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Improvement in quality of chrysant pot (*chrysanthemum sp.*) with daminozide and disbudding application

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The quality of pot chrysanthemums is determined by plant height and flower diameter. To improve the quality of chrysanthemum pot, the application of daminozide and disbudding (removing the bud of new flowers) was used. Daminozide applications with inaccurate concentrations and incorrect timing of disbudding could make the chrysanthemums were not meet the quality standards. The right daminozide doses concentration level and proper time of disbudding will increase the quality chrysanthemum pot. This research aimed to study the interaction between daminozide concentration and disbudding applications on the quality chrysanthemum pot. The research was conducted from January until April 2017 and located in Tutur Village, Sub-district Pasuruan, and East Java on altitude 900 meter above sea level (m.a.s.l.). Temperature in daily average was 24^{o}C. This research was using factorial randomized block design. The first factor is daminozide concentration and the second factor is disbudding periods. Chrysanthemum seeds were using Time Jewel variety. Observation parameters consist of plant height, time of initiation, colouring, and harvest, flower diameter, and vase life. The results of research showed that daminozide concentration and disbudding periods were not significantly affect on parameter initiation, coloring, harvest, and flower diameter, but significantly affect on vase life. The daminozide concentration 8000 ppm and disbudding 7 days after initiation has freshness of 7 days longer than without disbudding. Daminozide concentration 8000 ppm was having faster initiation time than plants untreated with daminozide application. Disbudding 7 days after initiation performed coloring and harvest age 1 week faster, with flower diameter 5 cm higher than control.

Keywords: Chrysanthemum pot, Daminozide, Disbudding, Flower Diameter, Plant height.

INTRODUCTION

Chrysant (*Chrysanthemum* sp.) is a popular ornamental plant. Chrysanthemum as potted plants has some advantages than the others potted plants such as, flowering time that can be regulated so it can be produced on year-round, various type of flowers, and easy to take care (Indah et al., 2015). Pot chrysanthemumsstandart type is very popular and high demand, because it has a wide flower diameter 6-8 cm..In the PT. Wahanakharisma Flora, pot chrysanthemumssales between June until August 2015 were high as many as 6000-12000 pots, while in theCondido Agro KbU, in July until September 2016 sales of pot chrysanthemum each week could reached ± 1500 pot (Ni'mah, 2016). Thepot chrysanthemums business opportunities can be done by producing quality chrysanthemum, The determinant of the quality of pot chrysanthemums flowers is plant height, that is balanced with the height of pots, with flower diameter 8-10 cm. Crater (1992), explained that the height of chrysanthemum have to balanced with the height of pot. For the ideal size of pot

chrysanthemums is 2 to 2.5 times the height of pot. Efforts should be made to suppress the growth of chrysanthemum and forming the flowers with the appropriate diameter by using the retardant such as, daminozide and removing the undesirable flowers (disbudding). However, the application of daminozide with concentration of 8000 ppm and the absence of disbudding of flowers showed that many plants were not met the standard quality of chrysanthemum pot, which has height of more than 30 cm with a diameter 5-7 cm. Therefore,this study aimed to determine the daminozide concentration and the right time of disbudding on the growth of chrysanthemum pot

MATERIALS AND METHODS

This research was conducted in Tutur, Pasuruan, East Java on the altitude 900 m.a.s.l with daily average temperature 24^{o}C from January 2017 until April 2017. The research material consisted of chrysanthemum with Time jewel (white cream) variety, height ± 10 cm, daminozide with concentration 0 ppm, 4000 ppm, and 8000 ppm, cocopeat planting medium, and cow manure (2: 1), AB nutrient, pesticide (Samite, Dursban, Kardan, and Antracol). The tools that were using in this research consist of pot diameter 16 cm, height 12 cm, sprayer, hose brooch, drip installation, ruler, stationery, and camera.

