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Effect of Tiling System Spacing and Number of Seeds per Hole on Growth and Yield of Kale Land (*Ipomoea reptans* Poir.)

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ABSTRACT

This study aims to determine the best spacing and the most effective number of seeds per hole against kale land (*Ipomoea reptans* Poir). This research was carried out in an experimental area located at Jalan Bunga Cempaka, Tanjung Sari, Medan Selayang District, Medan with an altitude of ± 32 meters above sea level from March to April 2022. This study used a factorial randomized block design, with 2 treatment factors. namely : Planting Distance (J1 : 10 x 10 cm, J2 : 15 x 15 cm, J3 : 20 x 20 cm) and number of seeds per hole (B1 : 1 seed, B2 : 2 seed, B3 : 3 seed, B4 : 4 seed). The results of this study showed that treatment with the tiled spacing system significantly increased plant height, increased root wet weight, and increased plant wet weight per plot. The best results for all these parameters were at a spacing of 15 x 15 cm. Treatment of the number of seeds per planting hole significantly increased the number of leaves that grew and the wet weight of the crown. The best results for all these parameters were treated with 4 seeds per hole. The interaction between the spacing of the tile system and the number of seeds per hole gave unrealistic results for all observation parameters
Keyword: Kale land, number of seeds per hole, spacing, tile system.

ABSTRAK

Penelitian ini bertujuan untuk mengetahui jarak tanam terbaik dan jumlah benih per lubang paling efektif terhadap kangkung darat (Ipomoea reptans Poir). Penelitian ini dilakukan di lahan percobaan yang terletak di Jalan Bunga Cempaka, Tanjung Sari, Kecamatan Medan Selayang, Medan dengan ketinggian ± 32 meter dpl pada bulan Maret sampai dengan April 2022. Penelitian ini menggunakan rancangan acak kelompok faktorial, dengan 2 faktor pengobatan. yaitu : Jarak Tanam (J1 : 10 x 10 cm, J2 : 15 x 15 cm, J3 : 20 x 20 cm) dan jumlah benih per lubang (B1 : 1 benih, B2 : 2 benih, B3 : 3 benih, B4 : 4 biji). Hasil penelitian menunjukkan bahwa perlakuan dengan sistem jarak tanam bedengan nyata meningkatkan tinggi tanaman, meningkatkan bobot basah akar, dan meningkatkan bobot basah tanaman per petak. Hasil terbaik untuk semua parameter tersebut terdapat pada jarak tanam 15 x 15 cm. Perlakuan jumlah benih per lubang tanam nyata meningkatkan jumlah daun yang tumbuh dan bobot basah tajuk. Hasil terbaik untuk semua parameter tersebut adalah perlakuan dengan 4 benih per lubang. Interaksi antara jarak tanam sistem ubin dengan jumlah benih per lubang memberikan hasil yang tidak realistis untuk semua parameter pengamatan
Keyword: Tanah kangkung, jumlah bibit per lubang, jarak tanam, sistem ubin

1. Introduction

Kale land (*Ipomoea reptans* Poir) is an annual or annual plant which is an important leaf vegetable in Southeast Asia and South Asia. The nutritional content in every 100 grams of kale contains 29 kcal of energy, 3 grams of protein, 0.3 grams of fat, 5.4 grams of carbohydrates, 73 mg of calcium, 50 mg of phosphorus, 3 mg of iron, 6300 IU of vitamin A, 0.07 mg of vitamin B1, and 32 mg of vitamin C. Based on where it grows, kale land is divided into two types, namely: 1) land kangkung, living in dry or dry places, and 2) water spinach, living in watery and wet places (Balai Pengkajian Teknologi Pertanian Jambi, 2009).

Kale land is a cultivated plant, short-lived and relatively affordable by various groups of people. Therefore, kale can be used as food diversification in Indonesia (BPTP, 2014). Based on BPS data (2017), the annual production of land spinach is 297.130 tons. Most of Indonesia's population consumes 173 grams of fruit and vegetables per day, which is lower than the recommended RDA of 400 grams per capita per day.

The increase in the demand for kale in Indonesia is not followed by the production of the plant itself. In 2017 the national harvested area for kangkung planting was 2,554 ha with an average yield of 108.87 tons/ha, in 2018 the harvested area was 2,554 ha with an average yield of 113.82 tons/ha. Even in 2019 there was an increase in harvested area of 214 ha compared to the previous year, but production decreased (Statistik Produksi Hortikultura, 2020).

In Indonesian, the development of vegetable farming faces several obstacles, including the scale of farming that is still narrow and inefficient, limited land area, cultivation techniques, low production, lack of knowledge about nutrient requirements in plants and the use of plant spacing that is not optimal. tend to assume that the narrower the spacing, the more the results obtained due to the increasing number of plant populations. This causes the low quality and quantity of ground

water spinach produced. According to Wijaya (2012), it is very important to pay attention to the quality of vegetables according to the standards set. The quality of vegetables expected by producers is to have a fresh shape, color and not contain pesticide residues and heavy metal content. Plant density or plant spacing will be closely related to competition between plants in getting sunlight and nutrients. In terms of competition for sunlight, high plant density causes a high level of competition so that the air humidity around the plant is high and increases the risk of being attacked by pests and diseases.

