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THE QUALITY IMPROVEMENT OF TWO TYPES OF *Crysanthemums* WITH BAMBOO-LEAVES BASED ORGANIC FERTILIZER

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ABSTRACT

Crysanthemum is a decorative plant with high economical value. The main problem of chrysanthemum growers in Yogyakarta is the low quality of the flowers, characterized by low erectness and brightness of flowers, spots on flowers and leaves, and less-than-maximum flower sizes due to pests and diseases. One attempt to improve the lack of erectness of Crysanthemum is the provision of Si (silica). Organic Si can be obtained from fertilizer made from bamboo leaves. This study aims to determine whether bamboo-leaves based organic fertilizer could improve the quality of the two types of chrysanthemums. The study was conducted from March to August 2015 in the village of Panggeran, Hargobinangun, Pakem, Sleman, Yogyakarta and Production Laboratory of Institut Pertanian INTAN Yogyakarta. The design of treatment used was split plot with a completely randomized design. Treatments of main crysanthemum plot consisted of: spray and standards; treatments of organic fertilizer as subplots consisted of: cow manure, rice huskcharcoal, bamboo leaf compost and bamboo leaf charcoal, 3 kg / m2 each. Variables observed were color of flowers and flower quality: erectness, freshness, diameter of stem and others. The color data were obtained by vhromameter, values of CIE L * a * b * were converted to RGB and then descriptively analyzed. The quality data besides color variants were then analyzed by 5%-Duncan test. The results showed that bamboo-leaves-based organic fertilizer produced brighter yellow colors on spray type compared to treatment of manure and rice husk charcoal,. Organic fertilizer products gave the same quality. There were differences in the appearances of the two types of chrysanthemums.

Keywords: type of chrysanthemums, organic fertilizer, bamboo leaves, quality, erectness.

1. INTRODUCTION

Chrysanthemum sp is an ornamental crop of high economic value and much needed in community along with increasing public welfare. Demand for ornamental plants including chrysanthemums increases every year. Chrysanthemum demands in Yogyakarta reached 5,000 sheaves/ week (250.000 sheaves/ year) with a Rp 10.000-15.000 /sheaf per annum with 10-12 stalks per sheaf. Local Yogyakarta can only fulfill 30% of the needs while 70% are still supplied from outside the region (Bandungan, Pasuruan, Malang) (Rustijarno, 2014). That number increased dramatically at certain times, such as New Year, Christmas and Eid.

The main problem in Yogyakarta chrysanthemum flower growers in meeting market needs other than production is the poor quality of the flowers, characterized by erectness and the low brightness of flowers, spots on flowers and leaves, as well as the less than optimum sizes caused by pests and diseases. One attempt to improve the lack of erectness and resistance to biotic and a biotic stress is through the provision of Si (silica). Si has a positive effect on the resistance to pests and diseases, and also increases yields through improved efficiency of photosynthesis. The direct effect of Si is increasing plant resistance to biotic and abiotic stress(Matichenkov & Calvert, 2002).

Organic Si can be obtained from an organic fertilizer made from rice husks and bamboo leaves.Bamboo leaves are very abundant and have not been used optimally in Sleman, especially Pakem which is also one of the centers of chrysanthemum in Yogyakarta. Bamboo-leaf ash has a higher Fe content than rice Hulk. Bamboo-leaf ash is composed of $Si0_2$ 75, 90 %, Al_2O_3 4,13 %, Fe_2O_3 1,22 %,CaO 7,47 %, MgO 1,85 %, and K_2O 5, 62 % while rice husk ash Fe_2O_3 is composed by 0,95 %, SiO_2: 67, 30 %, CaO 1,36 %, Al_2O_3 4,90 %, MgO: 1, 81 %; LOI: 17,78 (Nasih, 2011). This study aims to determine whether a bamboo-leaf based organic fertilizer improve the quality of the two types of chrysanthemums.

2. LITERATURE REVIEW

Today's chrysanthemums are highly evolved flowering plants. A member of the Asteraceae (Compositae) family, the *Chrysanthemum* is related to dahlias, sunflowers, marigolds, zinnias, and cosmos. The placement of the florist chrysanthemum in this genus was very contentious. The genus *Chrysanthemum* once included more species, but was split several decades ago into several genera, putting the economically important florist chrysanthemum in the genus *Dendranthema*. The placement of the florist chrysanthemum in this genus was very contentious.

Chrysanthemums' colours vary, but white and yellow are favoured by consumers. Chrysanthemums marketable as cut flowers are characterised by long and strong, sturdy stems, spotless bright colour, optimum size, and without any disturbance from organisms.

