The Role of Dialogue and Networking on Chrysant Shuttle Breeding Programme: Evaluation on F1 Population of Shape and Colour of Chrysant (*Dendranthema grandiflora* Tzvelev)

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Abstract

Different from other crops, working on ornamental plant breeding depends on the preference of consumer. The performance of cut flower, especially chrysant, is determined by the type, quality, shape, size, colour, resistance to pest and disease, etcetera.

In shuttle breeding programme on chrysant that was conducted by Research Institute of Ornamental Plant (RIOP) Indonesia, consumers were involved to select the prospective flowers to be released as new variety. We therefore must maintain the closely relationship amongst scientist, farmers, farm entrepreneur, floristry or hobbyist, through the routine dialogue. This dialogue is realized at least every six month, especially on the occasion of "variety selection preferred by consumer" programme. Of these "selected varieties", the ornamental plant breeder will improve them by other novel characters, like the resistance to pest and disease, etcetera. In order to prevent the similar/ overlapping work, the networking between RIOP and universities (IPB, UNPAD, UNIBRAW, etc.) were established, even with related institutions abroad, like MINT (Malaysia) and IAEA (Vienna).

The evaluation of this research resulted that the most preferred flower colour selected were white, bright yellow/ yellow, pink, purple/ light purple, orange, peach and bright red. For flower shape, spray single still dominates the consumer's preference.

Based on this research experience, it can be concluded that the dialogue and networking established between breeder and consumer play an important role in ornamental plant breeding. It really influences the type of variety that will be released as new cultivars.

Key Words: Selection, Chrysant, Shuttle Breeding.

Introduction

Floriculture refers to cultivating and trading of flowers, ornamental plants, bulbs, turf grass and other related horticultural specialities for ornamental purposes and to protect the environment from pollution. In past, these requirements were met from homegrown plants but with increasing urbanization and accelerated income level; demand for floricultural product has grown up. This development has led to the emergence of floriculture sector as an important segment of the trade.

Chrysant is the popular ornamental plant in Indonesia, and being one of the main representatives of cut flowers beside rose, carnation and lily. The flowers are used for gifts, special occasions, home decoration and institutional needs. Shape, size, colour, scent of flowers and products with long vase-life receive due consideration (Singh, 2001).

In Indonesia, chrysant produced by farmers has conservative colour, i.e. white, yellow and red. The limited range of flower colour and shape usually constrict the creation of flower designer. Providing the various colour and shape of flower is aimed to anticipate the change of consumer's preference (Marwoto, Sutater, Sanjaya and Setyawati, 1995).

Since 1999, RIOP (Research Institute of Ornamental Plant), Indonesia created "Shuttle Breeding Programme" for chrysant, in which public may involve the research by being a selector. To achieve the purpose of this programme, we develop the dialogue and establish the networking between RIOP and universities (IPB, UNPAD, UNIBRAW, etc.), ASBINDO (Indonesian Flower Association), even with related institutions abroad, like MINT (Malaysian Institute for Nuclear Technology Research), Malaysia and IAEA (International Atomic Energy Agency), Vienna.

Objectives

The objectives of the research were obtaining the type of chrysant, which was suitable and preferred by consumers based on criteria of flower shape and colour. The evaluation was also made to compare the offspring's' characters to their parent line. The materials resulted from this selection will be evaluated for continued breeding programme, or for preparation of releasing a new variety.

Methodology

Research method was individual plant selection, on F1 population of chrysant, produced by hybridisation between local parent and introduced parent. There were 10 lines, which were produced through hybridisation, utilized in this selection programme. Those lines used are as followed:

Table 1.
Ten Lines of Chrysant produced by Ten Crossing between Local and Introduced Parent Lines/Cv

Lines Code	Parent lines/cultivars	
	Female parent	Male parent
133	Town Talk	Retno Dumilah
150	Town Talk	Dewi Ratih
151	Klondike	891104
159	880077	891104
161	Statesman	Klondike
162	Rose Queen	Rose Queen (selfing)
163	Rose Queen	Klondike
164	Statesman	850140
165	Royal Happy	Klondike
166	Royal Happy	830132

The local parent were cv. 'Dewi Ratih', cv. 'Retno Dumilah', lines no. 880077, no. 891104, no. 850140 and no. 830132, whereas the introduced one were cv. 'TownTalk', cv.'Klondike', cv.'Rose Queen', and cv.'Royal Happy'. These 10 crossing had been conducted in previous research. Each line has very various number produced by hybridisation methods. It was ranged from 12 to 163 plants per line, and become more than 700 plants that have to be selected.

Consumers (as selectors) were invited when the flowers bloomed, to select the flowers based on shape and colour they like. This method was done by giving a label with different colour for each

selector. Selectors consist of researchers of RIOP, university students, grower from Holland, and growers from ASBINDO. Every flower, which obtained label become "selected flower" and characterized for breeding purpose. The evaluation was also made to compare the performance of the offsprings to their parents. Characterization was done towards each selected plant. The petal colour was matched with the Royal Horticultural Colour Chart.

