中，在花梗長及花梗重、株高均有顯著差異，以'Passion'、'Dyanito'最短，'Fidelio'最長，花苞數以'Prissilla'、'Rose supreme'最少，自種植至切花達50%天數以'Why not'、'Mykonos'之68.5天最短，'Passion' 102.5天最長，株高以'Fidelio'明顯較其它品種為長，葉片數則以'Chrisina' 8.85天最多，而以'Yellow Gem'、'Mykonos'的6.2片最少(表六)。短日下在

採收後種球品質方面，'Why not'，'Impoter'種球最重，所產生木子數'Red Beauty' 35.1個及'Advance Red' 36.2及35.1最多，而'Ben Vento' 1.7個最少(表七)。根據國外秋冬季種植唐菖蒲，幾乎所有品種之花蕾數與花序品質都較為低劣。而此次參試之品種，於自然日照(短日區)皆有花莖長度較弱小，花序較短、開花率較低現象發生，而電照區呈顯著之差異。而由植株諸性狀，花莖長度、莖粗、花蕾數等綜合觀之。但整體而言，對光線較敏感之品種'Rose Supreme'、'Red Beauty'、'Why Not'、'Anglia'、'Wonder'、'Fidelio'、'Dyanito'、'Mykonos'、'Carueiranne'、'Grurcl Prix'、'Yellow'，對光線較不敏感之品種有'Impoter'、'Chrisina'、'Mascagni'、'Perseus'、'Pink Perfection'，經長日處理後切花品種有'Brasilia'、'Saxony'、'Amsterdam'切花之開花率，瓶插後6日整株達到3級之開花率，'Invitatie'、'Advance Red'、'Prissilla'、'Wig's sensation'、'Wonder'五品種，電照區與對照區均呈顯著差異，兩者處理之開花率相差19.33~4.38%(表三)。經由電照處理者花莖長度及花苞數品質較佳，或許其貯藏供花蕾開花用之物質較為充足。Magie和Poe<sup>(15)</sup>指出小花蕾不能有效開花，主要原因是貯存在花莖內之碳水化合物缺乏，而Rao和 Mohan Ram<sup>(22)</sup>提到“光”可以誘引澱粉？(amylase)產生並使澱粉水解，而誘導唐菖蒲小花蕾之花瓣生長發育，因此光對唐菖蒲切花之開花率有其相關性，花梗重方面，'Advance Red'、'Grurcl Prix'、'Carqueiranne'三品種電照區之花梗重皆比對照區重39 g、32 g、28 g(表一)。根據Shillo及Halevy<sup>(27)</sup>試驗報告指出，唐菖蒲長日處理會增加其植株鮮重和葉子及花朵之大小，其對'Spick'品種施以長日處理，結果植株鮮重比短日處理者增加33%，本試驗結果與其相似。

為改善冬季種植唐菖蒲其植株生育與切花品質不佳之情形，可選用對光較不敏感之品種如'Eurovision'、'Friendship'、'White Friendship'、'Jessica Mascagni'及'Peter Pears'等品種，而本次試驗所用之'Impoter'、'Chrisina'、'Mascagni'、'Perseus'、'Pink Perfection'應避免種植，並採用較大尺寸之球莖(如12~14 cm和14~16 cm)。許氏譯述<sup>(4)</sup>，較大球莖因貯存有較多的養分，因此植株生育與開花情形會較好，本試驗所採用之球莖為8~10 cm，若改以尺寸較大之球莖，其品質將會更佳，而且可以提早2~3週收穫，對日長處理收穫期延後之情形，將可獲得解決。

栽培密度亦影響切花及種球品質Bhattarhee<sup>(7)</sup>以Friendship為材料，將株距為15 cm、20 cm及25 cm(行距皆20 cm)，結果顯示：隨株距的提高，則較大等級的球數日會大大的增加，每株所結子球莖及小球莖日亦增加。Shillo和Halevy試驗報告指出<sup>(29)</sup>種植密度與植株之生育及切花之品質成反比趨勢，因此冬季種植唐菖蒲可採用較低栽培密度來改善切花品質。另報告指出<sup>(28)</sup>唐菖蒲用光源100 Lux低光強度增加日照時間，可以促進植株生育與切花品質，因此冬季栽培唐菖蒲為使植株生育良好及切花品質更佳，除採上述方法外，由本次試驗結果氣象因子應引入考慮再實施長日處理以促進之。

本省唐菖蒲切花之生產以4、5、6、7月最少，10月至3月間最多，因農曆年節其間，市場花需求量大，生產者較能獲利，故秋冬季為本省重要栽培季節。本試驗利用夜間連續電照暗期中斷方式，其植株生育與切花之品質皆獲致相當促進效果，惟收穫期延後。根據Shillo等人<sup>(28)</sup>試驗報告指出夜間連續4小時暗期中斷電照方式獲得同樣結果，但改以間歇週期性電照(cyclic lighting)，每15分鐘電照5分暗10分連續4 hr，其促進效果亦同，但收穫期提前。Shillo

表一、日長處理對唐菖蒲切花期園藝性狀調查

Table 1. The effect of photoperiod on horticultural characters of gladiolus at harvesting stage