Quality improvement can be done by temperature and lighting arrangement (quality of light and length of illumination), fertilization and choice of planting medium. Administration of organic fertilizer containing Si such as husk charcoal, bamboo-leaf compost or bamboo-leaf charcoal for planting medium benefits positively for chrysanthemum. For sugar cane, Si can induct resistance of biotic stress, reducing probability of collapsing and restoring leaf and stem erectness, also increasing

efficiency of water usage (Matichenkovand Calvert, 2002; Yukamgo and Nasih, 2007). Research result for bougenville showed that combination of Si and K were able to increase diameter and hardness of flower stem, were also able to increase flower shelf life. 100 kg/Ha dosage of K and 11, 2 kg/ Ha of Si resulted in longest bougenville shelf life of 6, 3 days (Suyono, dkk, 2013).

3. MATERIAL ANDMETHODS

The study was conducted at flower's plastic house inPanggeran, Hargobinangun, PakemSleman Yogyakartaand Production Laboratory ofInstitut Pertanian Yogyakarta from March 2015 until August 2015. Chrysanthemum cuttings materials are Stalkon (spray type) and Fiji variety (standard) obtained fromPakem nurseries, Sleman, Yogyakarta, compost and bamboo-leaf charcoal, rice husk charcoal, cow manure, chromameter (*Kamera Konica Minoltameasured heat; tipe CR-400 head*).

The study used a 2x4 factorial design treatment, arranged in a split plot design with the completely randomized design environment in a flower house made of bamboo, covered in UV (ultraviolet) plastic complete with ± 250 $m^2$of extensive lightings. Treatment done to two types of chrysanthemum flowers were standard (single flower) and spray (multiple flowers) as the main plot and treatment of organic fertilizer as subplots consisting of: cow manure 3 kg/m^2 (Anonym, 2006), rice husk, bamboo-leaf compost and bamboo-leaf charcoal 3 kg/m^2each. Areas of each plot were 5 $m^2$with planting space of 10x10 cm each.

Samples were taken randomly to observe: Color of flower, erectness (droop angle) and robustness of the stem, the moisture content of the stem (%), freshness of flowers (day), diameter of flowers (mm) and length of the stem (cm), diameter of flowers (cm), presence or absence of pest attack. The flower colors were obtained by chromameter, done in Genetics Laboratory, Faculty of Agriculture, Universitas Gadjah Mada. From chromameter measurements, L*a*b* values obtained then being converted to R (*red*), G (*green*) and B (*blue*) with L*a*b* to RGB conversion formula. From RGB values, difference between treatments could be calculated by comparingΔE values.Qualitative deifinition of RGB obtained for each flower can be calculate by finding the nearest RGB distance from flower to RGB definitions from Azalea (Rsn, Gsn, Bsn) fan 1 - 4 (Azalea org, 2007). Erectness could be tested by putting flower in a vase filled with oasis and water then measuring the drop angle to horizontal line; stem sturdiness measured by comparing stem length(cm) and diameter (mm); freshness (day) was the number of days passed until flowers wilted; pests and diseases attacking the fresh cut flowers. The moisture content data was square transformed then together with others quality measurements except colors tested with Duncan's Multiple Range Test.

4. RESULT AND DISCUSSIONS

Result of colour testing in Table-1 shown that different treatment of fertilizers didn't effect the brightness of standard yellow chrysanthemum RHS 160 A, UCL 87 *moderate yellow* and standard white crysanthemum RHS 156 B, UCL 93 *yellowish gray*. In spray type, different treatments on fertilizers didn't affect brightness on white chrysanthemum RHS 155 C, UCL 153 *greenish white* but affected yellow ones. Flowers fertilized by bamboo-leaf charcoal and bamboo-leaf compost had brighter yellow compared to cow manure and rice husks fertilized flowers, shown by higher L* and B* values. Effects on bamboo-leaf based compost and bamboo leaf based charcoal on brightness just being observed on spray type flower, this was assumed to be caused by Silica from bamboo leaf based fertilizer. Also assumed that flowers from spray-type to be 5-6 stalks with small-sized blossoms with less petals and moisture content, causes Si to accumulate, with brighter reflection. Different from standard type, although there's only one big blossom with a lot of petals and higher moisture content results in lower accumulation of Si on petals.

Bamboo leaf compost and charcoal, rice husk charcoal gave stem erectness and robustness, moisture contents, diameter and length, flower diameter and strength against pests and diseases that comparable to cow manure. Cow manure gave longer lasting freshness by two days compared to other kinds of fertilizers. Moisture contents, N, P and K contents of cow manure were higher compared to bamboo leaf or rice husk charcoal based fertilizer resulted in higher water reserve in cell vacuoles. Lack of N, P, and K would result in lower production and quality of chrysanthemum. Bamboo leaf and rice husk charcoal based fertilizer would give the same quality by 3 kg/m^2 dosage but for longer lasting freshness higher dosage is needed.

