

切花菊品种资源表型多样性分析

钟声远^{1,2}, 罗宇婷¹, 赵 勇¹, 王振兴¹, 管志勇¹, 房伟民¹, 陈发棣¹, 王海滨^{1,①}

(1. 南京农业大学园艺学院 作物遗传育种与种质创新国家重点实验室 农业农村部景观设计重点实验室, 江苏 南京 210095;

2. 福建省农业科学院作物研究所 农业农村部植物新品种测试福州分中心, 福建 福州 350013)

摘要: 为了明晰国内切花菊品种资源的表型多样性,以 905 个切花菊品种(包括 234 个切花大菊品种和 671 个切花小菊品种)为材料,对花型、花色和叶型 3 个质量性状进行统计分析,对株高、茎粗、茎秆强度、节间长度、叶长、叶宽、叶长宽比、叶边缘锯齿数、最低位一级裂刻深度、顶生裂片相对于叶的长度、花径和舌状花数 12 个数量性状进行变异分析,并对上述表型性状的 Shannon-Wiener 多样性指数进行比较。结果表明:切花大菊的花型以莲座型和蜂窝型为主,占比分别为 53.0%和 19.6%;花色以黄色和白色为主,占比分别为 29.9%和 22.2%;叶型以长叶和正叶为主,占比分别为 41.0%和 34.2%。切花小菊的花型以单瓣型和莲座型为主,占比分别为 25.9%和 20.4%;花色以粉色和黄色为主,占比分别为 23.8%和 20.0%;叶型以长叶和正叶为主,占比分别为 44.0%和 20.4%。切花大菊和切花小菊的 12 个数量性状中,舌状花数的变异系数最大(分别为 38.38%和 99.93%),叶长宽比的变异系数最小(分别为 13.27%和 12.56%);并且,除叶长宽比外,其余 11 个数量性状的变异系数均大于 15%。切花大菊和切花小菊 12 个数量性状的 Shannon-Wiener 多样性指数分别为 1.877~2.103 和 1.450~2.094,且除切花小菊的舌状花数外,其余数量性状的 Shannon-Wiener 多样性指数较为接近。另外,切花小菊 3 个质量性状和多数数量性状的 Shannon-Wiener 多样性指数高于切花大菊。综上所述,切花大菊和切花小菊的表型性状多样性较高,但多数数量性状不稳定;并且,切花小菊多数表型性状的多样性高于切花大菊。

关键词: 切花菊; 种质资源; 表型性状; 变异分析; 表型多样性

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Analysis on phenotypic diversity of cut chrysanthemum cultivar resources ZHONG Shengyuan^{1,2}, LUO Yuting¹, ZHAO Yong¹, WANG Zhenxing¹, GUAN Zhiyong¹, FANG Weimin¹, CHEN Fadi¹, WANG Haibin^{1,①} (1. State Key Laboratory of Crop Genetics and Germplasm Enhancement, Key Laboratory of Landscaping, Ministry of Agriculture and Rural Affairs, College of Horticulture, Nanjing Agricultural University, Nanjing 210095, China; 2. Fuzhou Sub-center for New Plant Variety Tests, Ministry of Agriculture and Rural Affairs, Crop Research Institute, Fujian Academy of Agricultural Sciences, Fuzhou 350013, China), *J. Plant Resour. & Environ.*, 2021, 30(5): 22-33

Abstract: To clarify the phenotypic diversity of cut chrysanthemum cultivar resources, 905 cut chrysanthemum cultivars (containing 234 standard cut chrysanthemum cultivars and 671 spray cut chrysanthemum cultivars) were taken as materials, statistical analysis was conducted for 3 qualitative characters of flower type, flower color and leaf type, and variation analysis was conducted for 12 quantitative characters of plant height, stem diameter, stem strength, internode length, leaf length, leaf width, ratio of leaf length to leaf width, serrate number of leaf margin, depth of the lowest bit crack, length of apical lobe relative to leaf, inflorescence diameter and ray floret number, meanwhile, Shannon-

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作者简介: 钟声远(1995—),男,畲族,福建泉州人,硕士,研究实习员,主要从事植物新品种 DUS 测试及种质资源研究。

①通信作者 E-mail: hb@njau.edu.cn

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Wiener diversity indexes of above phenotypic characters were compared. The results show that the flower types of standard cut chrysanthemum are mainly incurve type and pompon type, which account for 53.0% and 19.6%, respectively; the flower colors are mainly yellow and white, which account for 29.9% and 22.2%, respectively; the leaf types are mainly long leaf and normal leaf, which account for 41.0% and 34.2%, respectively. The flower types of spray cut chrysanthemum are mainly single type and incurve type, which account for 25.9% and 20.4%, respectively; the flower colors are mainly pink and yellow, which account for 23.8% and 20.0%, respectively; the leaf types are mainly long leaf and normal leaf, which account for 44.0% and 20.4%, respectively. The coefficients of variation of ray floret number of standard cut chrysanthemum and spray cut chrysanthemum are the greatest (which are 38.38% and 99.93%, respectively) among 12 quantitative characters, and those of ratio of leaf length to leaf width are the smallest (which are 13.27% and 12.56%, respectively); in addition, except for ratio of leaf length to leaf width, the coefficients of variation of other 11 quantitative characters are all greater than 15%. Shannon-Wiener diversity indexes of 12 quantitative characters of standard cut chrysanthemum and spray cut chrysanthemum are 1.877–2.103 and 1.450–2.094, respectively, and except for ray floret number of spray cut chrysanthemum, the Shannon-Wiener diversity indexes of other quantitative characters are relatively close. Furthermore, Shannon-Wiener diversity indexes of 3 qualitative characters and most quantitative characters of spray cut chrysanthemum are higher than those of standard cut chrysanthemum. In conclusion, the diversities of phenotypic characters of standard cut chrysanthemum and spray cut chrysanthemum are relatively high, but most quantitative characters are not stable; in addition, the diversities of most phenotypic characters of spray cut chrysanthemum are higher than those of standard cut chrysanthemum.

Key words: cut chrysanthemum; germplasm resource; phenotypic character; variation analysis; phenotypic diversity

菊花 (*Chrysanthemum morifolium* Ramat.) 姿态优美、形态多样,具有很高的观赏价值和经济价值。切花菊是菊花的一个重要类型,广泛栽培于世界各地,品种资源极为丰富,具有花型多样、花色丰富、耐贮运和瓶插期长等优点,深受消费者喜爱,市场价值和前景极高^[1-3]。

品种资源分析是实现植物优良种质创新、品种选育和高效生产的前提和关键。与国外相比,国内切花菊的育种工作起步较晚,资源研究相对滞后,在资源保存和新品种选育上存在目的不明确、针对性不强等问题,严重阻碍了切花菊的品种创新研究^[4]。目前,国内研究者已经通过引种、杂交育种^[5-6]、辐射诱变^[7]、组织培养^[8]和分子育种^[9]等方法引进或培育出数百个切花菊新品种^[10],但是各切花菊品种的花型和花色等性状较为模糊,且切花菊的研究方法无统一标准,均不利于国内切花菊的育种及生产。

鉴于此,本研究以 905 个切花菊品种(包括 234 个切花大菊品种和 671 个切花小菊品种)为材料,对花型、花色和叶型 3 个质量性状进行统计分析,对株高和茎粗等 12 个数量性状进行变异分析,并对各表型性状的 Shannon-Wiener 多样性指数进行比较,以期明确国内切花菊品种资源的表型多样性,为切花菊

的栽培、育种和应用提供参考数据。

1 材料和方法

1.1 材料

供试材料为 905 个切花菊品种,包括 234 个切花大菊品种和 671 个切花小菊品种,具体名录见附录 I。供试切花菊分别种植于南京农业大学中国菊花种质资源保存中心以及上海虹华园艺有限公司、昆明虹之华园艺有限公司和云南丰岛花卉有限公司基地内的连栋薄膜温室中,每个品种不少于 100 株。种植畦长约 20.0 m、宽约 1.1 m,株距和行距均约 10 cm,栽培管理措施参照 DB32/T 3114—2016。

1.2 方法

在盛花期,每个品种选取 3 株株高中等的健康植株,对各品种的质量性状(包括花型、花色和叶型)和数量性状(包括株高、茎粗、茎秆强度、节间长度、叶长、叶宽、叶长宽比、叶边缘锯齿数、叶最低位一级裂刻深度、叶顶生裂片相对于叶的长度、花径和舌状花数)进行观测和拍照。

参照李鸿渐等^[11]和薛守纪^[12]的菊花品种分类方案,并结合专家意见和实际情况,分别对各品种的

花型、花色和叶型进行分类和统计分析。

参照 NY/T 2228—2012 测量并统计各品种的数量性状,每个性状重复测量或统计 3 次。用卷尺(精度 0.1 cm)测量株高(植株底部至顶部的长度);用游标卡尺(精度 0.01 mm)测量茎粗(植株茎秆上部 1/3 处的直径);用托普 YYD-1 茎秆强度测定仪(浙江托普云农科技股份有限公司,精度 0.1 N)测量茎秆强度(植株茎秆上部 1/3 处能承受的最大压力);统计植株底部至顶部的节间数,根据株高和节间数计算节间长度(株高除以节间数);用直尺(精度 0.1 cm)测量叶长和叶宽(植株茎秆上部 1/3 处叶片的最大长度和宽度),并计算叶长宽比(叶长与叶宽的比值);统计叶边缘锯齿数(植株茎秆上部 1/3 处叶边缘的锯齿数);用直尺测量并计算最低位一级裂刻深度(叶上最低位一级裂刻的长度除以最低位一级裂刻延伸至叶主脉的长度)和植株茎秆上部 1/3 处顶生裂片长度,计算顶生裂片相对于叶的长度(顶生裂片长度除以叶长);用直尺(精度 0.1 cm)测量花径(花盛开时切花大菊花序的直径或切花小菊最大花序的直径);统计舌状花数(切花大菊花序的舌状花数量或切花小菊最大花序的舌状花数量)。