The competition of plants in one clump is determined by the use of seeds per planting hole. In order to increase kale production, efforts can be made to improve cultivation methods, including setting the number of seeds per planting hole, and using high-yielding varieties. The use of seeds per planting hole has an effect on growth because it is directly faced with competition between plants in one clump. Plant density greatly affects the yield or crop production. This is related to the level of competition between plants in obtaining light, water, space, and nutrients. Plant density can be regulated by using the right number of seeds. The use of the right number of seeds will give good final results, besides being more efficient in land use (Harjadi, 2002).

2. Material and Methods

This research was carried out in an experimental area located at Jalan Bunga Cempaka, Tanjung Sari, Medan Selayang District, Medan with an altitude of ± 32 meters above sea level from March to April 2022. The materials used in this study were Bangkok LP-1 Kangkung Seed, Urea fertilizer, and chicken manure. The tools used in this study were hoe for land preparation, gembor for watering, meter for measuring plant height, camera as a research documentation tool from the beginning to the end of the study, sincere tool for recording research parameter data, analytical scales for weighing plant weights and tools other supporters.

This study used a Randomized Block Design (RAK) with 2 treatment factors, namely: Factor I : Planting distance which consists of 3 levels, namely J1: 10 x 10 cm; J2: 15 x 15 cm ; J3: 20 x 20 cm. Factor II: Number of seeds per hole consisting of 4 levels, namely B1: 1 Seed; B2: 2 Seeds ; B3: 3 Seeds ; B4: 4 Seeds. The research implementation includes land preparation, planting, fertilizing, maintenance, watering, weeding, pest and disease control, and harvesting. Parameter observations consisted of plant height, number of leaves, wet weight per sample, canopy wet weight per sample, root wet weight per sample, and wet weight per plot.

3. Result and Discussion

Plant Height

Observation data on plant height and plant variance of land kangkung aged 1 - 5 WAP showed that plant spacing had no significant effect at 3 WAP and significantly affected plant height 1 and 2 WAP, 4 and 5 WAP. While the number of seeds per hole had no significant effect on 1 WAP, 3 WAP and 4 WAP and had a significant effect on 2 WAP height.

Based on the results of the study, it was found that the highest average plant height was 39.89 cm at a spacing of 10 cm x 10 cm (J1), which was followed by a plant spacing of 15 cm x 15 cm (J2) and 20 cm x 20 cm (J3). This is in accordance with Silaban (2012). Closer spacing can increase vegetative growth, namely plant height, the closer the spacing, the more plant population, so that competition between plants in obtaining water and nutrients will increase, especially light. Increased shade between plants will result in etiolation or elongation of plant segments so that height growth will be faster.

Table 1. The height of kale land plants 1 – 5 WAP on the treatment of plant spacing and number of seeds per hole

Plant Age	Varieties	B1:1	B2:2	B3:3	B4:4	Average
		……cm……				
1 MST	J1	5.15	5.11	5.30	5.45	5.25a
	J2	5.44	5.31	5.63	5.46	5.46ab
	J3	4.51	5.01	5.17	5.26	4.99b
	Average	5.04	5.14	5.36	5.39	
2 MST	J1	9.37	10.17	11.10	11.30	10.48a
	J2	9.67	10.53	10.03	10.87	10.28b
	J3	8.60	9.17	8.87	10.43	9.27c
	Average	9.21c	9.96b	10.00b	10.87a	
3 MST	J1	14.83	16.27	16.93	15.27	15.83
	J2	14.43	15.87	15.73	14.63	15.17
	J3	12.93	13.00	13.17	15.70	13.70
	Average	14.07	15.04	15.28	15.20	
4 MST	J1	25.77	28.95	29.89	28.15	28.19a
	J2	24.81	27.04	27.21	27.83	26.72ab
	J3	21.29	23.97	23.67	26.86	23.95b
	Average	23.96	26.65	26.93	27.62	
5 MST	J1	36.73	41.09	41.96	39.76	39.89a
	J2	34.49	37.15	36.59	37.55	36.45ab
	J3	28.21	32.43	33.72	38.26	33.16b
	Average	33.14	36.89	37.42	38.52	

Description: Values followed by different letters in the same row or column in each week of observation show a significant difference based on the Duncan Multiple Range Test at 5% level.

Number of Leaves

Observation data on the number of leaves and plant variety prints of kale land on the effect of spacing and treatment of the number of seeds per hole can be seen in Appendix 15-22. The results showed that plant spacing had no significant effect on 3 - 5 WAP and a significant effect on the number of leaves 2 WAP, while the number of seeds per hole had a significant effect on plant age 2-5WAP.