Variety	Photoperiod <sup>1</sup>	Spike length (cm)	Fresh weight (g)	Florets No.	Spike dia (mm)	Plant height (cm)	Leaf No.	Days to 50% flower stalk emergence	Days to 50% flower stalk flowering
Mascagni	L	<b>84.30<sup>2</sup></b>	<b>39.38</b>	<b>12.00</b>	<b>7.16</b>	<b>54.00</b>	7.50	<b>81.50</b>	<b>87.50</b>
	S	<b>75.50</b>	<b>34.13</b>	<b>10.93</b>	<b>6.30</b>	<b>52.53</b>	7.50	<b>75.50</b>	<b>85.00</b>
Ben Vento	L	<b>93.03</b>	<b>72.00</b>	<b>15.58</b>	9.53	56.85	8.28	<b>88.00</b>	<b>96.50</b>
	S	<b>91.75</b>	<b>49.55</b>	<b>12.88</b>	9.40	56.30	8.08	<b>92.50</b>	<b>100.00</b>
Impoter	L	<b>82.48</b>	<b>48.48</b>	<b>12.43</b>	<b>7.62</b>	53.00	7.65	84.28	<b>93.20</b>
	S	<b>79.28</b>	<b>43.00</b>	<b>11.00</b>	<b>7.25</b>	52.33	7.25	88.33	<b>94.20</b>
Advance Red	L	93.35	<b>53.48</b>	<b>11.63</b>	<b>9.55</b>	64.90	<b>7.05</b>	<b>92.00</b>	<b>100.5</b>
	S	92.88	<b>92.88</b>	<b>10.35</b>	<b>8.18</b>	65.50	<b>7.40</b>	<b>85.00</b>	<b>94.2</b>
Carqueiranne	L	<b>90.75</b>	<b>66.78</b>	<b>14.23</b>	<b>8.65</b>	<b>54.80</b>	<b>6.20</b>	<b>83.50</b>	<b>93.40</b>
	S	<b>78.65</b>	<b>38.90</b>	<b>11.63</b>	<b>7.00</b>	<b>55.75</b>	<b>7.20</b>	<b>76.13</b>	<b>85.25</b>
Grurcl Prix	L	<b>98.50</b>	<b>74.43</b>	<b>12.90</b>	<b>9.21</b>	<b>62.20</b>	<b>8.15</b>	<b>98.50</b>	<b>96.50</b>
	S	<b>80.63</b>	<b>42.40</b>	<b>10.60</b>	<b>7.63</b>	<b>54.28</b>	<b>7.20</b>	<b>80.20</b>	<b>90.40</b>
Prissilla	L	<b>83.40</b>	<b>61.58</b>	<b>10.98</b>	<b>8.58</b>	<b>61.28</b>	<b>8.00</b>	<b>82.23</b>	<b>89.50</b>
	S	<b>75.38</b>	<b>41.68</b>	<b>8.53</b>	<b>7.00</b>	<b>58.23</b>	<b>7.28</b>	<b>75.20</b>	<b>78.50</b>
Rose Supreme	L	<b>100.63</b>	<b>66.00</b>	<b>13.23</b>	<b>8.32</b>	<b>73.08</b>	8.53	<b>83.38</b>	<b>92.05</b>
	S	<b>88.25</b>	<b>50.95</b>	<b>8.65</b>	<b>6.50</b>	74.25	8.20	<b>77.18</b>	<b>85.20</b>
Hunting Song	L	<b>77.25</b>	<b>52.28</b>	<b>12.48</b>	8.16	<b>48.45</b>	7.83	<b>74.45</b>	<b>84.18</b>
	S	<b>74.05</b>	<b>40.03</b>	<b>9.43</b>	8.03	<b>47.18</b>	7.90	<b>78.00</b>	<b>85.50</b>
Pink Perfection	L	<b>85.33</b>	<b>43.63</b>	<b>11.98</b>	7.03	<b>49.83</b>	7.65	<b>91.28</b>	<b>100.18</b>
	S	<b>81.08</b>	<b>40.45</b>	<b>11.20</b>	6.65	<b>51.20</b>	7.45	<b>76.50</b>	<b>86.50</b>
Chrisina	L	<b>95.45</b>	71.98	<b>16.43</b>	9.04	<b>59.60</b>	8.78	84.50	<b>94.18</b>
	S	<b>94.65</b>	72.03	<b>14.45</b>	8.75	<b>64.93</b>	8.85	84.23	<b>93.18</b>
Wig's sensation	L	<b>99.88</b>	<b>66.75</b>	<b>13.60</b>	<b>8.63</b>	<b>59.25</b>	8.08	<b>84.35</b>	<b>92.50</b>
	S	<b>92.23</b>	<b>43.15</b>	<b>10.90</b>	<b>7.48</b>	<b>61.63</b>	8.33	<b>80.00</b>	<b>89.50</b>
Red Beauty	L	<b>100.83</b>	<b>64.55</b>	<b>14.35</b>	<b>9.07</b>	<b>68.50</b>	<b>8.08</b>	<b>88.20</b>	<b>96.48</b>
	S	<b>90.03</b>	<b>44.25</b>	<b>10.45</b>	<b>7.28</b>	<b>67.30</b>	<b>7.73</b>	<b>75.00</b>	<b>85.50</b>