1.3 数据统计及分析

采用 EXCEL 2016 软件统计和整理实验数据,计算不同花型、花色和叶型占比;采用 SPSS 25.0 软件计算各数量性状的最大值、最小值、极差、标准差、平均值和变异系数。

参照 Keylock^[13]的方法,根据每个表型性状不同分级的占比计算各性状的 Shannon-Wiener 多样性指数(H')。其中,数量性状分成 10 级,级差 0.5 δ ,1 级小于 $\bar{X}-2.0\delta$,10 级大于等于 $\bar{X}+2.0\delta$ (\bar{X} 为平均值, δ 为标准差);质量性状以每个类型为一级。

2 结果和分析

2.1 切花大菊和切花小菊质量性状统计分析

2.1.1 花型统计分析 研究表明:供试切花大菊的花型分为莲座型、蜂窝型、芍药型、松针型、辐射型、荷花型和托桂型(图版 I-1~7)。统计结果(表 1)表明:莲座型品种数最多(124),占比为 53.0%;蜂窝型品种数次之(46),占比为 19.6%;荷花型品种数较少(8),占比为 3.4%;托桂型品种数最少(7),占比为 3.0%。

表 1 切花大菊花型统计分析

Table 1 Statistical analysis on flower type of standard cut chrysanthemum

花型 Flower type	品种数 Cultivar number	占比/% Proportion
莲座型 Incurve type	124	53.0
蜂窝型 Pompon type	46	19.6
芍药型 Peony type	24	10.2
松针型 Acicular type	14	6.0
辐射型 Radiation type	11	4.7
荷花型 Lotus type	8	3.4
托桂型 Anemone type	7	3.0

研究表明:供试切花小菊的花型分为单瓣型、莲座型、托桂型、迷你型、蜂窝型、风车型、复瓣型和松针型(图版 I-8~15)。统计结果(表 2)表明:单瓣型品种数最多(174),占比为 25.9%;莲座型和托桂型品种数较多,分别有 137 和 124 个品种,占比分别为 20.4%和 18.5%;复瓣型品种数较少(18),占比为 2.7%;松针型品种数最少(9),占比为 1.3%。

表 2 切花小菊花型统计分析

Table 2 Statistical analysis on flower type of spray cut chrysanthemum

花型 Flower type	品种数 Cultivar number	占比/% Proportion
单瓣型 Single type	174	25.9
莲座型 Incurve type	137	20.4
托桂型 Anemone type	124	18.5
迷你型 Mini type	94	14.0
蜂窝型 Pompon type	73	10.9
风车型 Windmill type	42	6.3
复瓣型 Double type	18	2.7
松针型 Acicular type	9	1.3

2.1.2 花色统计分析 研究表明:供试切花菊花色分为白色、黄色、粉色、紫色、红色、绿色、橙色、间色和双色(图版 I-16~24)。统计结果(表 3)表明:供试切花大菊和切花小菊均包含上述 9 种花色。供试切花大菊中,花色为黄色和白色的品种数居前 2 位,分别有 70 和 52 个品种,占比分别为 29.9%和 22.2%;花色为双色的品种数较少(4),占比为 1.7%;花色为间色的品种数最少(2),占比为 0.8%。供试切花小菊中,花色为粉色和黄色的品种数居前 2 位,分别有 160 和 134 个品种,占比分别为 23.8%和 20.0%;花色为双色的品种数最少(25),占比为 3.7%。

表 3 切花大菊和切花小菊花色统计分析
Table 3 Statistical analysis on flower color of standard cut chrysanthemum and spray cut chrysanthemum

花色 Flower color	切花大菊 Standard cut chrysanthemum		切花小菊 Spray cut chrysanthemum	
	品种数 Cultivar number	占比/% Proportion	品种数 Cultivar number	占比/% Proportion
白色 White	52	22.2	101	15.1
黄色 Yellow	70	29.9	134	20.0
粉色 Pink	36	15.4	160	23.8
紫色 Purple	21	9.0	57	8.5
红色 Red	10	4.3	45	6.7
绿色 Green	22	9.4	44	6.6
橙色 Orange	17	7.3	42	6.3
间色 Secondary color	2	0.8	63	9.4
双色 Bicolor	4	1.7	25	3.7

2.1.3 叶型统计分析 研究结果表明: 供试切花菊的叶型分为正叶、深裂正叶、长叶、深裂长叶、圆叶、葵叶、蓬叶和反转叶(图版 I - 25 ~ 32)。统计结果(表 4)表明: 供试切花大菊只有 7 个叶型, 无蓬叶, 但供试切花小菊包含上述 8 个叶型。供试切花大菊中, 叶型为长叶和正叶的品种数居前 2 位, 分别有 96 和 80 个品种, 占比分别为 41.0% 和 34.2%; 叶型为葵叶和反转叶的品种数居后 2 位, 分别有 4 和 3 个品种, 占比分别为 1.7% 和 1.3%。供试切花小菊中, 叶型为长叶和正叶的品种数居前 2 位, 分别有 295 和 137 个品种, 占比分别为 44.0% 和 20.4%; 叶型为反转叶的品种数最少(16), 占比为 2.4%。

2.2 切花菊数量性状的变异分析和 Shannon - Wiener 多样性指数比较

2.2.1 变异分析 分析结果(表 5 和表 6)表明: 供试切花菊的数量性状存在丰富的变异, 且多数数量性状的变异系数大于 20%。切花大菊 12 个数量性

状的变异系数为 13.27% ~ 38.38%, 其中, 舌状花数的变异系数最大, 叶长宽比的变异系数最小。切花小菊 12 个数量性状的变异系数为 12.56% ~ 99.93%, 其中, 舌状花数的变异系数最大, 叶长宽比的变异系数最小。

2.2.2 Shannon - Wiener 多样性指数比较 切花大菊和切花小菊表型性状的 Shannon - Wiener 多样性指数比较结果见表 7。由表 7 可见: 切花大菊花型、花色和叶型的 Shannon - Wiener 多样性指数分别为 1.422、1.857 和 1.403, 12 个数量性状的 Shannon - Wiener 多样性指数为 1.877 ~ 2.103, 其中, 茎秆强度、叶长、叶宽、叶边缘锯齿数、最低位一级裂刻深度和顶生裂片相对于叶的长度的 Shannon - Wiener 多样性指数高于 2.0, 其余数量性状的 Shannon - Wiener 多样性指数低于 2.0。切花小菊花型、花色和叶型的 Shannon - Wiener 多样性指数分别为 1.831、2.038 和 1.606, 12 个数量性状的 Shannon - Wiener 多样性指数

表 4 切花大菊和切花小菊叶型统计分析
Table 4 Statistical analysis on leaf type of standard cut chrysanthemum and spray cut chrysanthemum

叶型 Leaf type	切花大菊 Standard cut chrysanthemum		切花小菊 Spray cut chrysanthemum	
	品种数 Cultivar number	占比/% Proportion	品种数 Cultivar number	占比/% Proportion
正叶 Normal leaf	80	34.2	137	20.4
深裂正叶 Deeply cleft normal leaf	8	3.4	23	3.4
长叶 Long leaf	96	41.0	295	44.0
深裂长叶 Deeply cleft long leaf	28	12.0	100	14.9
圆叶 Round leaf	15	6.4	55	8.2
葵叶 Sunflower leaf	4	1.7	22	3.3
蓬叶 Basil leaf	0	0.0	23	3.4
反转叶 Reversed leaf	3	1.3	16	2.4

表 5 切花大菊数量性状变异分析¹⁾
Table 5 Variation analysis on quantitative characters of standard cut chrysanthemum¹⁾

统计量 Statistic	h/cm	d_{st}/mm	SSI/N	l_1/cm	l_L/cm	b_L/cm	R	n_{sc}	DLBC	l_{ALRL}	d_{in}/cm	n_{RF}
最小值 Minimum	40.0	2.32	10.5	0.59	3.9	2.8	1.30	11	0.23	0.16	5.0	34
最大值 Maximum	130.0	9.88	86.9	5.00	15.5	8.7	2.63	84	0.83	0.48	25.0	682
极差 Range	90.0	7.56	76.4	4.41	11.6	5.9	1.33	73	0.60	0.32	20.0	648
平均值 Mean	72.4	4.65	45.1	2.15	9.0	5.1	1.76	36.4	0.54	0.29	9.9	281.5
标准差 Standard deviation	20.6	0.90	15.5	0.59	1.9	1.1	0.23	11.4	0.13	0.06	3.0	108.0
CV/%	28.41	19.28	34.32	27.39	21.42	21.12	13.27	31.34	23.23	19.94	30.10	38.38

¹⁾ h : 株高 Plant height; d_{st} : 茎粗 Stem diameter; SSI: 茎秆强度 Stem strength; l_1 : 节间长度 Internode length; l_L : 叶长 Leaf length; b_L : 叶宽 Leaf width; R : 叶长宽比 Ratio of leaf length to leaf width; n_{sc} : 叶边缘锯齿数 Serrate number of leaf margin; DLBC: 最低位一级裂刻深度 Depth of the lowest bit crack; l_{ALRL} : 顶生裂片相对于叶的长度 Length of apical lobe relative to leaf; d_{in} : 花径 Inflorescence diameter; n_{RF} : 舌状花数 Ray floret number. CV: 变异系数 Coefficient of variation.

