The Effect of Spacing and Nitrogen Fertilizer Dose on Growth and Yield of Cabbage Flowers (*Brassica oleracea var. Botrytis L)*

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Abstract

The study entitled "The Effect of Spacing and Nitrogen Fertilizer Dose on Growth and Yield of Cabbage Flowers (Brassica oleracea var. Botrytis L.)", has been carried out in the research field of the Faculty of Agriculture, Muhammadiyah University of Yogyakarta, Tamantirto Village, Kasihan District, Bantul Regency, Yogyakarta Special Region . The altitude is 82 meters above sea level and the average temperature is 28ºC to 32ºC. This study aims to determine the effect of plant spacing and dosage of N fertilizer for growth and yield of cabbage flowers. In this study using a Factorial Design (4 x 4), which was arranged in a Completely Randomized Block Design (RALB) and repeated 3 times. The first factor is the spacing (J) consisting of 4 levels, namely J1 (40 x 30 cm), J2 (40 x 40 cm), J3 (40 x 50 cm), J4 (40 x 60 cm). The second factor is the dose of Nitrogen (N) fertilizer consisting of 4 levels, namely N1 (46 kg / ha), N2 (69 kg / ha), N3 (92 kg / ha), N4 (115 kg / ha). Observations were made on plant height, number of plant leaves, and crop production per hectare. The results showed that between treatment plant spacing and Nitrogen fertilizer doses did not show any interaction on all parameters observed. Planting cabbage flowers with a spacing of 40 x 40 cm produces a significantly higher flower weight than other spacing treatments. Fertilizing N doses 46 - 115 kg / ha does not affect the yield of flower cabbage, but the higher the dose tends to produce higher cabbage interest.

Key words : plant spacing, dosage of N fertilizer**,** Growth and Yield of Cabbage Flowers (*Brassica oleracea var. Botrytis* L.)",

A. Introduction

Cabbage flowers is one member of the family of a plant of the cabbage (cruciferae) . Its constituent parts of the these vegetables are consumed is mass interest rate or called “curd” .A mass of blossoms cabbage white a flower generally colored yellow or white brass , while brocolli dark green or green tinged bluish. The general public know cabbage flowers with cauliflower instead, appellation kol kembang, bloemkool or auliflower.Cauliflower was originally known as. subtropical plants

Its production in indonesia limited number of participants at the highlands of (a mountain range) course aimed among other things at cirateun the camp of dan between bandung and lembang , though the program was initiated have been to the regions plant cabbage flowers with the seeds of which are produced in saerah itself , so that known as the local cultivars of cirateun .However the end of the end of this is getting a lot of sun to reach the moon varieties -varieties of cabbage of the interest that formed suitable to be planted in the plains of low till the plains of medium sized .

Although just about the majority of the community loves cabbage flowers , but of consumers are still limited number of participants at certain groups only a matter of time .This limitation is the deserted condition was because a buildup in inventories can cabbage product gdp figures last week flowers in the country only the amount of adb bonds are relatively limited , so that prices will opening two service games as is quite expensive .In fact this time its a kind of vegetable are still

relatively have a lot of luxury category it will involve each (Rukmana ,1994)

Cabbage flowers also contain some substances that are useful for the human body, such as containing vitamins and minerals to aid digestion, neutralizing acid, facilitate defecate because it contains fiber and contains no cholesterol .Even the ancient greeks and romans used as ingredients of a plant of the cabbage medicines to successfully treat a pain, gout, diarrhea, a disturbance of the stomach, headache, kebutilan, ulcer, food poisoning and a healing wound Rukmana , 1994) .

According to knoot and deanon (1967), in 100 g cauliflower calories (31,0 kal), a protein (24 g), fat (0,4 g), carbohydrates (6,1 g), fiber (0,6 g), abu (0,8 g), calcium (34,0 mg), phosphorus (50,0 mg), iron (91,0 mg), sodium (8,0 mg), potassium (314 g), niacin (0,7 mg), vitamin a (95,0 mg), vitamin B1 (0,1 mg), vitamin B2 (0,1 mg), vitamin C (90,0 mg) and water (90,3 g).