Invitatie	L	<b>95.15</b>	<b>60.35</b>	<b>15.95</b>	<b>7.53</b>	<b>50.38</b>	7.20	<b>90.50</b>	<b>100.25</b>
	S	<b>80.78</b>	<b>40.45</b>	<b>13.35</b>	<b>6.98</b>	<b>62.58</b>	6.95	<b>94.23</b>	<b>90.28</b>
Passion	L	<b>87.65</b>	<b>41.90</b>	<b>11.90</b>	7.25	<b>60.00</b>	<b>7.68</b>	<b>91.45</b>	<b>107.50</b>
	S	<b>73.30</b>	<b>31.50</b>	<b>13.00</b>	7.45	<b>61.15</b>	<b>7.43</b>	<b>94.23</b>	<b>102.50</b>
Fidelio	L	<b>113.38</b>	<b>57.30</b>	<b>9.93</b>	7.63	<b>79.75</b>	<b>7.78</b>	<b>84.28</b>	<b>92.38</b>
	S	<b>102.60</b>	<b>52.90</b>	<b>12.95</b>	7.25	<b>75.60</b>	<b>8.25</b>	<b>76.23</b>	<b>85.00</b>
Anglia	L	<b>90.90</b>	<b>56.35</b>	<b>13.50</b>	<b>8.08</b>	<b>63.35</b>	7.90	<b>75.15</b>	<b>93.50</b>
	S	<b>83.20</b>	<b>38.23</b>	<b>9.83</b>	<b>7.15</b>	<b>54.83</b>	7.78	<b>69.25</b>	<b>75.00</b>
Snow	L	<b>88.80</b>	<b>31.40</b>	15.40	7.00	<b>51.40</b>	<b>7.65</b>	<b>80.50</b>	<b>90.50</b>
	S	<b>79.83</b>	<b>25.65</b>	15.48	5.95	<b>47.20</b>	<b>8.30</b>	<b>75.00</b>	<b>85.00</b>
Lady godiva	L	<b>54.00</b>	40.38	<b>15.83</b>	<b>7.38</b>	<b>62.43</b>	7.40	<b>68.20</b>	<b>77.50</b>
	S	<b>89.43</b>	40.40	<b>12.08</b>	<b>6.53</b>	<b>58.93</b>	7.33	<b>66.50</b>	<b>75.28</b>
Anitra	L	<b>82.05</b>	<b>38.63</b>	<b>12.63</b>	<b>5.59</b>	53.33	<b>6.75</b>	<b>67.13</b>	<b>75.23</b>
	S	<b>76.93</b>	<b>22.95</b>	<b>9.88</b>	<b>4.40</b>	53.35	<b>6.40</b>	<b>61.65</b>	<b>69.50</b>
Perseus	L	<b>85.33</b>	<b>33.90</b>	<b>13.03</b>	5.59	<b>58.48</b>	<b>7.10</b>	<b>64.50</b>	<b>74.20</b>
	S	<b>80.50</b>	<b>26.25</b>	<b>10.53</b>	5.25	<b>52.25</b>	<b>6.73</b>	<b>60.35</b>	<b>68.78</b>
Yellow gem	L	<b>90.40</b>	<b>52.63</b>	<b>12.73</b>	<b>7.75</b>	<b>60.45</b>	<b>5.63</b>	<b>85.50</b>	<b>95.50</b>
	S	<b>74.78</b>	<b>30.50</b>	<b>10.53</b>	<b>5.78</b>	<b>56.73</b>	<b>6.20</b>	<b>75.50</b>	<b>87.00</b>
Why not	L	<b>108.90</b>	<b>66.35</b>	<b>15.25</b>	<b>8.57</b>	<b>71.93</b>	<b>8.33</b>	<b>70.50</b>	<b>78.50</b>
	S	<b>96.28</b>	<b>59.90</b>	<b>11.45</b>	<b>7.55</b>	<b>70.48</b>	<b>7.50</b>	<b>60.50</b>	<b>68.53</b>
Mykonos	L	<b>88.38</b>	<b>48.58</b>	<b>13.53</b>	7.09	<b>64.98</b>	<b>7.25</b>	<b>73.50</b>	<b>78.50</b>
	S	<b>85.25</b>	<b>33.45</b>	<b>10.68</b>	7.38	<b>65.38</b>	<b>6.25</b>	<b>62.40</b>	<b>68.53</b>
Dyanito	L	<b>88.63</b>	<b>41.13</b>	<b>11.38</b>	<b>5.99</b>	<b>60.38</b>	7.15	<b>73.50</b>	<b>83.35</b>
	S	<b>73.13</b>	<b>24.60</b>	<b>8.43</b>	<b>5.53</b>	<b>52.80</b>	7.13	<b>62.40</b>	<b>69.15</b>
Wonder	L	<b>113.38</b>	<b>67.43</b>	<b>13.55</b>	<b>9.83</b>	<b>70.35</b>	<b>7.78</b>	<b>79.50</b>	<b>87.50</b>
	S	<b>94.50</b>	<b>58.53</b>	<b>10.10</b>	<b>7.80</b>	<b>63.48</b>	<b>7.48</b>	<b>69.50</b>	<b>78.25</b>
Eerde	L	<b>104.98</b>	<b>59.90</b>	<b>12.98</b>	<b>6.19</b>	<b>68.38</b>	7.53	<b>90.00</b>	<b>98.00</b>
	S	<b>90.93</b>	<b>54.08</b>	<b>10.60</b>	<b>7.33</b>	<b>57.65</b>	7.25	<b>85.00</b>	<b>94.25</b>

