中国桂花育种进展及新品种授权现状

Progress of Chinese *Osmanthus* Breeding and New Variety Rights

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一、研究背景 Research Background

- 中国十大传统名花之一 One of the top ten traditional Chinese flowers
- 极高的经济价值和观赏价值 Extremely high economic and ornamental value
- 遗传基因的多样性和性状变异丰富High genetic diversity and character variation
- 中国悠久的栽培历史及深厚的桂花文化 Long history of cultivation and culturally important in China

相关研究Related Studies

- **野生桂花的分布格局和遗传多样性The distribution pattern and genetic diversity of wild *Osmanthus***
- **栽培品种起源Origin of cultivars**
- **花芽分化和花开放及其分子调控Flower bud differentiation and genetic regulation**
- **种质创新及新品种选育Germplasm innovation and new variety breeding**

基金项目Fund projects：

- 中国野生桂花的遗传多样性及栽培桂花的起源研究 Research on genetic diversity of wild *Osmanthus* in China and its origin（31170656）
- 浙江省花卉农业新品种选育重大科技专项-桂花新品种创制与推广应用The new varieties in Zhejiang Province--New *Osmanthus* varieties and its application（2012C12909-3）
- 浙江省花卉农业新品种选育重大科技专项-特色优势木本花卉资源保育与种质创新Zhejiang Province flowers and agriculture new variety breeding major science and technology special fund（2016C02056-12）
- 野生桂花的遗传多样性研究Study on genetic diversity of wild Osmanthus（Y3100332）

一、中国桂花育种进展Progress of Chinese *Osmanthus* breeding

（一）桂花种质资源收集、保存及评价collection, preservation and evaluation of *Osmanthus* germplasm resources

- 种质资源评价：形态标记、分子标记

Evaluation：Morphological marker、Molecular marker

杭州市园林绿化股份有限公司就收集保存了桂花种质资源250份。182份种质资源的信息登录浙江省林木种质资源平台。建设种质资源圃100亩。

Hangzhou Landscaping Co. Ltd has collected 250 *Osmanthus* germplasm resources. 182 germplasm resources shared on Zhejiang Forest Genetic Resource Platform. Built 6.7 ha germplasm resources collection nursery.

桂花种质资源圃Germplasm resources collection nursery

(二)桂花育种目标Breeding objectives

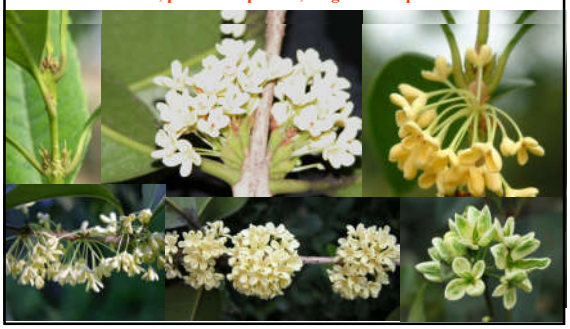
- 花序类型Inflorescence structure——聚伞和圆锥状花序Cyme & Panicle。
- 花期Blooming period：四季桂春秋冬开花Semperflorens Group from spring to winter；秋桂9～11月Others autumn。
- 花色Colour of Flower：白-乳黄；浅黄-金黄至深黄；橙黄-橙红。白色原始White–Cream； Light yellow–Golden or Deep yellow；Orange–Orange-red. Original white。
- 重瓣性Polyphyll：较少，2-3层花瓣，也有5～7枚.2-3 layer petals.
- 花冠裂片形状和排列Corolla lobe：形状有条形、卵形、椭圆、圆形、倒卵。排列有反卷、平展、斜展（钟状、狭钟和阔钟）、内扣型。Stripe, ovoid, elliptic, orbicular curls outwards, flat, oblique (bell-shaped, narrow and wide), internal clasp.
- 花径Flower diameter：大花型。小花品种5-7；中花7-9；大花9-13 mm。Grandiflora Group reaches 9–13 mm
- 营养器官Vegetative parts：叶色变化、枝条扭曲、叶形、大小。The change of leaves color、Twisted branches、Size and shape of leaf