The production of cabbage interest at the present time are still considered to be low, where average the results of in the dry season as much as 10,60 tons on higher demand for / ha of land and in the rainy season 5, 68 tons on higher demand for / than one hectare in size (Satsiyati, 1980 manners of a cit., gunadi and asandhi, 1988), with more area than you pertanaman supplies a limited amount of, pt pgn promised to supply commonly planted in the highlands of (rukmana, 1994). It was this ability that make cabbage flowers they received a score of are higher compared to cabbage krop .

The use of the crops in the cultivation of plants strongly influence the outcome .The smaller the corn used will increase the quantity of a crop per unit area .With the increase in the quantity of a crop per unit area and crop yield rose .Increase in quantity crop yield this is not necessarily the quantity it has some positive effects on the plant (anonymous, 1980). In the range of crops that wider will cause the union broad down or a little, also will result in extravagance of land use .

An increase in the price from the sale of could be achieved by the manner of increasing the charges imposed by (for the improvement of the cultivation of) (being an anonymous cog , 1980) .This program was part of the similarly shaped tool used to fix the income of farmers .Increasing the charges imposed by can be was done among other have been cut down written front when iezzo denied brazilian stand in the way of varieties , the distance sow in the ground an exact pattern for its , trimming , discharging fertilizer on a dose at the right time (being an anonymous cog ,1980) . The purpose of research to know the distance sow in the ground and dosage of a nitrogen fertilizer optimum position on the growth of and the outcomes of the cabbage flowers (brassica oleracea var .Botrytis l .) .

B. Materials and Methods

Research with the a method of field testing 4 x 4 factorial is are drawn up so as in the design random complete berblok (RALB) or randomized complete block including on the instrument types (RCBD) .Factors other than a fuel frenchman was broken the distance sow in the ground , only consist of four reach the level of less .While the second factor is a dose state fertilizer company pt n which is made up of four level .There was not one of end and his own purpose a combination treatment repeated three times .At their own volition were treatment being handed out as follows:

A. Factor I:
J1: distance cropping cauliflower 40 x 30 cm
J2: distance cropping cauliflower 40 x 40 cm
J3: distance cropping cauliflower 40 x 50 cm
J4: distance cropping cauliflower 40 x 60 cm

B. Factor II :

N1: dose of nitrogen fertilizer 46 kg / ha

N2: dose of nitrogen fertilizer 69 kg / ha

N3: dose of nitrogen fertilizer 92 kg / ha

N4: dose of nitrogen fertilizer 115 kg / ha

Of two factors didapatkkan 16 combination treatment .So that every group or blocks consisting of 16 combination treatment .Treatment treatment was as follows:

J1N1 = distance planting 40 x 30 cm and dosage of nitrogen fertilizer 46 kg per ha

J1N2 = distance planting 40 x 30 cm and dosage of nitrogen fertilizer 69 kg per ha

J1N3 = distance planting 40 x 30 cm and dosage of nitrogen fertilizer 92 kg per ha

J1N4 = distance planting 40 x 30 cm and dosage of nitrogen fertilizer 115 pounds / ha

J2N1 = distance planting 40 x 40 cm and dosage of nitrogen fertilizer 46 kg per ha

J2N2 = distance planting 40 x 40 cm and dosage of nitrogen fertilizer 69 kg per ha

J2N3 = distance planting 40 x 40 cm and dosage of nitrogen fertilizer 92 kg per ha

J2N4 = distance planting 40 x 40 cm and dosage of nitrogen fertilizer 115 pounds / ha

J3N1 = distance planting 40 x 50 cm and dosage of nitrogen fertilizer 46 kg per ha

J3N2 = distance planting 40 x 50 cm and dosage of nitrogen fertilizer 69

J3N3 = distance cropping 40 50 x cm and dosage of nitrogen fertilizer 92 kg / ha

J3N4 = distance cropping 40 50 x cm and dosage of nitrogen fertilizer 115 kg / ha