表 6 切花小菊数量性状变异分析¹⁾Table 6 Variation analysis on quantitative characters of spray cut chrysanthemum¹⁾

统计量 Statistic	h/cm	d_{st}/mm	SSl/N	l_1/cm	l_L/cm	b_L/cm	R	n_{sc}	DLBC	l_{ALRL}	d_{in}/cm	n_{RF}
最小值 Minimum	40.0	2.37	6.9	0.53	3.2	1.9	1.18	6	0.06	0.07	1.0	13
最大值 Maximum	165.0	6.76	129.7	5.42	13.5	8.0	2.60	88	0.90	0.56	11.0	521
极差 Range	125.0	4.39	122.8	4.89	10.3	6.1	1.42	82	0.84	0.49	10.0	508
平均值 Mean	78.4	4.34	41.8	2.14	8.3	4.7	1.80	38.7	0.59	0.30	5.0	94.4
标准差 Standard deviation	21.0	0.72	18.1	0.65	1.7	1.0	0.23	11.7	0.14	0.07	1.7	94.1
CV/%	26.78	16.63	43.26	30.16	20.85	21.16	12.56	30.34	23.17	23.15	33.08	99.93

¹⁾ h : 株高 Plant height; d_{st} : 茎粗 Stem diameter; SSl: 茎秆强度 Stem strength; l_1 : 节间长度 Internode length; l_L : 叶长 Leaf length; b_L : 叶宽 Leaf width; R : 叶长宽比 Ratio of leaf length to leaf width; n_{sc} : 叶边缘锯齿数 Serrate number of leaf margin; DLBC: 最低位一级裂刻深度 Depth of the lowest bit crack; l_{ALRL} : 顶生裂片相对于叶的长度 Length of apical lobe relative to leaf; d_{in} : 花径 Inflorescence diameter; n_{RF} : 舌状花数 Ray floret number. CV: 变异系数 Coefficient of variation.

表 7 切花大菊和切花小菊表型性状的 Shannon-Wiener 多样性指数比较¹⁾Table 7 Comparison on Shannon-Wiener diversity index of phenotypic characters of standard cut chrysanthemum and spray cut chrysanthemum¹⁾

性状 Character	H'_1	H'_2
花型 Flower type	1.422	1.831
花色 Flower color	1.857	2.038
叶型 Leaf type	1.403	1.606
株高 Plant height	1.951	2.036
茎粗 Stem diameter	1.877	2.071
茎秆强度 Stem strength	2.067	2.000
节间长度 Internode length	1.981	2.026
叶长 Leaf length	2.064	2.066
叶宽 Leaf width	2.045	2.094
叶长宽比 Ratio of leaf length to leaf width	1.992	2.062
叶边缘锯齿数 Serrate number of leaf margin	2.001	2.017
最低位一级裂刻深度 Depth of the lowest bit crack	2.080	2.051
顶生裂片相对于叶的长度 Length of apical lobe relative to leaf	2.103	2.056
花径 Inflorescence diameter	1.990	2.014
舌状花数 Ray floret number	1.986	1.450

¹⁾ H'_1 : 切花大菊的 Shannon-Wiener 多样性指数 Shannon-Wiener diversity index of standard cut chrysanthemum; H'_2 : 切花小菊的 Shannon-Wiener 多样性指数 Shannon-Wiener diversity index of spray cut chrysanthemum.

为 1.450 ~ 2.094, 除舌状花数外, 其余数量性状的 Shannon-Wiener 多样性指数较为接近。值得注意的是, 切花小菊 3 个质量性状和多数数量性状的 Shannon-Wiener 多样性指数高于切花大菊。

3 讨 论

长期的人工选择育种导致切花菊产生了大量的花型变异, 花型资源丰富, 为培育不同花型切花菊品种提供了丰富的材料。本研究中, 供试切花大菊品种

花型以莲座型和蜂窝型为主, 尤其是莲座型, 占供试切花大菊品种总数的一半以上。切花小菊不同花型品种分布较切花大菊更为均匀, 单瓣型、莲座型、托桂型、迷你型和蜂窝型占比均在 10% 以上, 其中, 单瓣型和莲座型占比达 20% 以上。切花小菊花型的 Shannon-Wiener 多样性指数高于切花大菊, 说明与切花大菊相比, 切花小菊的花型更为丰富。根据统计结果, 花色为黄色、粉色和白色以及叶型为长叶、正叶和深裂长叶的切花大菊和切花小菊占比较高, 而且切花小菊花色和叶型的 Shannon-Wiener 多样性指数高于切花大菊, 说明与切花大菊相比, 切花小菊的花色和叶型丰富度更高。

变异分析结果表明: 在供试切花大菊和切花小菊的 12 个数量性状中, 叶长宽比的变异系数均小于 15%, 而其余 11 个数量性状的变异系数均大于 15%, 说明切花菊多数数量性状不稳定, 仅叶长宽比相对稳定。冯晴云^[14]对 462 个切花菊品种舌状花数的研究表明: 切花大菊和切花小菊舌状花数的变异系数在供试数量性状中最大, 且切花大菊舌状花数的变异系数小于切花小菊, 但 Shannon-Wiener 多样性指数却高于切花小菊, 本研究也得到相同的结果, 说明与其他数量性状相比, 切花菊的舌状花数最不稳定, 且切花小菊舌状花数较切花大菊更不稳定, 但切花小菊舌状花数的多样性却低于切花大菊。与传统菊相比, 切花菊的瓣型和花型变异较少, 可根据叶部性状和茎秆性状进行辅助分类^[15-16]。沈凤等^[17]对 189 个切花菊品种的 12 个叶部性状进行了研究, 认为顶生裂片相对于叶的长度、最低位一级裂刻深度、叶边缘锯齿数和叶基部形状是引起切花菊叶部形态差异的主要原因。本研究中, 切花大菊和切花小菊的叶长宽比相对稳定, 且叶部性状的 Shannon-Wiener 多样性指数

总体上高于花部和茎秆性状,因此,可将叶部性状作为切花菊辅助分类的重要依据。

目前国内切花大菊种质资源较少,国内市场上流行的切花大菊品种也相对较少,花型主要集中在莲座型和蜂窝型,花色以黄色和白色为主^[18]。传统大菊的花部性状变异丰富^[19],但切花大菊的花型变异和花色丰富度均不及传统大菊,因此,若要提高切花大菊的花部性状多样性,可在育种过程中适当采用传统大菊作为亲本,以期在保持切花大菊基本特征的情况下丰富其花型和花色。切花小菊花型的 Shannon-Wiener 多样性指数高于切花大菊,说明切花小菊花型较切花大菊更丰富。目前,国内市场对切花小菊花型多样性的需求较高,且复瓣型具有贮运优势^[20-22],但复瓣型切花小菊的品种占比却较低,因此,需加强复瓣型切花小菊的育种工作。

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附录 I Appendix I

切花大菊(234个品种)Standard cut chrysanthemum (234 cultivars)

莲座型-白色 Incurve type-white: ‘精州’ ‘Jingzhou’; ‘白龙爪’ ‘Bailongzhao’; ‘银龙分水’ ‘Yinlongfenshui’; ‘白皇后’ ‘Arctic Queen’; ‘秦淮青玉’ ‘Qinhuaqingyu’; ‘秦淮玉荷’ ‘Qinhuaiyuhe’; ‘秦淮瑞雪’ ‘Qinhuaixue’; ‘秦淮新玉’ ‘Qinhuaixinyu’; ‘秦淮白玉’ ‘Qinhuaibaiyu’; ‘秦淮玉莲’ ‘Qinhuaiyulian’; ‘秦淮春雪’ ‘Qinhuaichunxue’; ‘秦淮浮云’ ‘Qinhuaifuyun’; ‘秦淮白露’ ‘Qinhuaibailu’; ‘秦淮霜白’ ‘Qinhuaishuangbai’; ‘秦淮白云’ ‘Qinhuaibaiyun’; ‘白平’ ‘Baiping’; ‘虹之飞雪’ ‘Hongzhifeixue’; ‘丽之白060-6061-10’ ‘Lizhibai 060-6061-10’; ‘QD3-129’; ‘QD3-127’; ‘QD3-121’; ‘QD3-119’; ‘QD3-118’; ‘QD3-117’; ‘QD3-116’; ‘QD3-114’; ‘QD3-107’; ‘QD3-104’; ‘QD3-103’; ‘832RYA117’; ‘4050RP9XC’; ‘878RWA117’; ‘4077RW9XC’; ‘4082RW9XC’; ‘4076RW9XC’; ‘034RW11A’; ‘4081RW9XC’

