

# 延迟荧光分析和激光共聚焦技术在检测非洲菊发育过程中表皮细胞叶绿素变化中的应用

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以非洲菊*Gerbera hybrida*为研究对象,对其生长发育过程(P1-P6期)中外轮舌状花进行延迟荧光(delayed fluorescence, DF)分析,并利用激光共聚焦成像系统对其各期表皮细胞中叶绿素的分布和相对含量进行检测,以研究非洲菊外轮舌状花发育过程中延迟荧光改变与其叶绿素变化的关系。结果发现在非洲菊外轮舌状花从P1到P6期颜色由嫩绿色变为绿色再逐渐变为金黄色的过程中,其荧光强度变化是先升高后降低。激光共聚焦成像结果表明,其花瓣表皮细胞中叶绿素的相对含量从P1到P4期先是逐渐增多,而后从P4到P6期逐渐减少。到后期只是在保卫细胞中还能观察到叶绿素的存在。实验结果表明应用DF技术,可以有效、无损伤地快速检测非洲菊花瓣中叶绿素的相对含量,结合荧光光谱分析以及激光共聚焦扫描显微成像技术,研究花瓣在发育过程中的叶绿素降解情况。

## Application of delayed fluorescence analysis and laser scanning confocal microscope in detecting chlorophyll content of *Gerbera hybrida* epidermal cell during its development

To investigate the relationship between delayed fluorescence change and chlorophyll content of *Gerbera hybrida* ray floret during its development (from P1 period to P6 period), delayed fluorescence analysis of *Gerbera hybrida* ray floret during its development was done. The distribution and content of chlorophyll in the epidermal cell of *Gerbera hybrida* ray floret was detected using laser scanning confocal microscope. The results demonstrated that the fluorescence intensity of ray floret gradually increased at first, and then gradually decreased from P1 period to P6 period as its colour turned from reseda to green and inaurate. The analysis using laser scanning confocal microscope illustrated that the relative content of chlorophyll in the epidermal cell of *Gerbera hybrida* ray floret also increased gradually from P1 period to P4 period and then diminished from P4 period to P6 period except that there was slight chlorophyll in guard cell of ray floret at last. The results suggested that the DF technique, combining with fluorescence spectrum and LSCM imaging, might be useful for the rapid and noninvasive evaluation of chlorophyll content and degradation in petal development in *Gerbera hybrida*.

### 关键词

非洲菊(*Gerbera hybrida*); 外轮舌状花(ray floret); 延迟荧光(delayed fluorescence); 叶绿素(chlorophyll)