

## 2021臺灣國際蘭花研討會蘭科植物科技研發成果發表 Taiwan International Orchid Show Orchid Research Result Publication

技術/專利：以花粉活力為蝴蝶蘭耐溫性檢測之參考指標

technology/patent: Use pollen viability as reference indicator for temperature tolerance of *Phalaenopsis*

研發機關：行政院農業委員會農業試驗所

Organization: Taiwan Agricultural Research Institute

聯絡人：蔡嫻婷\*、莊淨、夏奇鈺

Researcher: Wei-Ting Tsai, Nan-Hsin Lin, and Chi-Ni Hsia

聯絡電話：886-4-23317315

Telephone: 886-4-23317315

E-MAIL: wttsai65@tari.gov.tw

### 摘要 Abstract

品種多樣性是台灣蝴蝶蘭產業特色，但品種間耐溫性之差異造成栽培上之困擾，因此有必要建立耐溫性快篩技術。細胞膜穩定性是檢測植物耐溫性常用的指標，但需破壞組織且檢測耗時為其缺點。花粉對溫度相對敏感，不同溫度下之花粉活力在部分植物已被證明可做為植株耐溫性篩選之重要指標，本研究以電阻抗式流式細胞儀(Impedance Flow Cytometry, IFC)進行9個蝴蝶蘭商業品種花粉之活力檢測，於5-45°C間以5°C為單位共9個溫度分別處理3小時，並取第一片成熟葉以上述溫度處理3天後檢測其電解質滲漏率。將各溫度處理後之花粉活力率及葉片電解質滲漏率分別與25°C下之基礎值換算成IFC比值(IFC ratio)及葉片相對傷害率(relative injury, RI)後進行二者之相關性分析。結果顯示所有品種之IFC ratio與RI間皆具有顯著之負相關性，因此建議可用IFC檢測作為蝴蝶蘭耐溫性之快篩技術。

A great diversity on varieties is one of the advantage of *Phalaenopsis* industry in Taiwan, however the differences in temperature tolerance of these varieties have caused problems on cultivation. Although cell membrane stability of leaf is commonly used as an index of plant tolerance to temperature stress, it is time-consuming with destroyed leaf tissues. Therefore, a rapid non-destructive screening technique is urgent needed. Pollen viability under various temperature has been considered as an important indicator for screening temperature tolerance in some species. In this study, the Impedance Flow Cytometry (IFC) has been used to detect the viability of 9 commercial varieties of *Phalaenopsis* at 5-45°C for 3 hr with 5°C as an interval in a total of 9 treatments. Meanwhile, the 1<sup>st</sup> mature leaves from the plants in the same temperature treatments for 3 d were measured the electrical leakage rate. The data of pollen viability and leaf electrical leakage rate according to the 25°C as a basic value were both converted into IFC ratio and leaf relative injury (RI), and the correlation between these two ratios was analyzed. The results showed that there is a significant negative correlation between the IFC ratio and RI in all varieties. Therefore, it is suggested that IFC analysis might provide a rapid technique for temperature tolerance screening of *Phalaenopsis*.

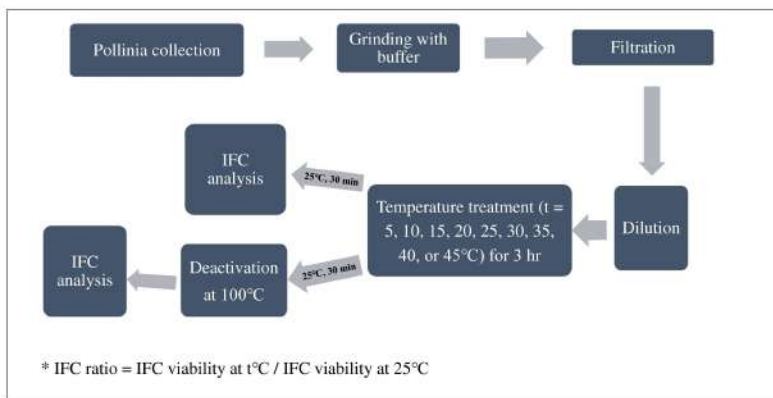


Figure 1. Process of IFC test for *Phalaenopsis* pollens.

Table 1. Correlation analysis between pollen IFC ratio and leaf relative injury (RI) during 5-45°C of *Phalaenopsis*.

Variety	Correlation coefficient (r value)	Significance	P value
A	-0.92	***	< 0.001 (1.12×10 <sup>-10</sup> )
B	-0.94	***	< 0.001 (2.57×10 <sup>-13</sup> )
C	-0.86	***	< 0.001 (6.99×10 <sup>-9</sup> )
D	-0.84	***	< 0.001 (3.43×10 <sup>-8</sup> )
E	-0.94	***	< 0.001 (1.93×10 <sup>-13</sup> )
F	-0.76	***	< 0.001 (4.84×10 <sup>-6</sup> )
G	-0.72	***	< 0.001 (3.52×10 <sup>-5</sup> )
H	-0.66	***	< 0.001 (2.66×10 <sup>-10</sup> )
I	-0.54	**	0.0039

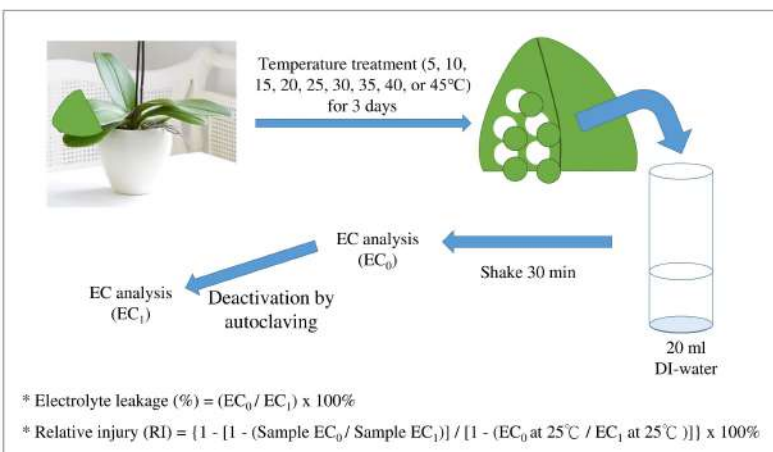


Figure 2. Process of relative injury test for *Phalaenopsis* leaves.

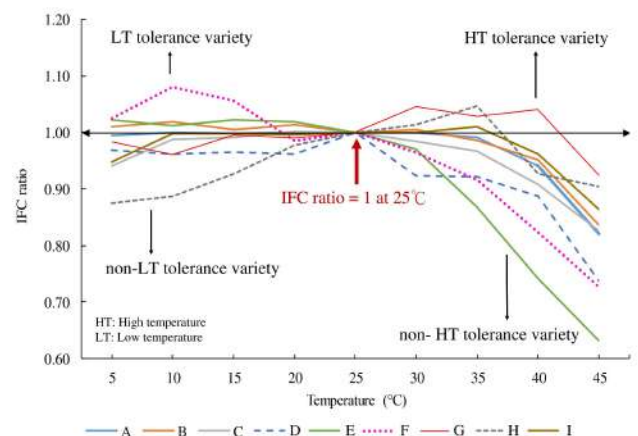


Figure 3. IFC ratio during 5-45°C of 9 commercial varieties of *Phalaenopsis*.