莲座型-黄色 Incurve type-yellow: ‘一品黄’ ‘Yipinhuang’; ‘光玉’ ‘Guangyu’; ‘精菱’ ‘Jingling’; ‘精诚’ ‘Jingcheng’; ‘光明’ ‘Guangming’; ‘黄色盆栽’ ‘Huangsepenzai’; ‘黄玉’ ‘Huangyu’; ‘光彩’ ‘Guangcai’; ‘黄天赞’ ‘Huangtianzan’; ‘十月黄中’ ‘Shiyuehuangzhong’; ‘秦淮金莲’ ‘Qinhuaijinlian’; ‘金爪’ ‘Jinzhao’; ‘黄绿天赞’ ‘Huanglvitianzan’; ‘黄切菊’ ‘Huangqiejue’; ‘黄咏’ ‘Huangyong’; ‘黄’ ‘Huang’; ‘秦淮鎏金’

- ‘Qinhuaailujin’; ‘引番黄轮芽’ ‘Yinfanhuanglunyu’; ‘吉祥’ ‘Jixiang’; ‘无名9’ ‘Wuming 9’; ‘南国の都’; ‘HJ1’; ‘QD3-123’; ‘QD3-122’; ‘QD3-108’; ‘QD3-102’; ‘7207PY9UC’; ‘4078RY9XC’; ‘4102RYAXC’; ‘D-640’; ‘12160’; ‘D350’; ‘D126’; ‘4064RY9XC’; ‘4041RY9XC’; ‘4099RYAXC’; ‘F-53’; ‘4090RYAXC’; ‘882RYA117’; ‘4098RYAXC’; ‘4038RY9XC’
- 莲座型-粉色 Incurve type-pink: ‘粉泰迪’ ‘Fentaidei’; ‘罗斯安娜粉绿’ ‘Luosiannafenlv’; ‘罗斯安娜粉’ ‘Luosiannafen’; ‘卡尔姆’ ‘Kaermu’; ‘国色天香’ ‘Guosetianxiang’; ‘秦淮粉玉’ ‘Qinhuaifenyu’; ‘秦淮淡妆’ ‘Qinhuaidanzhuang’; ‘秦淮染霞’ ‘Qinhuaيرانxia’; ‘秦淮胭脂’ ‘Qinhuaizhianzhi’; ‘顺发’ ‘Shunfa’; ‘伊特斯科’ ‘Yitesike’; ‘丽之瑰 060-6061-13’ ‘Lizhigui 060-6061-13’; ‘丽之粉 060-6061-04’ ‘Lizhifen 060-6061-04’; ‘QD3-101’
- 莲座型-紫色 Incurve type-purple: ‘紫冠’ ‘Ziguan’; ‘QD3-113’; ‘070-0343’; ‘4092RRAXC’; ‘7214RPAPC’; ‘4062RR9XC’; ‘4072RW9XC’; ‘4016RRAXC’; ‘1510-0171-001’; ‘405PRR9XC’
- 莲座型-红色 Incurve type-red: ‘美国红’ ‘Meiguohong’; ‘婆婆怒放’ ‘Posuonufang’; ‘1511-0174-002’
- 莲座型-绿色 Incurve type-green: ‘翡翠云’ ‘Feicuiyun’; ‘秦淮绿牡丹’ ‘Qinhuailmudan’; ‘秦淮绿茶’ ‘Qinhuailvercha’; ‘秦淮点翠’ ‘Qinhuaidiancui’; ‘秦淮青茶’ ‘Qinhuaiqingcha’; ‘秦淮抹茶’ ‘Qinhuaimeocha’; ‘绿边球’ ‘Lvbianqiu’; ‘淡绿天赞’ ‘Danlvtianzan’
- 莲座型-橙色 Incurve type-orange: ‘罗斯安娜桔’ ‘Luosiannaju’; ‘马罗’ ‘Maluo’; ‘木星’ ‘Muxing’; ‘红日’ ‘Hongri’; ‘橙匙’ ‘Chengchi’; ‘丽之青铜 060-6061-07’ ‘Lizhiqingtong 060-6061-07’; ‘丽之粉白 060-6061-变异’ ‘Lizhifenbai 060-6061-bianyi’
- 莲座型-间色 Incurve type-secondary color: ‘宫梅争艳’ ‘Gongmeizhengan’
- 莲座型-双色 Incurve type-bicolor: ‘金红’ ‘Jinhong’; ‘富爱格’ ‘Fuaige’; ‘乒乓 2NN’ ‘Pingpang2NN’
- 蜂窝型-白色 Pompon type-white: ‘南农白乒乓’ ‘Nannongbaipingpang’; ‘南农玉乒乓’ ‘Nannongyupingpang’; ‘南农白蜂窝’ ‘Nannongbaifengwo’; ‘Edge 白乒乓’ ‘Edge Baipingpang’; ‘白乒乓 2’ ‘Baipingpang 2’; ‘Feeling White’
- 蜂窝型-黄色 Pompon type-yellow: ‘南农黄乒乓’ ‘Nannonghuangpingpang’; ‘南农黄蜂窝’ ‘Nannonghuangfengwo’; ‘南农金乒乓’ ‘Nannongjinpingspang’; ‘南农金纽扣’ ‘Nannongjinniukou’; ‘新黄乒乓’ ‘Xinhuangpingpang’; ‘英雄’ ‘Yingxiong’; ‘黄乒乓’ ‘Huangpingpang’; ‘黄乒乓 2’ ‘Huangpingpang 2’; ‘阿布齐’ ‘Abuerqi’; ‘Feeling Sunny’
- 蜂窝型-粉色 Pompon type-pink: ‘南农豆包’ ‘Nannongdoubao’; ‘南农粉乒乓’ ‘Nannongfenpingpang’; ‘南农粉蜂窝’ ‘Nannongfenfengwo’; ‘香槟粉乒乓’ ‘Xiangbinfenpingpang’; ‘粉色蜂窝’ ‘Fensenfengwo’; ‘粉乒乓’ ‘Fenpingpang’; ‘粉乒乓 2’ ‘Fenpingpang 2’; ‘粉乒乓 3’ ‘Fenpingpang 3’; ‘科普顿’ ‘Kepudun’; ‘贝丽卡’ ‘Beilika’
- 蜂窝型-紫色 Pompon type-purple: ‘南农粉团子’ ‘Nannongfentuanzi’; ‘南农紫乒乓’ ‘Nannongzipingpang’; ‘甘娜须’ ‘Gannaxu’; ‘深紫乒乓’ ‘Shenzipingpang’; ‘紫乒乓’ ‘Zipingpang’
- 蜂窝型-红色 Pompon type-red: ‘南农红乒乓’ ‘Nannonghongpingpang’; ‘克洛诺斯’ ‘Kluonuos’; ‘红乒乓’ ‘Hongpingpang’
- 蜂窝型-绿色 Pompon type-green: ‘南农绿峰’ ‘Nannonglvfeng’; ‘南农绿冻’ ‘Nannonglvdong’; ‘南农绿茵’ ‘Nannonglvyin’; ‘南农绿菲’ ‘Nannonglvfei’; ‘南农如意’ ‘Nannongruiyi’; ‘黄绿乒乓’ ‘Huanglvpingpang’; ‘绿乒乓’ ‘Lvpingpang’; ‘兰茂绿茵’ ‘Lanmaolvinyin’; ‘Feeling Green Dark’
- 蜂窝型-橙色 Pompon type-orange: ‘南农橙乒乓’ ‘Nannongchengpingpang’; ‘南农小橘’ ‘Nannongxiaoju’; ‘橙乒乓’ ‘Chengpingpang’
- 芍药型-白色 Peony type-white: ‘秦淮白茶’ ‘Qinhuaibaicha’; ‘秦淮初雪’ ‘Qinhuaichuxue’; ‘11160’
- 芍药型-黄色 Peony type-yellow: ‘月黄’ ‘Yuehuang’; ‘芥末’ ‘Jiemo’; ‘经典’ ‘Jingdian’; ‘QD3-125’; ‘QD3-110’; ‘QD3-71’
- 芍药型-粉色 Peony type-pink: ‘秦淮粉芍药’ ‘Qinhuaifenshaoyao’; ‘南通粉’ ‘Nantongfen’; ‘威尼斯’ ‘Weinisi’; ‘秦淮粉牡丹’ ‘Qinhuaifenmudan’; ‘秦淮粉靛’ ‘Qinhuaifenyen’; ‘秦淮粉霞’ ‘Qinhuaifenshia’; ‘青出于蓝’ ‘Qingchuyulan’; ‘4763’
- 芍药型-紫色 Peony type-purple: ‘秦淮紫绣球’ ‘Qinhuaizixiuqiu’
- 芍药型-红色 Peony type-red: ‘巴卡红’ ‘Bakahong’; ‘D-147’
- 芍药型-绿色 Peony type-green: ‘秦淮茶园’ ‘Qinhuaichayuan’
- 芍药型-橙色 Peony type-orange: ‘秦淮金辉’ ‘Qinhuaijinhuai’; ‘广寒宫’ ‘Guanghangong’
- 芍药型-间色 Peony type-secondary color: ‘皮普’ ‘Pipu’
- 松针型-黄色 Acicular type-yellow: ‘松月’ ‘Songyue’; ‘白飞舞’ ‘Baifeiwu’; ‘黄色管’ ‘Huangseguan’; ‘黄香梨’ ‘Huangxiangli’; ‘无牌管状’ ‘Wupaiguanzhuang’
- 松针型-紫色 Acicular type-purple: ‘紫飞舞’ ‘Zifeiwu’; ‘紫松月’ ‘Zisongyue’; ‘4063RP9XC’
- 松针型-红色 Acicular type-red: ‘萨弗拉红’ ‘Safulahong’
- 松针型-绿色 Acicular type-green: ‘黄绿管’ ‘Huanglvguan’
- 松针型-橙色 Acicular type-orange: ‘橙松月’ ‘Chengsongyue’; ‘金松月’ ‘Jinsongyue’; ‘橙依’ ‘Chengyi’
- 松针型-双色 Acicular type-bicolor: ‘雪松月’ ‘Xuesongyue’
- 辐射型-白色 Radiation type-white: ‘秦淮剑云’ ‘Qinhuaijianyun’; ‘白安娜’ ‘Baiana’
- 辐射型-黄色 Radiation type-yellow: ‘黄安娜’ ‘Huanganna’; ‘秋香’ ‘Qiuxiang’; ‘QD2-16’
- 辐射型-粉色 Radiation type-pink: ‘粉安娜’ ‘Fenanna’