The chrysanthemum seedlings were planted in the middle of pot with upright position. Chrysanthemum seedlings are taken from Mother Plant (MP) cuttings that have been rooted for 10-12 days. The longday phase starts from 0 dap until the lateral shoots come out from the armpit leaves 2-3 cm after bud pinching. Additional light were given from 24.00 to 06.00 WIB which is arranged automatically. While the short day phase happened when the lateral shoots are formedin the armpit leaves 2-3cm until the plant is ready to be harvested. Watering and fertilization were done every two days by fertigation. Daminozide was given on plants at 2 week after planting (wap) and when the initiation of flower (± 6 wap). The application of pesticides were done 3 times a week, based on the pests and diseases

This research were using Factorial Randomized Block Design, which consists of two factors. The first factor wereDaminozide concentration: (1) K1 (Daminozide concentration 0 ppm), (2) K2 (Daminozide concentration 4000 ppm), and (3) K3 (Daminozide concentration 8000 ppm). The second factor were the timing of disbudding: (1) T1 (without disbudding treatment), (2) T2 (7 days after initiation), and (3) T3 (14 days after initiation). Thus, there were 27 experimental unit.

The variable observation of generative growth were flower initiation age, coloring age, flower diameter, harvest age, and vase life. The observations were conducted by taking 3 plant samples for generative growth. Observations begin at 21 days after planting (dap) with 14 days observation interval until harvest. Data were analyzed using variance analysis. If there are significant difference then continued with honestly significance difference (HSD) test.

RESULTS

The quality aspect onornamental plants is appearance. These components include several aspects such as size, shape, color, and age. Islam and Joyce (2015), stated that ornamental plant products in the economic context, is very important in maintaining the plant quality, which is determined by an acceptable quality based on consumers satisfaction.

Parameter observation ofpot chrysanthemums quality in this research consist of plant height, flower initiation age, coloring age, harvest age, flower diameter and vase life. There were nine treatments combination, that is daminozide concentration and disbudding time did not show any interaction on plant height parameter, flower initiation age, colouring age, harvest age, and flower diameter. While the vase life parameter shows the existence of interaction.

The observation of plant height was done by measuring the height of the plant from the first leaf that grew up to the growing point, indicating that there was no interaction between the two treatments, but the daminozide application had significant effect on the plant height (Figure 1). While the treatment time of disbudding has no significant effect on plant height. Plant height is the most important on plant growth indicator in the quality of potted plants. Plant height is influenced by growth regulators. Marshel et al., (2015), stated that plants can be used as potted ornamental flowers will need a reduction in plant height without reducing the quality and beauty of the plants that were done with the application of growth inhibitors (retardant). Daminozide is a growth regulator, thatused to suppress the growth of many plants (Kofidis et al., 2008).

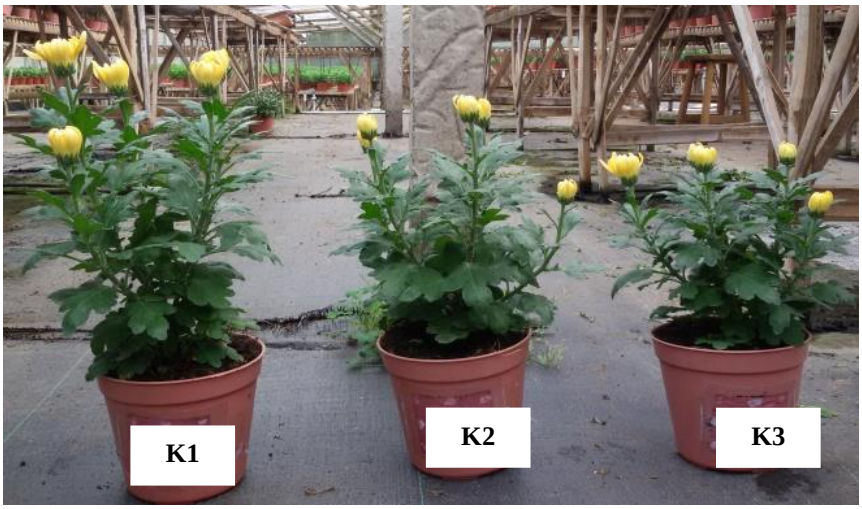


Figure 1.Plant height appearance on different concentrations of Daminozide (Daminozide 0 ppm (K1), Daminozide 4000 ppm (K2), and Daminozide 8000 ppm (K3))