Result and Discussion

The research of chrysant is still continued and developed to produce new varieties with stressing in more interesting flower shape and colour aspect. All the present-day colourful chrysant are the result of hybridization, spontaneous and induced mutations and selections (Datta, Chakrabarty, and Mandal, 2001). According to Harjadi (1989) selection method can be used to obtain the various flower colour, shape and other novelty traits.

Vegetative Traits

Vegetatively, each offspring has quite high variation, shown by the graph of distribution of plant height frequency (Fig. 1) and stem diameter (Fig. 2), case for line no. 133.

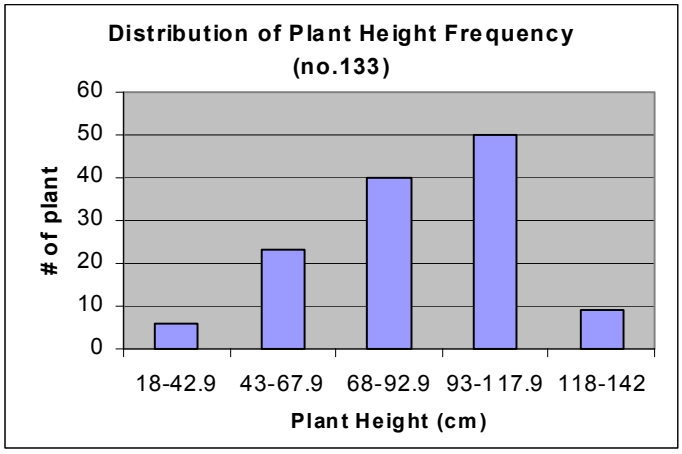

Figure 1. The Distribution of Plant Height (case for line no.133)

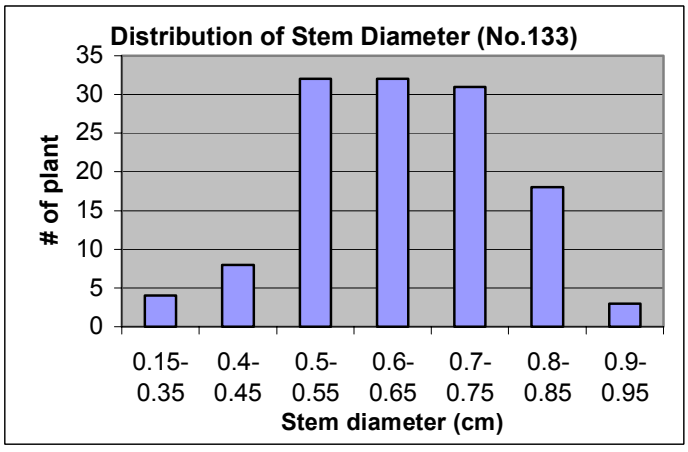

Figure 2. The Distribution of Stem Diameter (case for line no.133)

For other lines, the distribution pattern of plant height and stem diameter are quite similar to number 133, due to the genes segregation from each parent.

Flower Colour

Of each parameters evaluated, it was clearly define that from a single crossing, produced genotypically different offsprings for flower colour trait. It was caused by segregation, since chrysant is a highly heterozygous plant, which can be easily segregated into different genes structure. In addition, the new colour of flower are also due to reshuffling of histogenic layers, in which each layer has its own genes structure and dominancy that phenotypically influence the colour of petals (Datta, 2001).

Selection done in this research has also shown the tendency of the offspring characters to their parent's. Following table shows plant number of each line, number of selected plant, the variation of flower colour of each line (compare to their parent's colour) and the flower colour of selected plants.

Table 2. The Number and Variation of Flower Colour of Selected Plants

No. Line	Number of plants	Number of selected plant	FC* of male parent	FC* of female parent	FC* of offspring (lines)	FC* of selected plants
133	127	11	yellow	pink	yellow,white,pink,red, orange,purple,cream	7 white,4 yellow
150	36	4	yellow	purple	white,cream,yellow	2 white, 2 yellow
151	39	4	orange	yellow	pink,white,yellow, orange,red	2 pink,1 yellow, 1 purple
159	93	12	peach	yellow	pink,orange,red,peach yellow,purple,white	2 purple, 1pink 1yellow,1peach 4 red, 3 orange
161	95	12	white	orange	yellow,orange,white, pink,red	7 yellow,4 orange, 1white
162	74	3	pink	pink	pink,white,purple, orange,yellow	1pink,1 white, 1 purple
163	41	5	pink	orange	purple,pink,red,white, orange	3 purple,1 pink, 1 orange
164	163	35	white	red	yellow,white,pink, orange, red,purple	13 yellow,1 red 16 white, 2 pink 1ornge, 2 purple
165	12	2	purple	orange	purple,orange	2 purple
166	36	2	purple	pink	pink,white,cream,red	1 pink,1 white

*) FC : flower colour

Data on Table 2. shown that that the most preferred ray colour selected by the consumers were bright yellow/ yellow, white, purple/ light purple, orange, pink and bright red.