<sup>1</sup> L: Lighting Treatment, S: Without Light Treatment.<sup>2</sup> Values between L and S treatments followed by bold letters are significantly different at 5% by T-test.

表二、日長處理對唐菖蒲種球之影響

Table 2. The effect of photoperiod on corm characters of gladiolus

Variety	Photoperiod <sup>1</sup>	Corm weight (g)	Corm diameter (cm)	Cornel weight (g)	Cornel No.
Mascagni	L	<b>35.30</b> <sup>2</sup>	<b>16.13</b>	<b>4.50</b>	<b>26.33</b>
	S	<b>25.70</b>	<b>19.98</b>	<b>0.53</b>	<b>3.25</b>
Ben Vento	L	20.55	<b>13.40</b>	<b>2.38</b>	<b>15.13</b>
	S	9.83	<b>10.38</b>	<b>0.38</b>	<b>1.70</b>
Impoter	L	<b>36.25</b>	<b>14.45</b>	<b>1.85</b>	<b>5.75</b>
	S	<b>34.15</b>	<b>15.63</b>	<b>0.73</b>	<b>2.05</b>
Advance Red	L	<b>11.30</b>	10.73	<b>2.50</b>	<b>25.55</b>
	S	<b>10.75</b>	10.40	<b>3.78</b>	<b>35.10</b>
Carqueiranne	L	<b>16.25</b>	<b>12.30</b>	<b>2.60</b>	<b>16.48</b>
	S	<b>17.65</b>	<b>11.78</b>	<b>3.88</b>	<b>12.20</b>
Grurcl Prix	L	<b>28.28</b>	<b>14.65</b>	<b>0.75</b>	<b>5.85</b>
	S	<b>20.40</b>	<b>13.40</b>	<b>3.85</b>	<b>15.28</b>
Prissilla	L	25.40	14.40	<b>1.63</b>	<b>12.20</b>
	S	25.45	14.13	<b>9.33</b>	<b>18.75</b>
Rose Supreme	L	<b>24.48</b>	13.33	<b>1.85</b>	<b>16.53</b>
	S	<b>23.33</b>	13.23	<b>7.00</b>	<b>20.75</b>
Hunting Song	L	<b>20.58</b>	<b>12.38</b>	<b>1.38</b>	<b>11.13</b>
	S	<b>17.43</b>	<b>12.23</b>	<b>0.70</b>	<b>8.93</b>
Pink Perfection	L	<b>12.83</b>	<b>11.58</b>	1.55	<b>14.25</b>
	S	<b>17.55</b>	<b>12.53</b>	1.13	<b>15.10</b>
Chrisina	L	<b>25.45</b>	<b>14.33</b>	<b>3.68</b>	<b>9.50</b>
	S	<b>13.00</b>	<b>11.18</b>	<b>1.28</b>	<b>7.65</b>
Wig's sensation	L	<b>32.00</b>	<b>18.88</b>	4.25	<b>15.25</b>
	S	<b>33.45</b>	<b>14.60</b>	4.03	<b>11.85</b>
Red Beauty	L	<b>25.43</b>	<b>13.70</b>	<b>8.28</b>	<b>70.53</b>
	S	<b>17.60</b>	<b>11.70</b>	<b>7.65</b>	<b>36.15</b>
Invitatie	L	<b>11.05</b>	<b>10.73</b>	<b>0.88</b>	<b>7.30</b>
	S	<b>9.00</b>	<b>9.73</b>	<b>0.50</b>	<b>4.10</b>
Passion	L	<b>17.43</b>	12.63	1.18	<b>11.75</b>
	S	<b>16.68</b>	12.03	1.03	<b>9.60</b>
Fidelio	L	<b>28.45</b>	<b>14.48</b>	<b>1.58</b>	<b>10.85</b>
	S	<b>22.75</b>	<b>13.40</b>	<b>0.55</b>	<b>6.45</b>
Anglia	L	<b>55.88</b>	<b>14.20</b>	<b>3.35</b>	<b>22.43</b>
	S	<b>31.73</b>	<b>13.60</b>	<b>5.33</b>	<b>12.55</b>
Snow	L	<b>19.45</b>	<b>12.93</b>	4.48	<b>33.43</b>
	S	<b>17.35</b>	<b>12.25</b>	4.98	<b>18.55</b>
Lady godiva	L	<b>24.90</b>	<b>13.58</b>	<b>9.30</b>	<b>13.18</b>
	S	<b>28.43</b>	<b>14.28</b>	<b>8.63</b>	<b>20.65</b>
Anitra	L	<b>13.40</b>	11.50	<b>5.25</b>	<b>35.70</b>
	S	<b>16.73</b>	11.80	<b>3.63</b>	<b>14.10</b>
Perseus	L	<b>24.30</b>	<b>14.53</b>	<b>3.53</b>	<b>35.20</b>
	S	<b>12.93</b>	<b>12.98</b>	<b>1.73</b>	<b>12.85</b>
Yellow gem	L	<b>20.58</b>	<b>13.35</b>	1.53	<b>10.83</b>
	S	<b>17.55</b>	<b>12.28</b>	1.48	<b>5.45</b>
Why not	L	<b>24.63</b>	<b>14.23</b>	<b>3.20</b>	<b>35.80</b>
	S	<b>34.00</b>	<b>14.90</b>	<b>9.30</b>	<b>28.25</b>
Mykonos	L	<b>25.40</b>	<b>14.43</b>	<b>3.20</b>	<b>29.70</b>
	S	<b>18.78</b>	<b>12.73</b>	<b>2.53</b>	<b>15.10</b>
Dyanito	L	<b>19.85</b>	13.35	1.58	<b>15.11</b>
	S	<b>26.05</b>	13.95	1.88	<b>3.75</b>
Wonder	L	<b>26.38</b>	14.53	<b>3.48</b>	<b>27.25</b>
	S	<b>29.40</b>	14.75	<b>2.25</b>	<b>8.85</b>
Eerde	L	<b>20.93</b>	13.05	<b>1.38</b>	<b>12.95</b>
	S	<b>22.58</b>	13.33	<b>2.95</b>	<b>20.08</b>

<sup>1</sup> L: Lighting Treatment, S: Without Light Treatment

<sup>2</sup> Values between L and S treatments followed by bold letters are significantly different at 5% by T-test.

表三、日長處理對唐菖蒲 6 日開花率影響調查

Table 3. The effect of photoperiod on horticultural characters of gladiolus at harvesting stage