1花序类型Inflorescence structure

- 聚伞（无总梗）和圆锥状花序（有总梗） Cyme (without pedicel) & Panicle (with pedicel)。
- 聚伞花序由圆锥状花序经总梗缩短退化、花数减少而形成。

1花序类型

- 多类型的花朵排列；花芽数、花梗下垂、长短及排列Number of flower buds, pendulous pedicel, long or short pedicel



2花期Blooming period

- 春季开花，秋季开花。Flowering in spring, autumn
- 四季桂春、秋、冬开花。Semperflorens Group in spring, autumn and winter

3花色Colour of Flower

- 白-乳黄；浅黄-金黄黄；橙黄-橙红。White–Cream； Light yellow–Golden or Deep yellow；Orange–Orange-red

3花色Colour of Flower

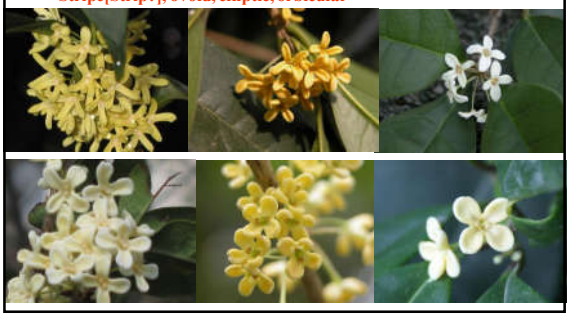
- 花色变化——异色现象Changes of colour

4重瓣性Double flowers

❖ 较少，2-3层花瓣，也有5～7枚。2-3 layer petals

5花冠裂片形状Corolla lobe

❖ 条形、卵形、椭圆、圆形、倒卵、倒卵状椭圆形、近圆形。
Stripe[Strip?], ovoid, elliptic, orbicular



6花冠裂片排列Corolla lobe

❖ 反卷、平展、斜展（钟状、狭钟和阔钟）、内扣型。curls outwards, flat, oblique (bell, narrow and wide), internal

7花径Flower diameter：较稳定

❖ 小花5-7 mm；中花7-9 mm；大花9-13 mm。
Small 5–7 mm；Middle 7–9 mm；Large 9–13 mm

8果实Fruits

❖ 按果实分类的品种，目前尚无认定新品种。
Identified by fruits

9营养器官Vegetative parts

❖ 稳定性状——枝条扭曲、下垂、树形；叶色变化、叶形、叶片大小.Change in leaf color、Twisted branches、Size and shape of leaf

营养器官Vegetative parts

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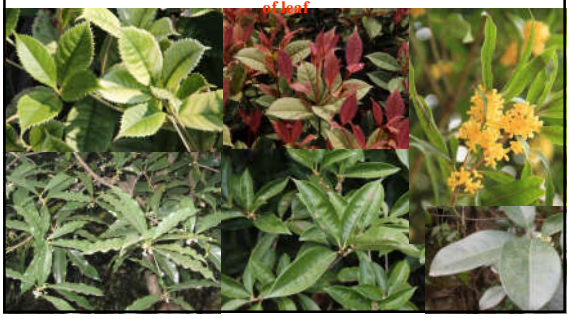


（四）桂花育种技术 Breeding technology

- 选择育种（自然变异、天然杂交个体、突变个体或组织）Selective breeding（natural variation, naturally occurring hybrids, mutants or tissue culture sports.
- 诱变育种（辐射诱变、化学诱变）Mutation breeding（radiation, chemical mutagenesis）
- 杂交育种（品种间杂交、种间杂交、F1代选择、胚胎拯救）Deliberate hybridisation（ infraspecific crosses、interspecific crosses、F1selection、embryo rescue