J4N1 = distance cropping 40 60 x cm and dosage of nitrogen fertilizer 46 kg / ha

J4N2 = distance cropping 40 60 x cm and dosage of nitrogen fertilizer 69 kg / ha

J4N3 = distance cropping 40 60 x cm and dosage of nitrogen fertilizer 92 kg / ha

J4N4 = distance cropping 40 60 x cm and dosage of nitrogen fertilizer 115

C. Results and Discussion

On this research parameter observed includes: tall plant, number of leaves , and from the sale of per hectare

A. tall plant

Average tall plant in be with way to measure tall plant on 4 plants sample, then calculated reratanya on observation week to=6. The results of the analysis test distance multiple ducan 5 % served in table 1

Table 1 . Rate high plant (cm)

plant spacing	Dose fertilizer N				Average
	N1	N2	N3	N4	
	46 kg/ha	69 kg/ha	92 kg/ha	115 kg/ha	
J1 (40 x 30 cm)	16, 07	15,93	15,87	16,43	16,07 a
J2 (40 x 40 cm)	15, 77	16,15	16,17	15,70	15,95 a
J3 (40 x 50 cm)	15,07	15,20	15,17	16,17	15,40 b
J4 (40 x 60 cm)	15,20	15,24	16,50	15,70	14,41 b
Average	15,53 q	15,63 q	15,67 q	16,00 p	(-)

means value in a column and row followed by un like letter (s) are significantly different at 5% level using DMRT (Duncan Multiple Rentang test)

The tendency of plant growth to elongate is driven by the higher content of auxin in cabbage flower plants. One of the endogenous growth regulators in the cabbage plant tissue in the form of auxins, is a typical organic compound that is capable of stimulating the extension of bud cells. Auxin is an organic compound in the form of Indol Acetic Acid which functions as an apical meristem growth stimulator. The nature of auxin when exposed to sunlight will be damaged (decreased). At a wide plant spacing the auxin content is low, this is because the cabbage plant auxin content of flowers at wide plant spacing experiences photooxidation or loss of auxin in the plant caused by sunlight which causes a reduction of the auxin in the proximal part.

In the treatment dosage of N4 fertilizer (115 kg / ha) produces high plant height. Because nitrogen is one of the supporting factors for the formation of vegetative organs, and nutrients must be available precisely in both quantity and type. The availability of nutrients in the form of compounds in the soil affects the absorption of nutrients by plant roots. Flower cabbage plants that grow are able to utilize nitrogen as optimal as possible to support the growth and development of flower cabbage plants. The element nitrogen influences the rate of cell division and enlargement. According to Haryadi (1994) if the rate of division and extension of the tissue takes place quickly then the growth of stems, roots, leaves and flowers goes quickly too.

B. Number Leaves

In the average number of plant leaves obtained by counting the overall leaves of 4 sample plants in each plot, then the average was calculated at the sixth week of observation. The results of Duncan's Multiple Range Test of 5% are presented in table 2.

Table 2. average number leaves

Plant Spacing	Dosage fertilizer N				average
	N1	N2	N3	N4	
	46 kg/ha	69 kg/ha	92 kg/ha	115 kg/ha	
J1 (40 x 30 cm)	22,87	24,40	24,47	23,27	23, 75 b
J2 (40 x 40 cm)	23,43	22,90	23,53	24,70	23, 64 b
J3 (40 x 50 cm)	21, 43	22,53	26,00	26,22	24, 05 b
J4 (40 x 60 cm)	24,5	25,53	26,63	28,11	26, 20 a
average	23, 07 q	23, 84 q	25,16 p	15,57 p	(-)

means value in a column and row followed by un like letter (s) are significantly different at 5% level using DMRT (Duncan Multiple Rentang test)
(-) ; No interaction

Based on variance shows that there is no interaction between the treatment of spacing and the dose of Nitrogen fertilizer in influencing the number of leaves. From table 2. it can be seen that the spacing of N4 (40 x 60 cm) produces a high number of leaves. This is due to the wide planting spacing that does not occur competition for nutrients, water and sunlight. Conversely, the narrower planting distance causes the number of leaves per plant at harvest to decrease. This is in accordance with the opinion of Nieuwhof (1969), which states that with competition as a result of narrow plant spacing, carbohydrate synthesis is slow. Causing the development of stunted leaves.