Variety	Photoperiod <sup>1</sup>	2 級	3 級	4 級	5 級	6 級
Mascagni	L	<b>30.40<sup>2</sup></b>	<b>15.93</b>	<b>10.40</b>	3.18	<b>0.00</b>
	S	<b>32.68</b>	<b>33.75</b>	<b>16.43</b>	3.75	<b>0.35</b>
Ben Vento	L	<b>20.73</b>	<b>6.90</b>	<b>5.00</b>	<b>0.00</b>	0.00
	S	<b>34.78</b>	<b>11.28</b>	<b>9.98</b>	<b>0.63</b>	0.00
Impoter	L	<b>15.48</b>	<b>8.58</b>	<b>3.45</b>	1.93	0.00
	S	<b>12.28</b>	<b>6.45</b>	<b>4.38</b>	2.18	0.00
Advance Red	L	<b>37.83</b>	<b>22.50</b>	<b>18.63</b>	<b>3.30</b>	0.00
	S	<b>29.95</b>	<b>15.85</b>	<b>7.83</b>	<b>0.00</b>	0.00
Carqueiranne	L	<b>12.85</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
	S	<b>15.75</b>	<b>9.95</b>	<b>5.75</b>	<b>2.78</b>	<b>0.55</b>
Grurcl Prix	L	<b>18.78</b>	<b>1.25</b>	<b>0.00</b>	<b>0.00</b>	0.00
	S	<b>35.50</b>	<b>18.50</b>	<b>8.48</b>	<b>1.50</b>	0.00
Prissilla	L	<b>37.85</b>	<b>6.88</b>	<b>2.30</b>	<b>2.30</b>	0.00
	S	<b>14.93</b>	<b>1.40</b>	<b>0.00</b>	<b>0.00</b>	0.00
Rose Supreme	L	<b>33.90</b>	<b>23.90</b>	<b>12.98</b>	<b>0.00</b>	<b>0.00</b>
	S	<b>32.60</b>	<b>22.75</b>	<b>12.60</b>	<b>7.45</b>	<b>1.35</b>
Hunting Song	L	<b>5.43</b>	<b>0.00</b>	0.00	<b>0.00</b>	0.00
	S	<b>20.43</b>	<b>11.55</b>	0.00	<b>2.33</b>	0.00
Pink Perfection	L	<b>40.80</b>	<b>16.05</b>	<b>21.30</b>	<b>4.88</b>	<b>0.00</b>
	S	<b>29.05</b>	<b>26.90</b>	<b>14.95</b>	<b>3.88</b>	<b>0.75</b>
Chrisina	L	<b>22.43</b>	<b>12.80</b>	<b>9.33</b>	<b>0.50</b>	0.00
	S	<b>32.93</b>	<b>20.03</b>	<b>13.15</b>	<b>1.63</b>	0.00
Wig's sensation	L	<b>43.58</b>	<b>32.83</b>	<b>27.63</b>	1.20	0.00
	S	<b>46.60</b>	<b>27.73</b>	<b>18.78</b>	1.55	0.00
Red Beauty	L	<b>29.88</b>	<b>9.13</b>	<b>2.25</b>	<b>0.00</b>	0.00
	S	<b>25.78</b>	<b>21.53</b>	<b>10.55</b>	<b>1.70</b>	0.00
Invitatie	L	<b>39.68</b>	<b>30.38</b>	<b>23.98</b>	<b>1.60</b>	0.00
	S	<b>18.70</b>	<b>11.05</b>	<b>8.33</b>	<b>0.66</b>	0.00
Passion	L	<b>15.35</b>	<b>8.40</b>	<b>3.30</b>	<b>0.48</b>	0.00
	S	<b>20.95</b>	<b>10.80</b>	<b>7.18</b>	<b>1.15</b>	0.00
Fidelio	L	<b>27.95</b>	<b>17.90</b>	<b>9.83</b>	<b>0.00</b>	0.00
	S	<b>20.83</b>	<b>18.75</b>	<b>8.75</b>	<b>0.75</b>	0.00
Anglia	L	<b>8.53</b>	<b>3.53</b>	<b>1.30</b>	0.00	0.00
	S	<b>31.75</b>	<b>19.85</b>	<b>9.53</b>	0.00	0.00
Snow	L	<b>28.70</b>	<b>11.00</b>	<b>3.15</b>	<b>1.60</b>	0.00
	S	<b>20.75</b>	<b>18.43</b>	<b>8.58</b>	<b>1.28</b>	0.00
Lady godiva	L	22.00	17.00	15.75	<b>1.58</b>	0.00
	S	38.95	32.48	28.48	<b>7.35</b>	0.00
Anitra	L	<b>15.80</b>	<b>0.00</b>	<b>0.00</b>	0.00	0.00
	S	<b>6.80</b>	<b>2.48</b>	<b>1.00</b>	0.00	0.00
Perseus	L	<b>13.75</b>	<b>6.75</b>	<b>4.28</b>	<b>0.60</b>	0.00
	S	<b>19.00</b>	<b>14.60</b>	<b>6.70</b>	<b>2.43</b>	0.00
Yellow gem	L	<b>41.23</b>	<b>38.75</b>	<b>29.85</b>	<b>11.63</b>	<b>4.78</b>
	S	<b>42.83</b>	<b>34.80</b>	<b>30.80</b>	<b>6.93</b>	<b>2.30</b>
Why not	L	<b>27.93</b>	<b>12.80</b>	<b>9.03</b>	0.00	0.00
	S	<b>38.98</b>	<b>21.80</b>	<b>15.95</b>	0.00	0.00
Mykonos	L	<b>1.63</b>	<b>0.00</b>	<b>0.00</b>	0.00	0.00
	S	<b>16.00</b>	<b>7.93</b>	<b>3.98</b>	0.00	0.00
Dyanito	L	<b>19.65</b>	<b>9.00</b>	<b>5.35</b>	0.00	0.00
	S	<b>10.33</b>	<b>5.18</b>	<b>2.20</b>	0.00	0.00
Wonder	L	<b>12.58</b>	<b>4.38</b>	<b>1.38</b>	<b>0.30</b>	0.00
	S	<b>2.40</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	0.00
Eerde	L	<b>26.25</b>	<b>15.23</b>	<b>3.65</b>	<b>1.28</b>	0.00
	S	<b>35.40</b>	<b>13.35</b>	<b>7.65</b>	<b>0.00</b>	0.00

<sup>1</sup> L: Lighting Treatment, S: Without Light Treatment.<sup>2</sup> Values between L and S treatments followed by bold letters are significantly different at 5% by T-test.

和Halevy<sup>(28)</sup>指出短日促進花序發育及開花，但卻減少花序的大小。日長增加葉片和花序重量和大小，且提高開花率及開花品質，而這種效果在2~3倍的栽培密度中仍可看到，長日效果在午夜電照1 hr即可看出，而暗中斷四小時被推荐於商業栽培使用，且電照強度35 Lux與130 Lux效果一樣，故本試驗採用100 Lux。因此，今後冬季栽培唐菖蒲尚能針對品種、球莖大小及種植密度、葉齡、季節，加以選擇配合妥適長日處理之電照方式，建立唐菖蒲適合電照之基本資料，對唐菖蒲之栽培與提高切花品質之生產會有很大幫助。並且靈活調適上述諸因素，實施產期調節工作，將使唐菖蒲之栽植不受氣候因子所限制，生產者即能獲得較大的利潤，而直接使整個唐菖蒲生產事業更理想。

表四、唐菖蒲不同品種在長日照下的切花期園藝性狀比較

Table 4. Comparison of horticultural characters among gladiolus varieties under the long photoperiod condition at harvesting stage