（五）桂花育种进展Progress of Osmanthus breeding

- 1、选择育种Selective breeding

自然突变体选择 Natural variation

1、选择育种Selective breeding

- 突变体保留Mutant

1、选择育种Selective breeding

- 胭脂红（突变体选择保留）'Yanzhihong' Carmine Mutant

1、选择育种 Selective breeding

- 自然变异Natural variation

‘永福紫绚’ ‘Yongfu Zixuan’ ‘朝阳金钻’ ‘Zhaoyang Jinzuan’ ‘永福彩霞’ ‘Yonfu Caixia’

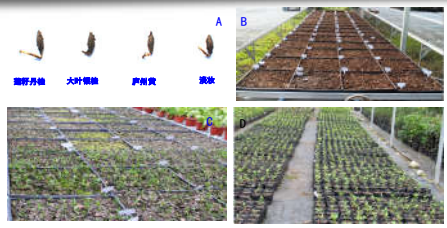
1、选择育种Selective breeding

1、选择育种Selective breeding

- 虔南贵妃
'Qiannan Guifei'

1、选择育种Selective breeding

2、桂花辐射诱变育种Mutation breeding



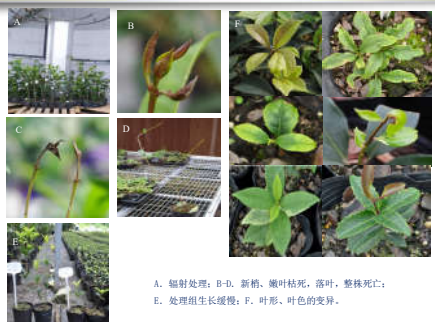
A. 辐射材料，胚根萌发After radiated, germination; B-D. 播种、发芽和移栽Seeding, germinating and transplanting

Meterial: 1 two-year old Semperflorens, 5 one-year old Osmanthus and germinating seeds of 9 cultivars

Method: Cesium radiation

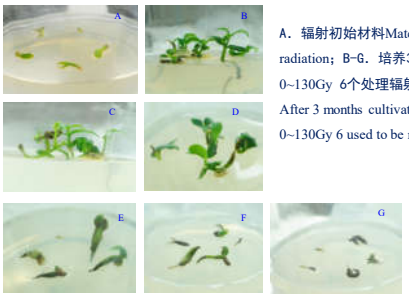
铯-137 辐射处理获得的叶色变异株Cs-137 Mutant

铯-137 辐射处理获得的部分桂花变异植株Cs-137 Mutant



A. 辐射处理；B-D. 新梢、嫩叶枯死，落叶，整株死亡；
E. 处理组生长缓慢；F. 叶形、叶色的变异。

离体胚辐射处理



A. 辐射初始材料Material before radiation；B-G. 培养3个月后，0~130Gy 6个处理辐射效应。
After 3 months cultivation，0~130Gy 6 used to be radiated

3、桂花杂交育种

2013年来，我们在桂花品种间、品种群间和种间（同属不同物种间）进行了杂交试验。2013年杂交组合32 个，2014年杂交组合5个。试验结果证明品种间和金桂、银桂2个品种群间杂交亲和力较大，金桂、银桂品种群与丹桂品种群间杂交亲和力次之，金桂、银桂、丹桂品种群与四季桂品种群间杂交亲和力较差。并存在杂种胚发育不良或不发育现象，说明金桂和银桂品种群亲缘关系最近，与丹桂品种群次之，与四季桂品种群间亲缘关系较远。

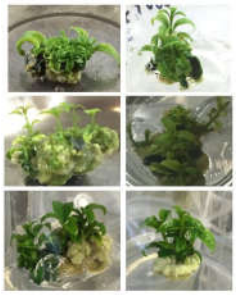
Since 2013, we have performed various crossing tests in Osmanthus including different varieties, Groups and species. We tested 32 crossies in 32[Think this should be 2013?] and 5 in 2014。The results showed that the greatest compatibility was gained between cultivars and two members of Latifolius Group and Thunbergii Group[Not quite sure what this is saying]，crossing between Latifolius Group, Thunbergii Group and Aurantiacus Group was in the middle, crossing between the three groups and Fragrans Group was harder.