The adding of Si could decrease the speed of water transpiration; strengthen epidermis cell walls so that it could halt transpiration, making water catchment less. Based on research done by Yohana *et al* (2013) on rice, dosage of agrosil silica and rice husk ash had significant result on ground pH and maximum child bulbs. Accumulated silica on leaves of rice would make leaf staying erect, helping in catching sunlight for photosynthesis and translocation of CO2 on pinacles, maximizing role of P. Si could strengthen stems, making it standing tall and erect, likewise for leaves, increasing resistance to pests and diseases, strengthening the network, reducing falls and fixing erectness of leaves and stems, as well as improving efficiency of water use (Yukamgodan Nasih, 2007).

There were differences in performance between standard and spray-type chrysanthemums. Standard chrysanthemums hadbigger stem diameter stems and larger flowers, high moisture content, but shorter in height. Spray-types had an average number of 5 flower stalks for each plants, smaller stems and flower diameter, andless moisture content. The freshness length of standar type is 4 days shorter than the spray type because of large flower sizes and big number and tight configuration of petals, as well as the lower accumulation of Si on flower petal, accelerating evaporation.

Pest moth and leaf rust disease attacking less than 1% of plants could be controlled manually in conjunction with bunching of leaves, and chemically with pesticides so that the quality of the drop won't be affected. There are no pests and diseases in crops of chrysanthemums, because of intensive control during crop growth and the generative phase, maintained sanitation and environmental conditions that do not favor the development of the cause of the disease. UV plastic houses and walls paranet create optimal growing environment and protecting of plant pests (Anonymous, 2006).

Table-1. RGB values converted from L*a*b* obtained from two types of yellow Chrysanthemum on treatment of organic fertilizer.

Flower type	Treatment	Mean R	Mean G	Mean B	RHS	UCL	UCL Color	Δ
Spray	Cow manure	224,87	216,54	65,28	1B	98	Brilliant Greenish Yellow	18,48
	rice huskcharcoal	216,23	207,43	59,23	1B	98	Brilliant Greenish Yellow	19,46
	Bamboo leaf compost	216,08	208,86	75,25	7D	101	LightGreenish Yellow	17,20
	Bamboo leaf charcoal	222,53	213,64	75,42	7D	101	Light Greenish Yellow	16,61
Standard	Cow manure	171,60	162,42	69,19	161A	87	Moderate Yellow	30,18
	rice huskcharcoal	183,27	172,5	68,08	160A	87	Moderate Yellow	21,24
	Bamboo leaf compost	185,87	173,67	66,26	160A	87	Moderate Yellow	19,31
	Bamboo leaf charcoal	194,11	183,35	76,61	160A	87	Moderate Yellow	18,31

Exp.: RHS: Royal Horticulture Society
UCL: Universal Color Language Chart

Table-2. Quality of Chrysanthemums on treatment of organic fertilizer.

Variables of quality	Organic fertilizer			
	Manure	Husk	Bamboo leaf charcoal	Bamboo leaf charcoal
Droop angle(°)	94,05 a	94,61 a	92,78 a	91,77 a
Erectness of stem	18,24 a	18,02 a	16,93 a	16,82 a
Moisture content of stem %	77,35 a	79,07 a	79,43 a	79,56 a
Freshness (hari)	15,17 a	12,33 b	13,17 b	13,00 b
Diameter of stem (mm)	4,49 a	4,69 a	4,53 a	4,54 a
Height of plant (cm)	82,88 a	82,56 a	80,48 a	79,74 a
Diameter of flowers (mm)	82,88 a	82,56 a	80,48 a	79,74 a

Exp.: Values followed by similar letter have similar values on Duncan test 5%

Table-3. Variables of quality in two types of Chrysanthemum on organic fertilizer.

Flower type	Droop angle of stem (°)	Stem erectness	Moisture content of stem %	Freshness (day)	Diameter of stem (mm)	Height of plant (cm)	Diameter of flower (mm)
Standard	93,28 x	15,02 y	79,59 x	11,67 y	4,68 x	69,62 y	107,12 x
Spray	93,33 x	20,07 x	72,95 y	15,67 x	4,45 y	89,45 x	55,72 y

Exp.: Values followed by similar letter have similar values on Duncan test 5%

Organic fertilizer made from bamboo leaves produced brighter yellow color (RHS 7D/ UCL 101) compared to manure and rice husk treatment (RHS 1B/ UCL 98). Treatment of organic fertilizer resulted in same

quality of chrysanthemums. There are differences in performance of the two types of chrysanthemums.

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