One of the supporters of the optimum formation of vegetative organs is nutrients. Nutrients needed by plants must be available precisely in both quantity and type. The availability of nutrients in the form of simple

compounds and good soil conditions is very beneficial in the absorption of nutrients by plant roots. According to Jumin (1991) Nitrogen is useful for increasing vegetative growth of plants, especially leaves. The effect of Nitrogen fertilizer is indicated by the formation of leaves with the optimum size and amount

C. Crop yields per hectare

From the results of an analysis of Duncan's Multiple Range Test of 5% of the yield of flower cabbage plants that have been conserved in tons per hectare can be presented in table 3.

Table 3. Crop yields per hectare(ton/ha)

Plant Spacing	Dosage fertilizer N				average
	N1	N2	N3	N4	
	46 kg/ha	69 kg/ha	92 kg/ha	115 kg/ha	
J1 (40 x 30 cm)	4,26	4, 47	4,47	5,30	4, 63 b
J2 (40 x 40 cm)	3,55	4,18	4,85	4,75	4, 33 b
J3 (40 x 50 cm)	3,21	3,67	2,88	3,33	3, 27 b
J4 (40 x 60 cm)	2,84	3,50	3,83	2,74	3, 23 a
Rerata	3, 47 q	3,95 q	4, 01 p	4, 03 p	(-)

means value in a column and row followed by un like letter (s) are significantly different at 5% level using DMRT (Duncan Multiple Rentang test

(-) ; No interaction

Based on variance, there was no interaction between the treatment of spacing and the dose of Nitrogen fertilizer in giving an effect on crop yields per hectare.

From table 3. it can be seen that the spacing in J1 (40 x 30 cm) and J2 (40 x 40 cm) produces high yields per hectare. Because the role of spacing in relation to the yield component per plant or yield per hectare is very important. Basically planting distance is closely related to governance the location and distribution of a plant in an area. A tight planting distance in an area with the same seed requirements is also getting more and more, so the more plant population in the same area will get high yields as well. This is in accordance with the opinion of Harjadi (1980), that the closer the planting distance the more the number of population and followed by the results, but the yield per plant is lower when compared to the wide planting distance. This opinion is supported by the opinion of Suprapto (1992), in general high yield per unit area will also be achieved by a high population, due to the achievement of maximum use of sunlight at the beginning of growth, even though each individual plant decreases due to nutrient competition , water and sunlight and other growing factors.

D. Conclusion

There is no interaction between treatment of spacing and Nitrogen fasting doses, on all observed parameters, The use of J4 spacing (40 x 60 cm) and N 92 kg / ha of fertilizer produced better plant growth compared to other treatments. For maximum growth and yield of cabbage flowers can be planted with J2 spacing (40 x 40 cm); while the dose of N that can be given is N3 93 kg / ha.

References

Anonim. 1980. Hortikultura I (Tanaman Dataran Tinggi). Direktorat Jendral Pertanian Tanaman Pangan. Proyek Penyuluhan Pertanian Tanaman Pangan. 40 hal.

Anonim. 1992. Tim Penulis Penebar Swadaya. Sayuran Komersial. Penebar Swadaya. Jakarta. 152 hal.

Harjadi, S. S. 1979. Pengantar Agronomi. Gramedia. Jakarta. 102 hal.

Jumin, H. B. 1991. Dasar – Dasar Agronomi. Rajawali Press. Jakarta. 140 hal.

Nieuwhof, M. 1969. Cole Crops. Leonard. Hill Books. London. 353 hal.

Rukmana, R. 1994. Budidaya Kubis Bunga dan Brocoll. Kanisius. Jakarta. 64 hal.

Suprapto, H. S. 1992. Bertanam Jagung. Penebar Swadaya. Jakarta. 59 hal.