种间杂交没有获得种子。

No seeds were gained from interspecific crosses.

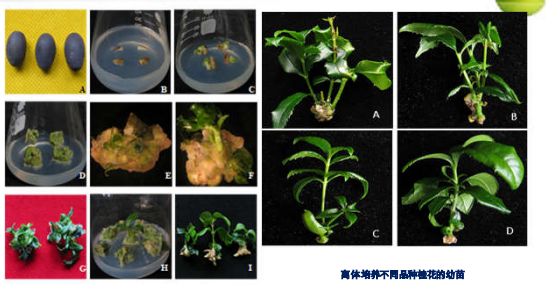
胚胎拯救Embryo rescue

丹桂品种群的‘莲子丹桂’与四季桂品种群‘圆叶四季’间“杂交胚”的组织培养。
Aurantiacus Group‘LianziGan gui’crossed with Fragrans Group‘Yuanye Sijigui'



增值系数较高的基因型

桂花杂种胚的组织培养Embryo tissue culture



离体培养不同品种桂花的幼苗

共获得9个全同胞家系共644株杂交后代组培苗；644
Tissue culture seedlings

青山基地Qingshan Nursery

（六）存在问题及建议Problems and Suggestions

（1）桂花新品种培育应以选择育种为主，发现与保留自然变异类型、突变体或组织器官，人工杂交育种可获得部分杂交家系，经多次选择可获得部分性状可预见品种，远缘杂交的胚胎发育不良等问题可通过胚胎拯救措施解决，但桂花组织培养增值率偏低，愈伤化程度高，有待于进一步研；使用分子标记辅助选择育种，缩短育种周期。

Osmanthus breeding should mainly focus on selective breeding, combined with mutation breeding and crossbreeding. The problems of distant hybridization can be solved through embryo rescue, but the tissue culture is still under research.

（2）桂花耐寒性差，将桂花与耐寒性较强木犀属植物进行杂交，培育出具有较强耐寒性的桂花新品种，拓宽桂花的应用范围。

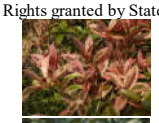
O. fragrans has low resistance to cold. Through crossed with high cold-resistant *Osmanthus* plants, its cold resistance could be improved, extending its use in cooler climates.

三、桂花（木犀属）植物新品种权现状

The status quo of plant new species right

（一）国家林业局授权的新品种

- 2009年以来，国家林业局共授桂花新品种权18件。
- Since 2009，18 new Plant Variety Rights granted by State Forestry Bureau.
- **2009**
- **云田彩桂 ‘Yuntian Caigui’**
  - 品种权号：20090026
  - 品种权人：易剑雄
- **2012**
- **银碧双辉‘Yinbi Shuanghui’**
  - 品种权号：20120108
  - 品种权人：重庆比德夫园林
- **虔南桂妃 ‘Qiannanguifei’**
  - 品种权号：
  - 品种权人：



国家林业局受理的新品种权

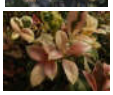
- **2014-15**
- **盘垂桂 ‘Panchuigui’**
  - 品种权号：20140146
  - 品种权人：冯常柳
- **金玉桂花 ‘Jinyu’**
  - 品种权号：20140095
  - 品种权人：李长攸（转让：杭州园林）
- **橙光墨影‘chengguang Moying’**
  - 品种权号：20150160
  - 品种权人：浙江滕头园林股份有限公司



国家林业局受理的新品种权

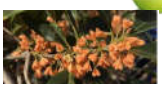
- **2016——7个**
- **胭脂红'Yanzhihong'：**
  - 品种权号：20160138
  - 品种权人：金华市奔月桂花专业合作社
- **华安天香'Huaan Tianxiang'**
  - 品种权号：20160137
  - 品种权人：金华市奔月桂花专业合作社
- **早蓥'Zaoxing'**
  - 品种权号：20160139
  - 品种权人：山东农大、金华奔月
- **彩虹'Caihong'**
  - 品种权号：20160043
  - 品种权人：株洲云田彩桂公司