Variety	Spike length (cm)	Fresh weigh (g)	Florets No.	spike dia (mm)	Plant height (cm)	Leaves No.	Days to 50% flower stalk emergence	Days to 50% flower stalk flowering
Mascagni	84.30n <sup>1</sup>	39.38r	12.00j	7.16ijk	53.98p	7.50ij	81.50k	87.50k
Ben Vento	93.03h	72.00b	15.85b	9.53ab	56.85n	8.28bc	88.00f	96.50d
Impoter	82.48p	48.48m	12.43i	7.62gh	53.00q	7.65ghij	84.28h	93.20g
Advance Red	93.35h	53.48k	11.63jk	9.55ab	64.90f	7.05l	92.00b	100.50b
Carqueiranne	90.75ij	66.78d	14.23d	8.65d	54.80o	6.20n	83.50l	93.40g
Grurcl Prix	98.50f	74.43a	12.90fgh	9.21bc	62.20h	8.15cd	89.50e	96.50d
Prissilla	83.40o	61.58g	10.98l	8.58d	61.28i	8.00def	82.23j	89.50j
Rose Supreme	100.63d	66.00e	13.23ef	8.32de	73.08b	8.53ab	83.38i	92.05h
Hunting Song	77.25q	52.28l	12.48l	8.16e	48.45t	7.83efg	75.45n	84.18l
Pink Perfection	85.33m	43.63n	11.98j	7.03jk	49.83s	7.65ghij	91.28c	100.18b
Chrisina	95.45g	71.98b	16.43a	9.04c	59.60kl	8.78a	84.50h	94.18b
Wig's sensation	99.88e	66.75d	13.60e	8.63d	59.25l	8.33bc	84.35h	92.50h
Red Beauty	100.83d	64.55f	14.35d	9.07c	68.50e	8.08cde	88.20f	96.48d
Invitatie	95.15g	60.35h	15.95b	7.53ghi	50.38s	7.20kl	90.50d	100.25b
Passion	87.65l	41.90o	11.90j	7.25hijk	60.00jk	7.68ghi	99.45a	107.50a
Fidelio	113.38a	57.30i	12.95fgh	7.63gh	79.75a	7.78fgh	84.28h	92.38h
Anglia	90.90i	56.35j	13.50e	8.08ef	63.35g	7.90defg	75.15n	83.50m
Snow	88.80k	31.40t	15.40c	6.99k	51.40r	7.65ghij	80.50l	90.50i
Lady godiva	54.00r	40.38q	15.83b	7.38ghij	62.43h	7.40jk	68.20q	77.50o
Anitra	82.05p	28.63u	12.63hi	5.59m	53.33q	6.75m	67.13r	75.23p
Perseus	85.33m	33.90s	13.03fg	5.59m	58.48m	7.10l	64.50s	74.20q
Yellow gem	90.40j	52.63l	12.73ghi	7.75fg	60.45j	5.63o	85.50g	95.50e
Why not	108.9b	66.35de	15.25c	8.57d	71.93c	8.33bc	70.50p	78.50n
Mykonos	88.38k	48.58m	13.53e	7.09jk	64.98f	6.43n	70.33p	78.50n
Dyanito	88.63k	41.13p	11.38k	5.99l	60.38j	7.15kl	73.50o	83.35m
Wonder	113.38a	67.43c	13.55e	9.82a	70.35d	7.78fgh	79.50m	87.50k
Eerde	104.98c	59.90h	12.98fgh	6.19l	68.38e	7.53hij	90.00de	98.00c

<sup>1</sup> Values within the column followed by different letter are significantly different (P<0.05).

表五、唐菖蒲不同品種在長日照下的切花期種球比較

Table 5. Comparison of corm characters among gladiolus varieties under the long photoperiod condition

Variety	Corm weigh (g)	Corm diameter (cm)	Cormel weight (g)	Cormel No.
Mascagni	35.30a <sup>1</sup>	16.13a	4.50d	26.33g
Ben Vento	20.55i	13.40de	2.38g	15.13k
Impoter	26.25d	14.45bc	1.85h	5.75r
Advance Red	11.30o	10.73i	2.50g	25.55h
Carqueiranne	16.25l	12.30g	2.60g	16.48j
Grurcl Prix	28.28c	14.65bc	0.75k	5.85r
Prissilla	25.40e	14.40bc	1.63hi	12.20n
Rose Supreme	22.48h	13.33de	1.85h	16.53j
Hunting Song	20.58i	12.68fg	1.35ij	11.13o
Pink Perfection	12.83n	11.58h	1.55i	14.25l
Chrisina	25.45e	14.33c	3.68e	9.50p
Wig's sensation	32.00b	14.65b	4.25d	15.25k
Red Beauty	25.43e	13.70d	8.28b	70.53a
Invitatie	11.05o	10.73i	0.88k	7.30q
Passion	17.43k	12.63fg	1.18j	11.75n
Fidelio	28.45c	14.48bc	1.58hi	10.85o
Anglia	22.88h	13.60d	3.53e	22.43i
Snow	19.45j	12.93ef	4.48d	33.43d
Lady godiva	24.90f	13.58d	9.30a	35.18c
Anitra	13.40m	11.50h	5.25c	35.70b
Perseus	24.30g	14.53bc	3.53e	35.20c
Yellow gem	20.58i	13.35de	1.53i	10.83o
Why not	24.63fg	14.23c	3.20f	35.80b
Mykonos	25.40e	14.43bc	3.20f	29.70e
Dyanito	19.85j	13.35de	1.58hi	15.10k
Wonder	26.38d	14.53bc	3.48ef	27.25f
Eerde	20.93i	13.33de	1.38ij	12.95m

<sup>1</sup> Values within the column followed by different letter are significantly different (P<0.05).