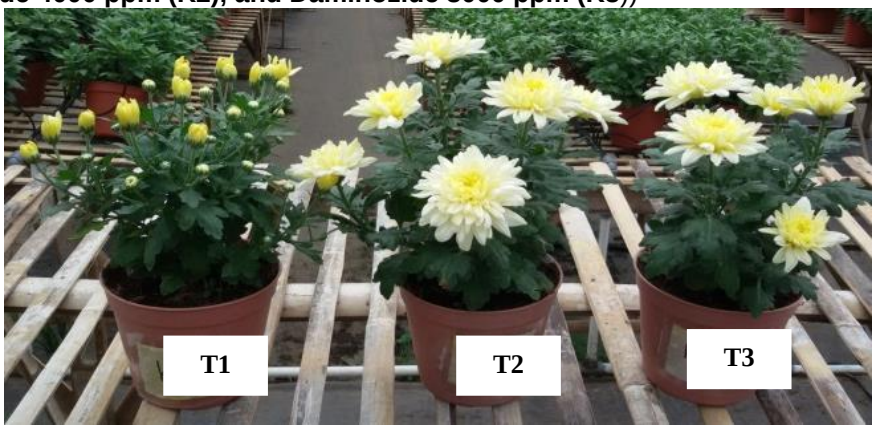


Figure 2.Chrysanthemum appearance on difference time of disbudding (Without disbudding or control (T1), disbudding 7 dai (T2), disbudding 14 dai (T3))

Daminozide is the first chemical that used to inhibit plant growth (Basra, 2000). The research of Hashemabadi et al*.*, (2012), showed that the application of optimum daminozide concentration can decreased the plant height, improve the quality of flowers, and increase the amount of essential oil in chrysanthemums. In this study, the application ofdaminozide causes lower plant height as the level of daminozide concentration increases (Figure 3). The research of Runtunuwu et al*.,* (2011), showed the provision of retardan such as paclobrutazole on higher concentrations could decrease the plant height. Pinto et al*.*, (2005), stated that daminozide application also showed the same result that is capable of reducing the length of internode and the height of Liliput (*Zinnia elegans*). Crater (1992), stated that the ideal plant height of pot chrysanthemums is 2-2.5 times of the pot height. The standart plant height in this research was 12cm, with an expectation that the appropriate chrysanthemum height is 24-30cm. Daminozide with concentration 4000 ppm has an ideal average plant height 24.33cm which is significantly different from the concentration 8000 ppm with height 19.57cm.

The flower initiation age was observed when the plants began to form the flower buds. The daminozide applications had a significant effect on the age of flower initiation. While disbudding treatment had no significant effect on the age of flower initiation. The growth of flower was observed from the initiation of flower buds until flowers are perfectly formed (Hidayat, 2010). The result of this research showed that daminozide with concentration of 8000 ppm (control) has the fastest initiation age and the plants without daminozide applications have the slowest initiation age. The higher daminozide concentration will accelerate the age of flower initiation (Figure 4a). Daminozide could inhibit the vegetative growth by translocating photosynthate

for vegetative growth toward to generative growth, particularly to flower formation. Flower buds formation were having faster rates compared to the plants without application of daminozide (Timur et al., 2015). Plant growth regulator such as cycocel and daminozide are not only control the plant size, but also could stimulate flower buds formation (Lizawati, 2008). The research of Pinto et al., (2005) explained that daminozide tends to improve the process of translocation of photosynthesis and flowering that contributes to improving the quality of the plant

The observations of coloring age and harvest age started when primordial flowers were appearing colour of 25%. This research showed that the timing of disbudding had significant effect on coloring age and harvest age, but there were no significant effect on daminozide concentration. Cahyono (1999) stated that disbudding is the disposal of unwanted flower buds. Disbudding begins when the unexpected flowers begin to grow and ready to be thrown away without disturbing the crown flowers. To get a good quality of flowers, then this process must done when the flower budsas small as possible. The difference of disbudding timing is very influential on the color of flower, harvest age and flower diameter. In this study, disbudding were performed at 7 days after initiation had the fastest colouring age and harvest age compared to control plants (Figures 4b and 4c). In Figure2, shows that the control have the slowest flowering phase compared to the other plants with disbudding treatment at 7 and 14 days after initiation. It happened because without disbudding treatment (control), it will have more than one flower of each branch, so the sinks will compete to get photosynthate, that caused the proportion ofeach plant organ are lower (Hopkins, 1995). Sarawa and Baco (2014),stated that photosynthate as result of photosynthesis will be distributedto the plant organsfor vegetative and generative growth. The ability of the source is produce photosynthetic and the ability of the sink is to accommodate photosynthate that greatly determines the high production of a plant.