The results showed that the spacing only significantly affected the number of leaves 2 WAP with the highest average (7.55) at a spacing of 10 cm x 10 cm, followed by the treatment with a spacing of 15 cm x 15 cm (J2) and 20 cm x 20 cm (J3). This is because at close spacing there is competition between plants in obtaining nutrients, sunlight and air. Generally, at a close spacing, the internodes lengthen, so that the plants are etiolated as a result, they look taller and the leaves are lush, but the stems of the plants easily fall when exposed to wind and rain. This is in accordance with the statement of Sham (1992), that the arrangement of plant spacing can affect production related to the process of photosynthesis and intraspecific competition between plants for nutrients and absorption of water to grow and develop. The wider the spacing, the more light enters, so the greater the light intensity received by the plant, the more leaves will be produced.

Table 2. T Description: Values followed by different letters in the same row or column in each week of

Plant Age	Planting Distance	B1:1	B2:2	B3:3	B4:4	Average
2 MST	J1	3.53	6.07	9.67	10.93	7.55a
	J2	3.00	6.07	8.27	10.27	6.90b
	J3	3.13	5.60	7.07	9.53	6.33b
	Average	3.22d	5.91c	8.33b	10.24a	
3 MST	J1	6.20	10.73	15.40	18.27	12.65
	J2	5.80	10.60	15.73	18.80	12.73
	J3	5.93	10.07	13.73	18.60	12.08
	Average	5.98d	10.47c	14.96b	18.56a	
4 MST	J1	9.53	16.20	23.73	28.73	19.55
	J2	8.40	16.20	23.80	30.47	19.72
	J3	8.07	15.93	21.67	28.67	18.58
	Average	8.67d	16.11c	23.07b	29.29a	
5 MST	J1	12.13	21.00	28.60	35.40	24.28
	J2	10.93	23.47	33.33	40.13	26.97
	J3	10.33	20.20	34.60	41.47	26.65
	Average	11.13d	21.56c	32.18b	39.00a	

Description: Values followed by different letters in the same row or column in each week of observation show a significant difference based on the Duncan Multiple Range Test at 5% level.

Wet Weight per Sample

The results showed that the planting distance had no significant effect on the wet weight per sample of land kangkung but had a significant effect on the number of seeds perhole.

Based on the results of the study, it was found that the highest average wet weight of the sample (37.73 grams), root weight per sample (5.07 grams) and canopy wet weight (32.66 grams) was treated with 4 seeds (B4) per planting hole. This was due to the number of seeds in treatment B4 more than in treatment B3, B2, B1 so that the plant weight was higher. This is in accordance with the opinion of Tangendjaja and Elizabeth (2012) which states that the wet weight will increase if the ratio of one plant to another is also different.

Table 3. Wet weight per sample of kale land on spacing treatment and number of seeds per planting hole.

Observation Age	Varieties	B1:1	B2:2	B3:3	B4:4	Average
		……..……grams…….……				
5 MST	J1	15.49	30.48	29.85	26.73	25.64
	J2	15.35	31.87	35.67	38.93	30.46
	J3	13.73	24.82	34.49	47.52	30.14
	Average	14.86b	29.06a	33.34a	37.73a	

Description: Values followed by different letters in the same column show significant differences based on the Duncan Multiple Range Test at 5% level.

Wet Weight per Plot

The results showed that the number of seeds per hole had no significant effect on wet weight per plot and significantly affected the treatment. spacing.

Table 6. Wet weight per plot of land kale land on spacing treatment and number of seeds per planting hole.

Observation Age	Varieties	B1:1	B2:2	B3:3	B4:4	Average
		…… Kg…….				
5 MST	J1	1.70	1.10	1.09	1.03	1.23b
	J2	1.68	1.22	1.24	0.68	1.21b
	J3	1.85	1.46	2.63	1.56	1.88a
	Average	1.74	1.26	1.66	1.09	

Description: Values followed by different letters in the same column show significant differences based on the Duncan Multiple Range Test at 5% level.

Table 4 shows that although the difference was not significant, the highest average wet weight per plot of land kangkung was treated with 1 seed (B1) per hole, namely 1.74 Kg and the lowest was at 4 seeds (B4) per hole, namely 1.09 Kg. The highest average wet weight per plot of land kangkung at 20 cm x 20 cm spacing treatment was 1.88 Kg which was significantly different with 10 cm x 10 cm (J1) and 15 cm x 15 cm (J2) spacings.

4. Conclusions

Plant spacing affected plant height 5 WAP, number of leaves 2 WAP, root wet weight per sample and wet weight per plot. The highest plant height 5 WAP was at a spacing of 10 cm x 10 cm, the highest root wet weight per sample was at a spacing of 15 cm x 15 cm, and the highest wet weight per plot was at a spacing of 20 cm x 20 cm. The number of seeds per hole significantly affected the height of 2 WAP, number of leaves 2 -5 WAP, wet weight per sample, canopy wet weight per sample and root wet weight per sample. The highest yield was obtained at planting 4 seeds per hole. There was no interaction effect between planting distance and number of seeds per hole on all parameters. Doing a quality harvest can be done by maintaining the quality of leaf vegetables before harvesting and at harvest, which includes harvesting at the right harvest age.

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