- 辐射型-绿色 Radiation type-green: ‘翠心’ ‘Cuixin’; ‘绿安娜’ ‘Lvanna’; ‘玉安娜’ ‘Yuanna’
- 辐射型-橙色 Radiation type-orange: ‘橙安娜’ ‘Chenganna’; ‘棕安娜’ ‘Zonganna’
- 荷花型-白色 Lotus type-white: ‘神马’ ‘Shenma’; ‘精の一世’
- 荷花型-黄色 Lotus type-yellow: ‘QD3-128’; ‘QD3-105’
- 荷花型-粉色 Lotus type-pink: ‘秦淮丽秀’ ‘Qinhualixiu’; ‘秦淮胭脂’ ‘Qinhuaiyanhe’
- 荷花型-紫色 Lotus type-purple: ‘紫色盆栽’ ‘Zisepenzai’; ‘QD3-85’
- 托挂型-白色 Anemone type-white: ‘瑞多斯特’ ‘Ruiduosite’; ‘天使’ ‘Angelina’
- 托挂型-黄色 Anemone type-yellow: ‘阳光’ ‘Yangguang’; ‘Supernova Yellow’; ‘QD4-3’
- 托挂型-粉色 Anemone type-pink: ‘贝蕾丝’ ‘Beileisi’
- 托挂型-红色 Anemone type-red: ‘南农朱雀’ ‘Nannongzhuque’
- 切花小菊(671个品种) Spray cut chrysanthemum (671 cultivars)
- 单瓣型-白色 Single type-white: ‘南农冰清’ ‘Nannongbingqing’; ‘南农凯歌’ ‘Nannongkaige’; ‘南农小牙白’ ‘Nannongxiaoyabai’; ‘南农冰洁’ ‘Nannongbingjie’; ‘南农冰泉’ ‘Nannongbingquan’; ‘南农冰雪’ ‘Nannongbingxue’; ‘南农方舟’ ‘Nannongfangzhou’; ‘南农碧云’ ‘Nannongbiyun’; ‘南农玉笏’ ‘Nannongyuhu’; ‘南农芝士’ ‘Nannongzhishi’; ‘南农缤云’ ‘Nannongbinyun’; ‘南农小清新’ ‘Nannongxiaqingxin’; ‘南农冰雨’ ‘Nannongbingyu’; ‘梵蒂冈’ ‘Fandigang’; ‘奥茨’ ‘Aoci’; ‘调’ ‘Diao’; ‘白小’ ‘Baixiao’; ‘涅瓦’ ‘Niewa’; ‘诺亚’ ‘Nuoya’; ‘Rossi 白’ ‘Rossi White’; ‘Q1-86’; ‘Q1-79’; ‘Q1-74’; ‘Q1-16’; ‘Q1-118’; ‘12-2290’; ‘Grand White’
- 单瓣型-黄色 Single type-yellow: ‘南农黄莺’ ‘Nannonghuangying’; ‘南农锦衣’ ‘Nannongjinyi’; ‘南农黄金甲’ ‘Nannonghuangjinjia’; ‘南农金柠檬’ ‘Nannongjinningmeng’; ‘南农丰收’ ‘Nannongfengshou’; ‘南农金焰’ ‘Nannongjinyan’; ‘南农金灿’ ‘Nannongjincan’; ‘南农金光’ ‘Nannongjinguang’; ‘南农单金翠’ ‘Nannongdanjincui’; ‘南农金旗’ ‘Nannongjinqi’; ‘南农小柠檬’ ‘Nannongxiaoningmeng’; ‘金秀’ ‘Jinxiu’; ‘英小’ ‘Yingxiaohuang’; ‘秋铃’ ‘Qiuling’; ‘黄小’ ‘Huangxiao’; ‘诺亚黄’ ‘Nuoyahuang’; ‘新知娅’ ‘Xinzhiya’; ‘豹’ ‘Bao’; ‘苏格兰’ ‘Sugelan’; ‘Rossi 黄’ ‘Rossi Yellow’; ‘Q1-85’; ‘Q1-81’; ‘Q1-80’; ‘Q1-65’; ‘Q1-53’; ‘Q1-23’; ‘Q1-21’; ‘Q1-18’; ‘Q1-111’; ‘Q1-110’; ‘Q1-107’; ‘12105’; ‘110-2350’; ‘Celebrate’
- 单瓣型-粉色 Single type-pink: ‘南农凯悦’ ‘Nannongkaiyue’; ‘南农翠玫’ ‘Nannongcuimei’; ‘南农佳人’ ‘Nannongjiaren’; ‘南农花仙子’ ‘Nannonghuaxianzi’; ‘南农缤纷’ ‘Nannongbinfen’; ‘南农粉靛’ ‘Nannongfendi’; ‘南农粉丽’ ‘Nannongfenli’; ‘南农香槟粉’ ‘Nannongxiangbinfen’; ‘南农粉韵’ ‘Nannongfenyun’; ‘无名粉白’ ‘Wumingfenbai’; ‘英小粉’ ‘Yingxiaofen’; ‘阿美的’ ‘Ameidi’; ‘Rossi 粉’ ‘Rossi Pink’; ‘Q1-91’; ‘Q1-88’; ‘Q1-83’; ‘Q1-75’; ‘13202’; ‘111154’; ‘Q1-17’; ‘Q1-115’; ‘Q1-114’; ‘Q1-113’; ‘713MPA106’; ‘746SPA107’; ‘849MPA117’; ‘Isis’; ‘Grand Rose’; ‘Grand Splendid’; ‘Grand Salmon’; ‘Caesar Improved’; ‘Moon Light’; ‘Tigerrag’; ‘Classy’; ‘Anky’; ‘Ceremony’
- 单瓣型-紫色 Single type-purple: ‘南农紫绒’ ‘Nannongziron’; ‘南农紫云英’ ‘Nannongziyunying’; ‘南农菲紫’ ‘Nannongfeizi’; ‘秋红小菊’ ‘Qiuhongxiaoju’; ‘秋5’ ‘Qiu 5’; ‘Q1-87’; ‘Q1-66’; ‘Q1-3’; ‘Q1-117’; ‘4659MP9XC’; ‘840MPA117’; ‘7802MY9XC’; ‘840MRA117’
- 单瓣型-红色 Single type-red: ‘南农火山’ ‘Nannonghuoshan’; ‘南农红雀’ ‘Nannonghongque’; ‘南农红焰’ ‘Nannonghongyan’; ‘南农红橙’ ‘Nannonghongcheng’; ‘南农红云’ ‘Nannonghongyun’; ‘南农红楼’ ‘Nannonghonglou’; ‘南农红衣’ ‘Nannonghongyi’; ‘南农红绒’ ‘Nannonghongrong’; ‘南农红韵’ ‘Nannong Hongyun’; ‘南农红旗’ ‘Nannonghongqi’; ‘南农小金红’ ‘Nannongxiaojinhong’; ‘特洛尔’ ‘Teluoer’; ‘香槟红’ ‘Xiangbinhong’; ‘红哈雷’ ‘Honghalei’; ‘巧克力’ ‘Qiaokeli’; ‘阿多拉’ ‘Aduola’; ‘红小’ ‘Hongxiao’; ‘都柏林’ ‘Dubolin’; ‘迷你铁锈红’ ‘Minitixiuhong’; ‘Wembley’; ‘622MRA097’
- 单瓣型-绿色 Single type-green: ‘绿精灵’ ‘Lvjingling’
- 单瓣型-橙色 Single type-orange: ‘南农果粒橙’ ‘Nannongguolicheng’; ‘南农向阳’ ‘Nannongxiangyang’; ‘南农香橙’ ‘Nannongxiangcheng’; ‘南农馨雅’ ‘Nannongxinya’; ‘哈雷’ ‘Halei’; ‘Rossi 香槟’ ‘Rossi Champagne’; ‘Q1-82’; ‘4768MYAXC’; ‘593S09097’; ‘Grand Orange Deep’
- 单瓣型-间色 Single type-secondary color: ‘南农彩丝带’ ‘Nannongcaisidai’; ‘南农七彩’ ‘Nannongqicai’; ‘南农小丽’ ‘Nannongxiaoli’; ‘南农勋章’ ‘Nannongxunzhang’; ‘南农红霞’ ‘Nannonghongxia’; ‘南农火炬’ ‘Nannonghuoju’; ‘南农锦缎’ ‘Nannongjinduan’; ‘南农洒金’ ‘Nannongsajin’; ‘南农炫虹’ ‘Nannongxuanhong’; ‘南农炫红’ ‘Nannong Xuanhong’; ‘南农炫紫’ ‘Nannongxuanzi’; ‘南农紫眸’ ‘Nannongzimou’; ‘潇洒’ ‘Xiaosa’; ‘紫星空’ ‘Zixingkong’; ‘草籽花’ ‘Caozihua’; ‘红黄复色’ ‘Honghuangfuse’; ‘里斯本’ ‘Lisiben’; ‘里斯本深’ ‘Lisibenshen’; ‘Q1-90’; ‘Q1-84’; ‘Q1-73’; ‘Q1-52’; ‘Q1-116’; ‘Q1-108’; ‘14555’; ‘715MMA106’; ‘4690MM9XC’; ‘ストラダピンク’
- 单瓣型-双色 Single type-bicolor: ‘香槟黄’ ‘Xiangbinhuang’; ‘Q1-76’; ‘Q1-15’; ‘Grand Orange’
- 莲座型-白色 Incurve type-white: ‘南农胭脂’ ‘Nannongyanzhi’; ‘南农云岳’ ‘Nannongyunyue’; ‘南农恒月’ ‘Nannonghengyue’; ‘南农庐云’ ‘Nannongluyun’; ‘南农嵩云’ ‘Nannongsongyun’; ‘南农岱月’ ‘Nannongdaiyue’; ‘南农庐月’ ‘Nannongluyue’; ‘南农庐秀’ ‘Nannongluxiu’; ‘南农清泉’ ‘Nannongqingquan’; ‘南农岱雪’ ‘Nannongdaixue’; ‘南农岱春’ ‘Nannongdaichun’; ‘南农云翠’ ‘Nannongyuncui’; ‘南农泰白’ ‘Nannongtaibai’; ‘Q4-24’; ‘Champagne Golden’
- 莲座型-黄色 Incurve type-yellow: ‘南农迟黄’ ‘Nannongchihuang’; ‘南农恒辉’ ‘Nannonghenghui’; ‘南农恒耀’ ‘Nannonghengyao’; ‘南农金庐’ ‘Nannongjinlu’; ‘南农锦庐’ ‘Nannong Jinlu’; ‘南农杨桃’ ‘Nannongyangtao’; ‘南农衡星’ ‘Nannonghengxing’; ‘南农衡阳’ ‘Nannonghengyang’;