Flower Shape

The flower shape of line number 150, 151, 162, 163, 165 and 166 are all spray-single. No.159 has two shapes: spray-single and spray-double. The shape of line no.133, 161 and no.164, are more various i.e. spray-single, spray-double, and semi-decorative, with tubular petal (no.161 and

no.164) and pompon (no.164). But the most preferred shape selected by the selectors is spray-single (appendix 1.)

All 90 selected plants were characterized for their generative traits, as can be seen on Appendix 1. The following test would be done is multilocation test, which is again, utilizing the nurseries land that being part of this networking frame. Several different altitude and microclimate of nurseries will be used to examine the adaptability and resistance of those 90 selected lines towards the specific circumstance, pest and disease.

This one cycle of breeding programme will be repeated in order to obtain better characters of each selected line from previous cycle. That is why this program was called as "shuttle breeding programme". Any improvement from each cycle will be resulted by breeding treatment, but determined by consumer's preferences.

Once the selected line proved its novelty traits that required by the consumers, it can be registered as a new variety released by RIOP and its related counterpart. We can see here, how necessary and fruitful cooperation can be built through the dialogue and networking amongst us.

Conclusion

The evaluation resulted that the most preferred ray colour selected were bright yellow/ yellow, white, purple/ light purple, orange, pink and bright red. For flower shape, spray single still dominates the consumer's preference.

The dialogue and networking established between breeders and consumers play an important role in ornamental plant breeding. It really influences the type of variety that will be released as new cultivars.

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Appendix 1. Characterization of Some Selected Chrysant Lines

No. Line	Stem φ	Flowr φ	Petals #	Disk #	Flower type	Vas life	Flower colour
159.79	0,81	4,8	27	290	spray/single	10	pink
166.14	0,57	4,72	26	164	spray/single	12	pink-peach
162.7	0,75	5,05	21	209	spray/single	14	pink
133.50	0,75	4,68	24	187	spray/single	8	white
161.56	0,695	3,2	61	229	spray/double	13	orange
164.18	0,51	1,95	51	112	spr.dbl.small	5	pink
161.74	0,98	3,72	164	218	spray/double	8	orange
133.67	0,95	4,1	22	147	spray/single	8	bright yellow
164.110	0,55	2,76	6	50	spray/double	10	white
133.87	0,86	5,1	31	184	spray/single	10	pure white
133.57	0,85	6	26	142	spray/single	14	yellowish white
161.1	0,4	2,85	75	258	spray/single	8	yellow
161.26	0,55	3,1	143	27	semidecortve	12	white
159.20	0,95	5,1	23	287	spray/single	12	pale yellow
159.30	0,92	3,65	21	234	spray/single	11	light orange
164.88	0,7	3,6	92	34	spray/single	12	purplish white
159.39	0,82	5,9	30	246	spray/single	11	bright red
133.95	0,315	6,6	102	82	spray/double	11	bright yellow
150.1	0,92	4,75	27	269	spray/single	12	bright yellow
151.22	0,94	5,02	29	161	spray/single	12	bright yellow
164.81	0,75	3,4	136	50	semidecortve	11	bright yellow
164.144	0,92	3,4	116	20	semidecortve	13	white
133.88	0,75	5,75	34	245	spray/single	12	greenish white
163.28	0,92	4,48	31	23	spray/single	14	purple
164.21	0,52	2,2	93	102	semidecortve	12	white
164.100	0,61	2,38	55	161	spray/double	12	yellow
164.51	0,75	3	59	121	double spoon	8	yellow
161.91	0,65	4	77	147	double spoon	12	bright yellow
159.67	0,71	5,5	20	305	spray/single	13	bright red
164.28	0,52	2,1	153	29	semidecortve	11	white
133.13	0,82	5,2	22	167	spray/single	11	white
151.13	0,75	7,85	29	182	spray/single	11	light yellow
133.5	0,58	5,25	21	209	spray/single	12	yellow
150.28	0,7	5,5	27	143	spray/single	8	white
162.46	0,7	6,2	37	153	spray/single	12	pinkish white
150.15	0,6	5,4	32	196	spray/single	13	greenish white
164.66	0,5	2,5	69	100	spray/double	13	white
164.59	0,58	2,7	194	11	semidecortve	13	light red
164.121	0,68	3,1	95	45	semidecortve	7	pinkish white
151.31	0,7	3,14	123	36	spray/single	4	purple
161.69	0,7	5,07	116	184	spray/double	3	yellow
165.11	0,95	3,63	21	245	spray/single	13	purple
161.94	0,62	4,21	154	241	spray/double	3	yellow
159.4	0,95	4,95	31	264	spray/single	12	peach