表六、唐菖蒲不同品種在短日照下的切花期園藝性狀比較

Table 6. Comparison of horticultural characters among gladiolous varieties under the short photoperiod condition at harvesting stage

Variety	Spike length (cm)	Fresh weigh (g)	Florets No.	Spike dia (mm)	Plant height (cm)	Leaves No.	Days to 50% flower stalk emergence	Days to 50% flower stalk flowering
Mascagni	75.50q <sup>1</sup>	34.13o	10.93ghi	6.30kl	52.53st	7.15ij	75.50j	85.00j
Ben Vento	91.75e	49.55h	12.88d	9.40a	56.30n	8.08bc	92.50b	100.00b
Impoter	79.28n	43.00j	11.00gh	7.25ghi	52.33t	7.25ghi	85.33c	94.20c
Advance Red	92.88d	92.88a	10.35jk	8.18c	65.50e	7.40fgh	85.00c	94.20c
Carqueiranne	78.65o	38.90n	11.63e	7.00ij	55.75o	7.20hi	76.13i	85.25ij
Grurcl Prix	80.63kl	42.40k	10.60ij	7.63ef	54.28q	7.20hi	80.20f	90.40e
Prissilla	75.38q	41.68l	8.53n	7.00ij	58.23k	7.28fghi	75.20j	78.50k
Rose Supreme	88.25h	50.95g	8.65n	6.50k	74.25b	8.20b	77.18h	85.20ij
Hunting Song	74.05s	40.03m	9.43m	8.03cd	47.18v	7.90cd	78.00g	85.50i
Pink Perfection	81.08k	40.45m	11.20fg	6.65jk	51.20u	7.45fg	76.50i	86.50h
Chrisina	94.65c	72.03b	14.45b	8.75b	64.93f	8.85a	84.23d	93.18d
Wig's sensation	92.23e	43.15j	10.90ghi	7.48efgh	61.33i	8.08bc	80.00f	89.50f
Red Beauty	91.03f	44.25i	10.45jk	7.28fghi	67.30d	7.73de	75.00j	85.50i
Invitatie	80.78kl	40.45m	13.35c	6.98ij	62.58h	6.95jk	82.33e	90.28e
Passion	73.30t	31.50q	13.00cd	7.45efgh	61.15i	7.43fgh	94.23a	102.50a
Fidelio	102.60a	52.90f	9.93l	7.25ghi	75.60a	8.25b	76.23i	85.00j
Anglia	83.20j	38.53n	9.83l	7.15hi	54.83p	7.78d	67.25l	75.00l
Snow	79.83m	25.65t	15.48a	5.95ml	47.20v	8.30b	75.00j	85.00j
Lady godiva	89.43g	40.40m	12.68d	6.53k	58.93j	7.33fghi	66.50m	75.28l
Anitra	76.93p	22.95v	9.88l	4.40o	53.35r	6.40l	61.35o	69.50m
Perseus	80.50i	26.25s	10.53j	5.25n	52.25t	6.73k	60.35p	68.78n
Yellow gem	74.78r	30.50r	10.53j	5.78m	56.73m	6.20l	75.50j	87.00g
Why not	96.28b	59.90c	11.45ef	7.55efg	70.48c	7.50ef	60.50p	68.53n
Mykonos	85.25i	33.45p	10.68ghij	6.38k	65.38e	6.20l	60.50p	68.53n
Dyanito	73.13t	24.60u	8.43n	4.53o	52.80s	7.13ij	62.40n	69.50m
Wonder	94.50c	58.53d	10.10kl	7.80de	63.48g	7.48fg	69.50k	78.25k
Eerde	90.98f	54.08e	10.60ij	7.33fghi	57.65l	7.25ghi	85.00c	94.25c

<sup>1</sup> Values within the column followed by different letter are significantly different (P<0.05).

表七、唐菖蒲不同品種在短日照下的切花期種球比較

Table 7. Comparison of corm characters among gladiolus varieties under the short photoperiod condition

Variety	Corm weigh (g)	Corm diameter (cm)	Cormel weight (g)	Cormel No
Mascagni	25.70fg <sup>1</sup>	13.98d	0.53o	3.25t
Ben Vento	9.83p	10.38o	0.38o	1.70v
Impoter	34.15a	15.63a	0.73mno	2.05u
Advance Red	10.75o	10.40o	3.78f	35.10b
Carqueiranne	17.65l	11.78lm	3.83f	12.20k
Grurcl Prix	20.40j	13.40e	3.85f	15.28g
Prissilla	25.45g	14.13d	9.33a	18.75f
Rose Supreme	23.33h	13.23e	7.00d	20.75d
Hunting Song	17.43l	12.23ijkl	0.70no	8.93n
Pink Perfection	17.55l	12.53ghi	1.13klm	15.10g
Chrisina	13.00n	11.18n	1.28kl	7.65o
Wig's sensation	33.45b	14.60bc	4.03f	11.85l
Red Beauty	17.60l	11.70m	7.65c	36.15a
Invitatie	9.00q	9.73p	0.50o	4.10r
Passion	16.68m	12.03ijlm	1.03lmn	9.60m
Fidelio	22.75i	13.40e	0.55o	6.45p
Anglia	31.73c	14.20cd	5.33e	12.55j
Snow	17.35l	12.25ijk	4.98e	18.55f
Lady godiva	28.43e	14.28cd	8.63b	20.65d
Anitra	16.73m	11.80klm	3.63f	14.10h
Perseus	12.93n	12.98efg	1.73j	12.85i
Yellow gem	17.55l	12.28hij	1.48jk	5.45q
Why not	34.00a	14.90b	9.30a	28.25c
Mykonos	18.78k	12.73fgh	2.53h	15.10g
Dyanito	26.05f	13.95d	1.88ij	3.75s
Wonder	29.40d	14.75b	2.25h	8.85n
Eerde	22.58i	13.05ef	2.95g	20.08e

<sup>1</sup> Values within the column followed by different letter are significantly different (P<0.05).