- ‘南农高芒’ ‘Nannongsongmang’; ‘南农金嵩’ ‘Nannongjinsong’; ‘南农嵩耀’ ‘Nannongsongyao’; ‘南农泰辉’ ‘Nannongtaihui’; ‘南农金鹏’ ‘Nannongjinli’; ‘黄萝莉’ ‘Lollipop Yellow’; ‘欧元黄’ ‘Euro Sunny’; ‘香草沙冰’ ‘Xiangcaoshabing’; ‘伊比斯阳光’ ‘Ibis Sunny’; ‘吐瓦鲁’ ‘Tuwalu’; ‘秀芳の顶’; ‘Q4-27’; ‘Q4-26’; ‘Q4-22’; ‘Q4-21’; ‘Q4-18’; ‘Q4-1’; ‘479MO117’; ‘090-0167’; ‘4094RYAXC’; ‘7602MYADC’; ‘7114RYAHC’; ‘137-0002’; ‘4093RYAXC’; ‘140-0449’
- 莲座型-粉色 Incurve type-pink: ‘南农粉云’ ‘Nannongfenyun’; ‘南农高粉’ ‘Nannongsongfen’; ‘南农岱华’ ‘Nannongdaihua’; ‘南农庐霞’ ‘Nannongluxia’; ‘南农烟霞’ ‘Nannongyanxia’; ‘南农粉庐’ ‘Nannongfenlu’; ‘南农衡春’ ‘Nannonghengchun’; ‘南农衡韵’ ‘Nannonghengyun’; ‘南农庐春’ ‘Nannongluchun’; ‘南农岱丽’ ‘Nannongdaili’; ‘南农泰春’ ‘Nannongtaichun’; ‘南农岱粉’ ‘Nannongdaifen’; ‘南农粉蕊’ ‘Nannongfenrui’; ‘南农小粉庐’ ‘Nannongxiaofenlu’; ‘南农衡秀’ ‘Nannonghengxiu’; ‘南农丽雅’ ‘Nannongliya’; ‘南农飞霞’ ‘Nannongfeixia’; ‘宝缇’ ‘Baoti’; ‘可爱罗伊斯’ ‘Keailuoyisi’; ‘杜鹃’ ‘Tucana’; ‘亚马逊’ ‘Amazon’; ‘粉丹特’ ‘Fendante’; ‘粉杜鹃’ ‘Tucana Pink’; ‘坦率粉’ ‘Candor Pink’; ‘粉萝莉’ ‘Lollipop Pink’; ‘粉提卡’ ‘Fentika’; ‘13232’; ‘13231’; ‘Q4-45’; ‘Q4-29’; ‘Q4-28’; ‘Q4-25’; ‘Q4-19’; ‘HW02’; ‘814MPA117’; ‘901MPA117’; ‘740MPA106’; ‘6406MPAWC’; ‘847MPA117’; ‘Crystal Pink’
- 莲座型-紫色 Incurve type-purple: ‘南农紫峰’ ‘Nannongzifeng’; ‘南农峨眉’ ‘Nannongemei’; ‘南农小嵩紫’ ‘Nannongxiaosongzi’; ‘南农嵩紫’ ‘Nannongsongzi’; ‘南农紫丹’ ‘Nannongzidan’; ‘紫丹特’ ‘Zidante’; ‘昆汀’ ‘Kunting’; ‘昆蒂’ ‘Kundi’; ‘大翔花’ ‘Daxianghua’; ‘紫萝莉’ ‘Lollipop Purple’; ‘精の音’; ‘4040RR9XC’; ‘4047RP9XC’; ‘4106RRAXC’
- 莲座型-红色 Incurve type-red: ‘南农乌金’ ‘Nannongwujin’; ‘南农庐火’ ‘Nannongluhuo’; ‘南农秋庐’ ‘Nannongqiulu’; ‘红萝莉’ ‘Lollipop Red’; ‘红丹特’ ‘Hongdante’; ‘都市’ ‘Urban’; ‘橙红’ ‘Chenghong’
- 莲座型-绿色 Incurve type-green: ‘南农绿芍药’ ‘Nannonglvshaoyao’; ‘南农春茶’ ‘Nannongchuncha’; ‘南农绿珊’ ‘Nannonglvshan’; ‘南农翠龙爪’ ‘Nannongcuilongzhao’; ‘南农绿牡丹’ ‘Nannonglvjudan’; ‘南农岱绿’ ‘Nannongdailv’; ‘南农绿玫瑰’ ‘Nannonglvmeigui’; ‘南农翠碟’ ‘Nannongcuidie’; ‘劳伦佑’ ‘Laolunyou’; ‘劳伦佐’ ‘Laolunzuo’; ‘菲丽’ ‘Feili’; ‘森林’ ‘Senlin’; ‘Q4-30’
- 莲座型-橙色 Incurve type-orange: ‘南农秋岳’ ‘Nannongqiuyue’; ‘南农嵩辉’ ‘Nannongsonghui’; ‘南农锦泰’ ‘Nannongjintai’; ‘锦峰’ ‘Jinfeng’; ‘桔丹特’ ‘Judante’; ‘887SOA117’
- 莲座型-间色 Incurve type-secondary color: ‘南农嵩绒’ ‘Nannongsongrong’; ‘南农紫唇’ ‘Nannongzichun’; ‘南农茶语’ ‘Nannongchayu’; ‘南农霞珠’ ‘Nannongxiazhu’; ‘阿花菲’ ‘Ahuafei’; ‘日引-2’ ‘Riyin-2’; ‘Q4-23’; ‘HW04’
- 莲座型-双色 Incurve type-bicolor: ‘迈锐宝’ ‘Mairuibao’
- 托桂型-白色 Anemone type-white: ‘南农星云’ ‘Nannongxingyun’; ‘南农星空’ ‘Nannongxingkong’; ‘南农银山’ ‘Nannongyinshan’; ‘南农玉盘’ ‘Nannongyupan’; ‘南农雪峰’ ‘Nannongxuefeng’; ‘南农月桂’ ‘Nannongyuegui’; ‘南农丽翠’ ‘Nannonglicui’; ‘南农丽云’ ‘Nannongliyun’; ‘南农丽雪’ ‘Nannonglixue’; ‘南农丽白’ ‘Nannonglibai’; ‘南农晚丽白’ ‘Nannongwanlibai’; ‘南农小丽白’ ‘Nannongxiaolibai’; ‘南农小丽翠’ ‘Nannongxiaolicui’; ‘南农丽洁’ ‘Nannonglijie’; ‘南农晴玉’ ‘Nannongqingyu’; ‘南农雪松’ ‘Nannongxuesong’; ‘南农小翠蝶’ ‘Nannongxiaocuidie’; ‘南农云雀’ ‘Nannongyunque’; ‘白捧花’ ‘Baipenghua’; ‘绿心小菊’ ‘Puma White’; ‘蒙白’ ‘Monalisa White’; ‘斗南 08’ ‘Dounan 08’; ‘Q2-28’; ‘Lennox’; ‘Swan’
- 托桂型-黄色 Anemone type-yellow: ‘南农小金星’ ‘Nannongxiaojinxing’; ‘南农皇冠’ ‘Nannonghuangguan’; ‘南农赤蜂’ ‘Nannongchifeng’; ‘南农冰淇淋’ ‘Nannongbingqilin’; ‘南农丽黄’ ‘Nannonglihuang’; ‘南农霞光’ ‘Nannongxiaguang’; ‘南农黄珑玉’ ‘Nannonghuanglongyu’; ‘南农黄鹏’ ‘Nannonghuangli’; ‘蒙淡黄’ ‘Monalisa Cream’; ‘蒙深黄’ ‘Monalisa Yellow’; ‘清露’ ‘Puma Sunny’; ‘瑞多斯特奶黄’ ‘Ruiduositenaihuang’; ‘瑞多斯特黄’ ‘Ruiduositehuang’; ‘浙江 6’ ‘Zhejiang 6’; ‘浙江 4’ ‘Zhejiang 4’; ‘Q2-31’; ‘4106’; ‘4608MMAKC’; ‘0623’; ‘7015MA106’
- 托桂型-粉色 Anemone type-pink: ‘南农星梦’ ‘Nannongxingmeng’; ‘南农星雨’ ‘Nannongxingyu’; ‘南农小草莓’ ‘Nannongxiaocaomei’; ‘南农丽莓’ ‘Nannonglimei’; ‘南农丽粉’ ‘Nannonglifeng’; ‘南农粉玉’ ‘Nannongfenyu’; ‘南农玫粉’ ‘Nannongmeifen’; ‘南农绯玉’ ‘Nannongfeiyu’; ‘南农粉葵’ ‘Nannongfenkui’; ‘南农小丽粉’ ‘Nannongxiaolifeng’; ‘南农雅丽’ ‘Nannongyali’; ‘南农飞蓬’ ‘Nannongfeipeng’; ‘南农胭脂玉’ ‘Nannongyanzhiyu’; ‘南农彩玉’ ‘NannongcaiYu’; ‘南农梦露’ ‘Nannongmenglu’; ‘南农粉胭’ ‘Nannongfenyan’; ‘南农落雁’ ‘Nannongluoyan’; ‘南农粉翠’ ‘Nannongfencui’; ‘南农丽槟’ ‘Nannonglibin’; ‘南农俏桂’ ‘Nannongqiaogui’; ‘南农霞衣’ ‘Nannongxiayi’; ‘南农落樱’ ‘Nannongluoying’; ‘南农爽桂’ ‘Nannongshuanggui’; ‘南农粉羽’ ‘Nannong Fenyu’; ‘南农小粉葵’ ‘Nannongxiaofenkui’; ‘南农风韵’ ‘Nannongfengyun’; ‘南农粉莺’ ‘Nannongfenying’; ‘南农绯云’ ‘Nannongfeiyun’; ‘深粉沙姆’ ‘Samos Dark Pink’; ‘粉沙姆’ ‘Samos Pink’; ‘蒙淡粉’ ‘Monalisa Pink’; ‘紫红托桂’ ‘Zihongtuogui’; ‘阿里格斯’ ‘Aligesi’; ‘蒙深粉’ ‘Monalisa Rosy’; ‘草莓菊’ ‘Caomeiju’; ‘粉星空’ ‘Fenxingkong’; ‘浙江 1’ ‘Zhejiang 1’; ‘浙江 11’ ‘Zhejiang 11’; ‘Q2-30’; ‘Q2-16’; ‘796SOA117’; ‘7808MPAXC’
- 托桂型-紫色 Anemone type-purple: ‘南农紫霞’ ‘Nannongzixia’; ‘南农紫莓’ ‘Nannongzimei’; ‘南农艳紫’ ‘Nannongyanzi’; ‘南农紫金轮’ ‘Nannongzijinlun’; ‘南农紫雀’ ‘Nannongzique’; ‘南农紫娇’ ‘Nannongzijiao’; ‘南农紫玉’ ‘Nannongziyu’; ‘南农裂帛’ ‘Nannongliebo’; ‘南农紫羽’ ‘Nannong Ziyu’; ‘南农紫翠’ ‘Nannongzicui’
- 托桂型-红色 Anemone type-red: ‘南农红娇’ ‘Nannonghongjiao’; ‘南农红红’ ‘Nannonglihong’; ‘南农丽枫’ ‘Nannonglifeng’; ‘蒙红’ ‘Monalisa Red’
- 托桂型-橙色 Anemone type-orange: ‘南农夕霞’ ‘Nannongxiaxia’; ‘南农丽橙’ ‘Nannonglicheng’; ‘南农丽珀’ ‘Nannonglipu’; ‘南农橙莺’ ‘Nannongchengying’; ‘南农暖阳’ ‘Nannongnuanyang’; ‘4-3 沪’ ‘4-3 Hu’
- 托桂型-间色 Anemone type-secondary color: ‘南农雅莓’ ‘Nannongyamei’; ‘南农胭脂莓’ ‘Nannongyanzhi mei’; ‘南农丽焰’ ‘Nannongliyan’; ‘南农翠