国家林业局受理的新品种权

- **2016——7个**
- **辉煌'Huihuang'**
  - 品种权号：20160174
  - 山东农业大学、淄博市沂河源桂花研究所
- **冬香银阁'Dongxiang Yinge'：**
  - 品种权号：20160175
  - 品种权人：沂源县林业局、淄博市沂河源桂花研究所
- **藏花阁'Canghuage'**
  - 品种权号：20160142
  - 品种权人：宜昌市林木种苗管理站、宜都市源丰苗木专业合作社



❖ 2017——5个

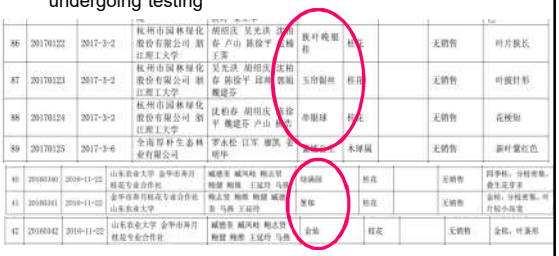
❖ 已审：永福彩霞'Yongfu Caixia'、朝阳金钻'Zhaoyang Jinzhuan'、永福紫绚'Yongfu Zixun'、财源'Caiyuan'、黑武士'Heiwushi'

'永福紫绚'

'朝阳金钻'

'永福彩霞'

■ 目前已申报未实审的品种7个;Seven new varieties are undergoing testing



（二）研究展望Research Ambitions

■ 1 桂花种质资源调查、评价与利用*Osmanthus* germplasm resources survey, evaluation and utilization

■ 野生资源的开发利用——做的工作较少。The development and utilization of wild resource——Lack of enough focus.

■ 大量栽培Enlarge cultivation：桂花*O. fragrans*

■ 少量栽培Moderate cultivation：石山桂*O. fordii*、华东木犀*O. cooperi*、红柄木犀*O. armatus*

■ 价值较大值得引种Introduction：山桂花*O. delavayi*、春季开花种类.Spring-blooming cultivars

■ 育种工作Breeding

■ 选择Selection：大多数品种通过选择获得——播种苗选择Most varieties are acquired through selection

■ 育种Breeding：诱变、杂交、远缘杂交、胚胎拯救Mutagenesis, hybridization, distant hybridization, embryo rescue.

研究展望Research Ambitions

■ 2桂花全基因组测序 *Osmanthus* genome sequencing

■ 进行中Under research：南林Nanjing Forestry University

■ 3新品种申报、DUS测试标准的制定New variety declaration and DUS test standard

■ 新品种DUS测试指南DUS test standard：南林完成Nanjing Forestry University。

■ 新品种发现New species discovery：栽培群体中调查、测试 Investigate and test in cultivation。

■ 4 桂花花色、花香机理研究Study on flower color and floral mechanism of *Osmanthus*

■ 查耳酮合酶CHS 基因克隆及序列分析Gene cloning and sequence analysis of chalcone synthase CHS

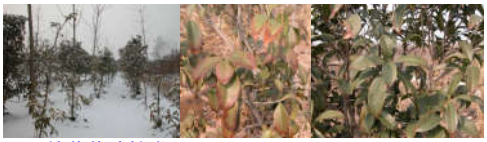
■ 二氢黄酮醇-4-还原酶DFR基因克隆及表达Dihydroflavonol - 4-reductase DFR gene cloning and expression

■ 转基因Transgenic：初步建立再生体系 preliminary establishment of regeneration system。

研究展望Research Expectations

■ 4 桂花抗逆性研究Study on the resistance of *Osmanthus*

■ 抗寒、抗旱、抗盐碱等Cold-resistance, drought-resistance, salinity-resistance, etc.



■ 5 桂花栽培技术Osmanthus culture technology

■ 配方施肥研究、水培技术、花期调控、盆栽技术等The study of formula fertilization, hydroponic technology, flower stage regulation, pot culture and so on

谢　谢！

欢迎批评和指正！

Thank you for your attention