Flower diameter is one of parameter on flower quality in chrysanthemums. Based on the results, daminozide concentration and disbudding time were not significant different on flower diameter. Timing of disbudding had significantly effect on theflower diameter. The pot chrysanthemums with disbudding treatment at 7 days after initiation had a larger diameter of flower than control (0 days after initiation) and the disbudding plant at 14 days after initiation (Fig. 4d). Syngenta (2015), stated that the removal of flower buds needs to be done on time so the quality of flowers are on the optimum performance, which is related to the translocation of photosynthetic. The research of Taiz and Zeiger (2010) in Sitompul (2015), stated that the partition of photosynthate from sources to sinks is influenced by many factors.

The first one is the source strength (leaves) that could produce photosynthate, and then it will be translocate to various sinks (plant organs) from vascular bundles, that connecting the sources to the sinks. The second is sink strength that drives the flow of photosynthesis, the amount of sinks are associated with photosynthate competition, and the third is molecules that act as signals. The factor that influences the partition of photosynthate is the competition between sinks such as vegetative and generative organs that will compete in obtaining photosynthate. If the numbers of sinks are fewer, the level of competition will be lower. Therefore, in this study the dibudding will left a few amount of flowers per plant, then partition of photosynthate will develop the flowers with larger diameter, compared without disbudding treatment. Figure 4d shows the difference in disbudding periods on the flower diameter.

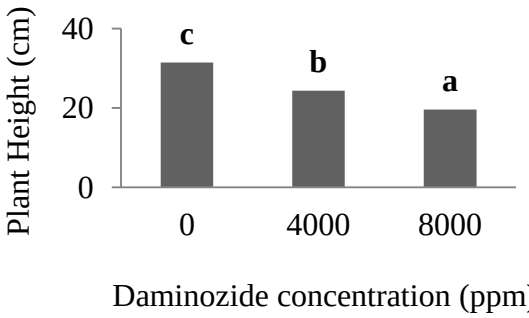
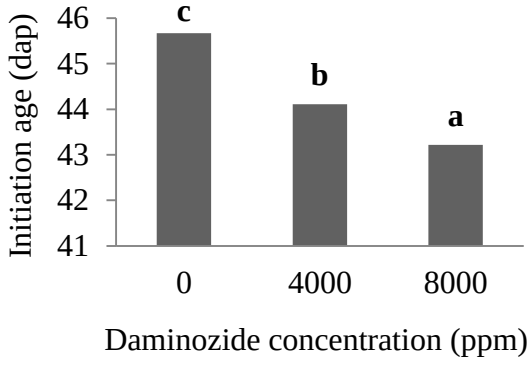


Figure 3.Plant height of pot chrysanthemum son the different daminozide concentration