- 玉‘Nannongcuiyu’;‘南农晨霞’‘Nannongchenxia’;‘南农花脸’‘Nannonghualian’;‘南农鬼脸’‘Nannongguilian’;‘南农飞焰’‘Nannongfeiyang’;‘南农小鬼脸’‘Nannongxiaoguilian’;‘南农旭日’‘Nannongxuri’;‘南农变脸’‘Nannongbianlian’;‘南农大花脸’‘Nannongdahualian’;‘南农双娇’‘Nannongshuangjiao’;‘南农炫葵’‘Nannongxuankui’;‘小菊双色’‘Xiaojushuangse’
- 托桂型-双色 Anemone type-bicolor:‘南农金红’‘Nannongjinhong’;‘浙江2’‘Zhejiang 2’
- 迷你型-白色 Mini type-white:‘南农雪点点’‘Nannongxuediandian’;‘南农雨点’‘Nannongyudian’;‘南农白碧’‘Nannongbaibi’;‘南农极点’‘Nannongjidian’;‘南农星点’‘Nannongxingdian’;‘南农点霜’‘Nannongdianshuang’;‘南农白点点’‘Nannongbaidiandian’;‘迷你白’‘Minibai’;‘阴阳’‘Yinyang’;‘凯蒂’‘Kaidi’;‘史泰白’‘Stallion White’;‘虹之华15’‘Hongzhihua 15’;‘虹之华14’‘Hongzhihua 14’;‘爱之白2’‘Aizhibai 2’;‘Q6-32’;‘Q6-29’;‘Q6-27’;‘Q6-22’;‘F-19’;‘F-29’
- 迷你型-黄色 Mini type-yellow:‘南农米黄’‘Nannongmihuang’;‘南农金点子’‘Nannongjindianzi’;‘南农晚黄点’‘Nannongwanhuangdian’;‘南农亮点’‘Nannongliangdian’;‘南农小点金’‘Nannongxiaodianjin’;‘南农小橙点’‘Nannongxiaochengdian’;‘体德查’‘Tedcha’;‘目黑黄’‘Muheihuang’;‘迷你黄’‘Minihuang’;‘Q6-16’;‘F-5’;‘F-14’;‘583MY9096’;‘749TG13P’;‘セイロイズイエロ一’
- 迷你型-粉色 Mini type-pink:‘南农茨粉’‘Nannongyingfen’;‘南农雨薇’‘Nannongyuwei’;‘南农雨萌’‘Nannongyumeng’;‘南农点玫’‘Nannongdianmei’;‘南农桃点’‘Nannongtaodian’;‘南农亮粉点’‘Nannongliangfendian’;‘南农芳点点’‘Nannongfangdiandian’;‘南农点樱’‘Nannongdianying’;‘南农俏点点’‘Nannongqiaodiandian’;‘南农绯点点’‘Nannongfeidiandian’;‘迷你浅粉’‘Miniqianfen’;‘粉妍’‘Fenyan’;‘目黑粉’‘Muheifen’;‘迷你小粉’‘Minixiaofen’;‘迷你深粉’‘Minishenfen’;‘Q6-2’;‘Q6-25’;‘Q6-24’;‘Q6-18’;‘F-1’;‘F-17’
- 迷你型-紫色 Mini type-purple:‘南农紫点点’‘Nannongzidiandian’;‘南农紫衫’‘Nannongzishan’;‘南农粉墨’‘Nannongfenmo’;‘虹之华5’‘Hongzhihua 5’;‘虹之华19’‘Hongzhihua 19’;‘Q6-8’;‘Q6-33’;‘Q6-26’;‘Q6-23’;‘Q6-17’;‘F-7’
- 迷你型-红色 Mini type-red:‘南农似红点’‘Nannongsihongdian’;‘南农亮红点’‘Nannonglianghongdian’;‘南农红点点’‘Nannonghongdiandian’;‘迷你菊芽变’‘Minijuyabian’;‘迷你’‘Mini’;‘Q6-31’;‘Q6-30’;‘F-10’;‘Tory’
- 迷你型-绿色 Mini type-green:‘Q6-19’;‘F-8’
- 迷你型-橙色 Mini type-orange:‘南农亮橙点’‘Nannongliangchengdian’;‘南农香橙点’‘Nannongxiangchengdian’;‘南农橙点点’‘Nannongchengdiandian’;‘南农点袖’‘Nannongdianyou’;‘迷你小香槟’‘Minixiaoxiangbin’;‘F-9’;‘F-12’;‘F-26’;‘614MPA097’;‘セイアメリマロン’
- 迷你型-间色 Mini type-secondary color:‘南农彩点点’‘Nannongcaidiandian’;‘南农似橙点’‘Nannongsichengdian’;‘南农晚樱’‘Nannongwanying’;‘欧米茄’‘Omega’;‘虹之华17’‘Hongzhihua 17’;‘セイアメリロゼ’
- 蜂窝型-白色 Pompon type-white:‘南农玉璇’‘Nannongyuxuan’;‘南农玉珠’‘Nannongyuzhu’;‘南农玉扣’‘Nannongyukou’;‘南农翠玉珠’‘Nannongcuiyuzhu’;‘南农汤团’‘Nannongtangtuan’;‘马蒂斯’‘Madisi’;‘4BX-012’;‘764MW13A’
- 蜂窝型-黄色 Pompon type-yellow:‘南农金珠’‘Nannongjinzhu’;‘南农金扣子’‘Nannongjinkouzi’;‘馒头菊’‘Mantouju’;‘斯耐’‘Sinai’;‘虹之秋萤’‘Hongzhiqiuying’;‘黄钻’‘Huangzuan’;‘乱16’‘Luan 16’;‘4712MY9XC’;‘4712PM9XC’;‘4791PYANC’;‘4695PY9XC’;‘873SYA117’;‘091-5153-01’;‘4715MY9XC’;‘HW8’;‘7206PY9XC’;‘HW9’;‘843MOA117’;‘4764MYAXC’;‘CH-13-8296’;‘838MYA117’;‘Q08-15-4’;‘Statesman’
- 蜂窝型-粉色 Pompon type-pink:‘杰妮粉’‘Jeanny Pink’;‘粉罗克’‘Fenluoke’;‘深粉乒乓’‘Shenfenpingpang’;‘马蒂斯粉’‘Madisifen’;‘奥丽萨巴’‘Aolisaba’;‘Q3-14’;‘Q08-8-17’;‘850MPA117’
- 蜂窝型-紫色 Pompon type-purple:‘南农烟花’‘Nannongyanhua’;‘红昌’‘Hongchang’;‘Q5-9’;‘Q5-10’;‘Albert Heijn’
- 蜂窝型-红色 Pompon type-red:‘赤 No. 1’‘Chi No. 1’
- 蜂窝型-绿色 Pompon type-green:‘南农绿云’‘Nannonglvyun’;‘南农追绿’‘Nannongzhuilv’;‘南农绿原’‘Nannonglv yuan’;‘南农思绿’‘Nannongsilv’;‘南农旋绿’‘Nannongxuanlv’;‘南农翠乒乓’‘Nannongcui pingpang’;‘南农绿星’‘Nannonglvxing’;‘南农豆绿’‘Nannongdoulv’;‘南农玉绒’‘Nannongyurong’;‘南农绿意’‘Nannonglv yi’;‘南农翠丽’‘Nannongcuili’;‘玛丽’‘Mali’;‘绿橄榄’‘Olive’;‘乡村音乐’‘Country’;‘绿球’‘Lvqiu’;‘浅绿大’‘Qianlvda’;‘小菊绿乒乓’‘Xiaojulv pingpang’;‘劳丽普绿’‘Laolipulv’;‘白钻’‘Baizuan’;‘Q3-4’;‘7111PG9HC’;‘852SGA117’;‘1511-0125-008’;‘HW5’;‘826MWA117’
- 蜂窝型-橙色 Pompon type-orange:‘莱克斯’‘Laikesi’;‘杰妮橙’‘Jeanny Orange’;‘4711PM9XC’;‘HW11’
- 蜂窝型-间色 Pompon type-secondary color:‘南农锦珠’‘Nannongjinzhu’
- 风车型-白色 Windmill type-white:‘南农白蝴蝶’‘Nannongbaihudie’;‘南农礼花’‘Nannonglihua’;‘南农小玉蝶’‘Nannongxiaoyudie’;‘南农沁风车’‘Nannongqinfengche’;‘Energy’
- 风车型-黄色 Windmill type-yellow:‘南农金蝴蝶’‘Nannongjinhudie’;‘黄风车’‘Huangfengche’;‘Q5-19’
- 风车型-粉色 Windmill type-pink:‘南农绽风车’‘Nannongzhanfengche’;‘南农雅风车’‘Nannongyafengche’;‘南农粉风车’‘Nannongfenfengche’;‘南农秀风车’‘Nannongxiufengche’;‘南农载风车’‘Nannongzai fengche’;‘南农恬风车’‘Nannongtianfengche’;‘Q5-16’
- 风车型-红色 Windmill type-red:‘南农火风车’‘Nannonghuofengche’
- 风车型-绿色 Windmill type-green:‘南农茑萝’‘Nannongniaoluo’
- 风车型-间色 Windmill type-secondary color:‘旭风车’‘Xufengche’;‘秀幔戴花’‘Xiemandaihua’;‘罗马假日’‘Luomajiarì’;‘憩风车’‘Qifengche’