## 誌 謝

本計畫承蒙農委會計畫及前農林廳在提高唐菖蒲切花保鮮之試驗上經費支援，感謝本場黃芳暖小姐、吳文鳳小姐、許誌裕先生、黃素青小姐協助完成，謹此誌謝。

## 參考文獻

1. 台灣省政府農林廳 2001 台灣省農業年報 台灣省政府印刷廠。
2. 林月金 1987 台灣主要切花之產銷研究 p.16-17 台灣省台中區農業改良場特刊第6號。
3. 黃敏展 1970 唐菖蒲 p.1091-1091 台灣農家要覽(上) 豐年社。
4. 許圳塗譯 1987 熱帶及亞熱帶地區的唐菖蒲切花栽培 p.18-24 中華民國插花協會 台灣花藝雜誌社。
5. Apte, S. S. 1960. New approach to an old problem-early flowering of gladiolus. The Gladiolus, New Eng. Glad. Soc. 35: 123-130.
6. Borthwick, H. A. and M. W. Parker. 1949. Photoperiodic responses of gladiolus. North Am. Gladiolus Counc. Bull. 18: 11-22.
7. Bhattacharjee, S. K. 1981. Flowering and corm production of Gladiolus as influenced by corm size, Planting depth and spacing. Singapore J. pri. Ind. 9: 18-22.
8. Ferreira, D. I., J. J. van der Merwe and G. H. de Swardt. 1986. Starch metabolism in flowers of senescing gladioli inflorescences. Acta Hort. 177: 203-210.
9. Gibert, B. E. and F. R. Pember. 1935. Gladiolus culeure with special reference to winter forcing. Rhode Island State College Bull. 225.
10. Imanishi, H. and Y. Imae. 1990. Effect of low light intensity and low temperature given at different development stages on flowering of gladiolus. Acta hort. 266: 189-196.
11. Kosugi, K. 1962. Studies on production and flowering gladiolus. Mem. Fac. Agric. Ka-gawa Univ. 11: 1-69.
12. Laurie, A. and G. H. Poesh. 1932. Photoperiodism. The value of supplementary illumination and reduction of light on flowering plants in the greenhouse. Ohio Agric. Exp. Sta. Bul. 512-542.
13. Mckay, M. E., D. E. Byth, and J. A. Tommerup. 1981. Environmental responses of gladioli in south-east Queensland. Scientia Hortic. 14: 77-92.
14. Mckay, M. E., B. J. Hesse and J. C. Mulder 1982. The influence of illumination levels of daylength extension on yield of winter-grown gladioli in Queensland. Scientia Hortic. 17: 277-288.
15. Magie, R. O. and S. L. Poe. 1972. p.160-161. *In*: The World of the Gladiolus, North Am. Gladiolus Counc.
16. Magie, R. O. and W. B. Cowperthwaite. 1954. Commercial gladiolus production in Florida. Fla. Agric. Exp. Stn. Bull. 535, 67pp.
17. Mckay, M. E. 1979. Gladiolus production in south-east Queensland; propagation and environmental responses. M. Sc. Thesis, Univ. of Queensland, Dept. Agric. 178 pp.
18. Mckay, M. E., D. E. Byth and J. A. Tommerup. 1981. Environmental responses of gladioli in south-east Queensland. Scientia Hortic. 14: 77-92.

19. McKay, M. E., J. A. Tommerup and D. E. Byth. 1981. The influence of photoperiod and gladioli in Queensland. *Scientia Hort.* 14: 171-179.
20. Nakayama, M. 1967. Fundamental studies on the gladiolus culture in Magano Prefecture. IV. Effects of planting date, and photoperiod on the growth in gladiolus. *J. Faculty Agric. Shinshu University* 4: 121-131 (summary only).
21. Post, K. 1950. Florist crop production and marketing. Orange Judd Publishing Company, Inc. New York. p.611-633.
22. Rao, I. V. and H. Y. Mohan Ram. 1982. Specificity of gibberellin and sucrose-promoted flower bud growth in gladiolus. *Ann. Bot.* 50: 473-479.
23. Shillo, R. and A. H. Halevy. 1976b. The effect of various environmental factors on flowering of gladiolus. I. Light intensity. *Scientia Hort.* 4: 131-137.
24. Shillo, R. and A. H. Halevy. 1976. The effect of various environmental factors on flowering of gladiolus. II. Length of the day. *Scientia Hort.* 4: 139-146.
25. Shillo, R. and A. H. Halevy. 1976. The effect of various environmental factors on glowering of gladiolus. IV. Interaction of environmental factors-general discussion. *Scientia Hort.* 4: 157-162.
26. Shillo, R. and A. H. Halevy. 1975. Winter Blindness in gladiolus: Interaction of light and temperature. *Acta Hort.* 47: 277-285.
27. Shillo, R. and A. H. Halevy. 1981. Flower and corm development in gladiolus as affected by photoperiod. *Scientia Hort.* 15: 187-196.
28. Shillo, R., G. Valis and A. H. Halevy. 1981. Promotion of flowering by photoperiodic lighting in winter grown gladiolus planted at high densities. *Scientia Hort.* 14: 367-375.
29. Tsukamoto, V. and M. Yagi. 1960. Dormancy of gladiolus corms. VI. Effect of temperature treatment on breaking dormancy of gladiolus corms stored in a storage room and those grown under different daylengths. *Plant Cekk Physiol.* 1: 221-230.
30. Weinhart, F. F. and S. W. Decker. 1930. Experiments in forcing gladioli. *Univ. Illinois Agric. Exp. Stn. Bull.* p.243-361.
31. Yasuda, I. And N. Hashimoto. 1952. Effect of daylength on growth and flowering of gladiolus. *Jap. J. Hort. Ass.* 20: 238-242.

# Effect of Day Length on Flowering Date and Cut-flower Quality of Gladiolus<sup>1</sup>

Woan-Yuh Tsai<sup>2</sup>, Yann-Ray Chen<sup>3</sup>, Meei-Shiouh Yih<sup>2</sup> and Fang-Ming Wei<sup>2</sup>

## ABSTRACT

In order to enhance the plant growth and promote the quality of cut flower in gladiolus production, the screening and evaluation of suitable varieties for lighting treatment is carried out. 30 gladiolus varieties were planted under winter natural daylength (daylength less than 8-9 hours) and 4 hours lighting treatment at midnight (from 10 pm to 2 am). The result indicated that the long-day and short-day treatments have significant effect on gladiolus growth. Under long-day condition, the length of flower stem, flower bud number, opening rate of cut-flower, fresh weight and vase life have significantly enhancing response than that of short-day treatment. However, flower emergence day and harvesting day are delayed by 7-12 days. The result is different in different varieties. The suitable varieties such as: Hunting Song, Wig's Sensation, Fidelio, Massagi, Advance Red, Invitatie etc. have been selected for lighting treatment.

**Key words:** gladiolus, variety, photoperiod.

---

<sup>1</sup> Contribution No. 0518 from Taichung DAIS.

<sup>2</sup> Assistant of Taichung DAIS.

<sup>3</sup> Assistant Horticulturist of Taichung DAIS.