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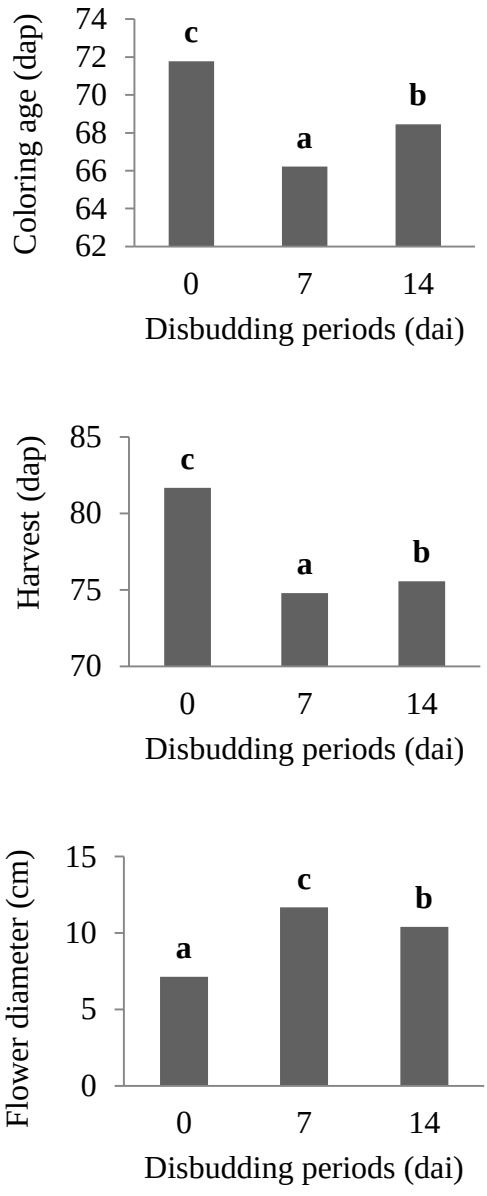

Figure 4.Flower quality. (a) Initial age; (b) Coloring age; (c) Harvest age; (d) Flower Diameter Pot Chrysanthemums on different concentration Daminozide

Long vase lives of flowers on pot chrysanthemum are indicated by flowers petal with 25% browning. In this study, the concentrations of daminozide and disbudding periods showed that there was a significant effect on the life of chrysanthemum pot. The daminozide concentration of 8000 ppm and the disbudding treatment at 7 days after initiation had7 days longer freshness than the without disbudding and daminozide application (Table 1). Long freshness of flowers is influenced by biotic and abiotic factors.

Table 1. Vase life of pot chrysanthemum on the various concentration of daminozide and disbudding periods.

Daminozide Concentration (ppm)	Disbudding Periods (dai)		
	0	7	14
0	15.00 a	22.33 c	22.33 c
4000	16.00 b	22.00 c	22.00 c
8000	16.00 b	26.67 e	25.00 d

Description : (*) = Numbers followed by the same letter at the same column showed no significant difference based on HSD test at level 5%., ppm = part per million, dai = days after initiation

Varieties is a biotic factor that affect the duration of flowers freshness on chrysanthemum,while abiotic factors that affect the duration of flowers freshness in pot chrysanthemum are long day, disbudding, and retardant application. According to Wattimena (1988), the physiological effects of the retardant are inhibiting the cell extension in sub apical meristem, shortening the plant segment, thickening the stem, preventing the lumber, blocking the etiolating, enhancing the root on the cuttings, inhibiting senescence, lengthening the shelf life, increasing fertilization ability, increase germination and shoots growth. Cahyono (1999), stated that type of disbudding in chrysanthemums is divided into standard type and spray type. Disbudding on spray type is in one branch of flower stalk are having more than one flower, while the standard type is in one branch of the flower stalk has only one flower. Disbudding on spray type will have short freshness time than the standard type. It caused by the number of flowers per plant. The more amount of flowers, the allocated photosynthate that divided on each sink organs (flowers) will be lower, so the plant will experience senescence quickly. While chrysanthemums with a standard type will only have one flower on each branch of the stalk, so the photosynthate that divided on each flower is higher, so the senescence of the plants will be slowly.

CONCLUSION

The daminozide concentration 8000 ppm and disbudding 7 days after initiation has freshness of 7 days longer than without disbudding. Daminozide concentration 8000 ppm was having faster initiation time than plants untreated with

daminozide application. Disbudding 7 days after initiation performed coloring and harvest age 1 week faster, with flower diameter 5 cm higher than control.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

Sitawati as the initiator of the research idea and reviewed the manuscript. and A. N. Ni'mah as technical implementation.

REFERENCES

Basra, A.S. 2000. Plant Growth Regulators in Agriculture and Horticulture. Haworth Press, Inc. New York. p 89-130

Cahyono, F.B. 1999. Seri Praktek Ciputri Hijau Tuntunan Membangun Agribisnis. Elex Media Komputindo. Jakarta. p 353 - 367

Crater, G.D. 1992. Potted Chrysanthemums Academic Press Inc. New York

Hashemabadi, D., S.R. Lipael., V. Shadparvar., M. Zarchini, and B. Kaviani. 2012. The Effect of Cycocel and Daminozide on some Growth and Flowering Characteristics of Calendula officinalis L., an Ornamental and Medicinal Plant. *Journal of Medicinal Plant Research*. 6(9): 1752-1757.