- 风车型-双色 Windmill type-bicolor: ‘南农俏风车’ ‘Nannongqiaofengche’; ‘南农魅风车’ ‘Nannongmeifengche’; ‘南农丽风车’ ‘Nannonglifengche’; ‘南农紫云间’ ‘Nannongziyunjian’; ‘南农绿蝴蝶’ ‘Nannonglvhudie’; ‘南农玉蝴蝶’ ‘Nannongyuhudie’; ‘南农舞风车’ ‘Nannongwufengche’; ‘南农尘风车’ ‘Nannongchenfengche’; ‘南农霞风车’ ‘Nannongxiafengche’; ‘南农清风车’ ‘Nannongqingfengche’; ‘南农羞风车’ ‘Nannong Xiufengche’; ‘南农红袖’ ‘Nannonghongxiu’; ‘香槟粉’ ‘Xiangbinfen’; ‘舞动’ ‘Wudong’; ‘Q5-12’; ‘Starling’
- 复瓣型-白色 Double type-white: ‘爱之白1’ ‘Aizhibai 1’
- 复瓣型-黄色 Double type-yellow: ‘黑心金黄’ ‘Heixinjinhuang’; ‘黑心黄’ ‘Heixinhuang’; ‘佛瑞格黄’ ‘Furuige Huang’; ‘金星’ ‘Jinxing’; ‘4746MYAKC’
- 复瓣型-粉色 Double type-pink: ‘迷你中香槟’ ‘Minizhongxiangbin’; ‘爱之粉’ ‘Aizhifen’; ‘柔情’ ‘Rouqing’; ‘保拉鲁’ ‘Baolalu’; ‘粉红狂潮’ ‘Fenhongkuangchao’; ‘Q1-109’
- 复瓣型-紫色 Double type-purple: ‘南农紫珠’ ‘Nannongzizhu’; ‘劳丽普’ ‘Laolipu’; ‘748MP139’
- 复瓣型-红色 Double type-red: ‘弗兰克’ ‘Frank’
- 复瓣型-橙色 Double type-orange: ‘桔星’ ‘Juxing’; ‘爱之槲’ ‘Aizhibin’; ‘F-3’
- 复瓣型-间色 Double type-secondary color: ‘南农彩云间’ ‘Nannongcaiyunjian’
- 复瓣型-双色 Double type-bicolor: ‘14578’
- 松针型-黄色 Acicular type-yellow: ‘南农古笙’ ‘Nannonggusheng’
- 松针型-紫色 Acicular type-purple: ‘南农花火’ ‘Nannonghuahuo’
- 松针型-红色 Acicular type-red: ‘HW22’
- 松针型-绿色 Acicular type-green: ‘浅绿多娜’ ‘Qianlvduona’; ‘浅绿’ ‘Qianlv’
- 松针型-橙色 Acicular type-orange: ‘Q5-14’; ‘817SOA117’; ‘6106’
- 松针型-双色 Acicular type-bicolor: ‘813MRA117’

图版说明 Explanation of Plate

图版 I 1-7. 切花大菊的花型: 1. 莲座型; 2. 蜂窝型; 3. 芍药型; 4. 松针型; 5. 辐射型; 6. 荷花型; 7. 托桂型. 8-15. 切花小菊的花型: 8. 单瓣型; 9. 莲座型; 10. 托桂型; 11. 迷你型; 12. 蜂窝型; 13. 风车型; 14. 复瓣型; 15. 松针型. 16-24. 切花菊的花色: 16. 白色; 17. 黄色; 18. 粉色; 19. 紫色; 20. 红色; 21. 绿色; 22. 橙色; 23. 间色; 24. 双色. 25-32. 切花菊的叶型: 25. 正叶; 26. 深裂正叶; 27. 长叶; 28. 深裂长叶; 29. 圆叶; 30. 葵叶; 31. 蓬叶; 32. 反转叶.

Plate I 1-7. Flower types of standard cut chrysanthemum: 1. Incurve type; 2. Pompon type; 3. Peony type; 4. Acicular type; 5. Radiation type; 6. Lotus type; 7. Anemone type. 8-15. Flower types of spray cut chrysanthemum: 8. Single type; 9. Incurve type; 10. Anemone type; 11. Mini type; 12. Pompon type; 13. Windmill type; 14. Double type; 15. Acicular type. 16-24. Flower colors of cut chrysanthemum: 16. White; 17. Yellow; 18. Pink; 19. Purple; 20. Red; 21. Green; 22. Orange; 23. Secondary color; 24. Bicolor. 25-32. Leaf types of cut chrysanthemum: 25. Normal leaf; 26. Deeply cleft normal leaf; 27. Long leaf; 28. Deeply cleft long leaf; 29. Round leaf; 30. Sunflower leaf; 31. Basil leaf; 32. Reversed leaf.

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图版 I

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Plate I



See the explanation at the end of the text