Hidayat, Y. 2010. Perkembangan Bunga dan Buah pada Tegakan Benih Surian (*Toona sinensis* Roem). *Jurnal Argikultura*. 21(1) : 13-20.

Hopkins, W.G. 1995. Introduction to Plant Physiology. John Wiley and Sons Inc. New York.

Indah, T., P. Dewanti, dan K.A. Wijaya. 2015. Pengaruh Konsentrasi Daminozide pada Pertumbuhan dan Hasil Tiga Varietas Tanaman Krisan Pot. *Berkala Ilmiah Pertanian*. Universitas Jember, Jember. 9 (10) : 1-4.

Islam, M.A dan D.C. Joyce. 2015. Postharvest Behaviorand Keeping Quality of Potted Poinsettia: A Review. *Research in Agriculture, Livestock And Fisheries*. 2 (2): 185-196.

Kofidis, G., A. Giannakoula., and I.F. Ilias. 2008.Growth, Anatomy and Chlorophyll Fluorescence of Coriander Plants (*Coriandrumsativum* L.) Treated with Prohexadione - Calcium and Daminozide. *Acta Biologica Cracoviensia.* 50 (2) : 55-62.

Lizawati. 2008. Induksi Pembungaan dan Pembuahan Tanaman Buah dengan Penggunaan Retardan. Jurnal Agronomi. 12 (2) : 18-22.

Marshel, E., M.K. Bangun., dan L.A.P. Putri. 2015. Pengaruh Waktu dan Konsentrasi Paclobutrazol terhadap Pertumbuhan Bunga Matahari (*Helianthus annuus* L.). *Jurnal Online Agroekoteknologi.* 3 (3) : 929-937.

Ni'mah, A. N. 2016. Budidaya Krisan Pot (*Chrysanthemum* sp.). Laporan : Magang Kerja. Fakultas Pertanian, Universitas Brawijaya, Malang.

Pinto, A.C.R., T..J.D. Rodrigues., I.C. Leite., J.C. Barbosa. 2005. Growth Retardants on Development and Ornamental Quality of Potted Lilliput (*Zinnia elegans* Jacq.). *Science Agriculture*. 62 (4) : 337-345.

Runtunuwu, S.D., R. Mamarimbing., P. Tumewu., dan T. Sondakh. 2011. Konsentrasi Paclobutrazol dan Pertumbuhan Tinggi Bibit Cengkeh (*Syzygium aromaticum* (L.) Merry l & Perry). *Eugenia*. 17(2) : 135-141.

Sarawa dan A.R. Baco. 2014. Partisi Photosynthate Beberapa Kultivar Kedelai (*Glicinemax*. (L.) Merr) pada Ultisol. *Jurnal Agroteknos*. 4(3) : 152-159.

Sitompul, S.M. 2015.Analisis Pertumbuhan Tanaman. UB Press Universitas Brawijaya Malang. Malang. p 199-200

Syngenta Flowers. 2015. Pot Mum Culture Guide. www.Syngentaflowersinc.com. Colorado.

Taiz, L., danZeiger. 2010. Plant Physiology, Fifth Edition. Sinauer Associates, Inc. Sunderland, USA.

Timur, A., Rugayah, dan S. Widagdo. 2015. Pengaruh Konsentrasi Paklobutrazol terhadap Penampilan Tanaman Gerbera

Lokal (*Gerbera jamesonii*) dalam Pot. p 271-281. Dalam Seminar Nasional Sains dan Teknologi VI. 3 Nov. 2015. Fakultas Pertanian Universitas Lampung. Lampung.

Wattimena, G.A. 1988. Zat Pengatur Tumbuh Tanaman. Pusat Antar Universitas Institut Pertanian Bogor bekerja sama dengan Lembaga Sumberdaya Informasi. Bogor.