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The Growth of Cultivated variety (Cv.) Bonci Peanuts on Various Types of Fertilizers and Planting Spacing Between Coconut and Banana Stands

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Abstract: North Maluku has a variety of germplasm that has been used by the community, one of which is the local peanut, better known as Bonci. In this study, the use of the Bonci DM 2 variety is an adaptive local variety in North Maluku. The purpose of this research is to study growth of Cv. Bonci DM 2 peanuts on various types of fertilizer and spacing between coconut and banana stands. The experimental design in this study was carried out using a 2-factor Factorial Randomized Block Design (RBD) with 3 (three) replications. The first factor is the type of fertilizer and plant spacing as the second factor. Data analysis used analysis of variance at the 95% confidence level and further testing to differentiate between treatments was carried out by the Tukey test at a 5% significance level. The results showed that the combination of treatments with various fertilizers and spacing had no significant effect on the growth of Cv. Bonci DM 2 peanuts. Nevertheless, the fertilizer application had a significant effect on the variables of the number of branches, the number of compound leaves 20 and 40 DAP, the number of gynophores, and the number of flowers 31 DAP. The spacing treatment had a significant effect on the number of branches at 31DAP.

Key words: Bonci nuts, North Maluku, fertilizer, spacing, stands

Introduction

Local peanuts cultivated by the community are better known as Bonci beans. Hidayat, et al., (2020a) stated that there are several varieties of peanut genetic resources have been characterized and

registered with the Center for Plant Variety Registration and Agricultural Licensing (PPVTPP) of the Ministry of Agriculture as local superior varieties of North Maluku such as Bonci Kao, Boci Sawala Pandanga, Boci Daare Pandanga, Bonci DM 1 and Bonci DM 2. In this study, the Bonci DM 2 variety, which is a local bean variety from West Halmahera, has red and cylindrical seeds. This variety is one of the adaptive local varieties in North Maluku. DM 2 Bonci has the potential to produce 1.75 tonnes/ha.

Data from Badan Pusat Statistik for 2019 peanut productivity in North Maluku is around 1 ton/ha, which is still below the average national productivity of 1.6 tons/ha. The low productivity of peanuts is caused by several factors, including cultivation techniques, soil fertility, drought which often occurs in peanut plants, especially in the reproductive phase, pest and disease disturbances, weeds, and not using superior varieties. The ability of the people of North Maluku to cultivate peanuts is still very limited.

One of the introductions to cultivation technology carried out in this study was the application of fertilization based on recommended dosages and types of fertilizers as well as regulating plant populations by adjusting the spacing between plants. Apart from being increased through the introduction of technology, peanut production in North Maluku can be done by optimizing the use of land under shade or stands. In the current condition in North Maluku, there are many lands under coconut or banana stands that have not been optimized. The potential of the land between stands of coconut or banana needs to be optimized, for this reason, it is necessary to carry out research related to land use under stands with seasonal crops such as peanuts.

The purpose of the study

The purpose of this study was to study the growth of Cv. Bonci DM 2 on various types of fertilizers and spacing between coconut and banana stands. The research hypothesis is H_0: Fertilizer and spacing have the same effect on the growth and production of peanuts Cv. Bonci DM 2 between coconut and banana stands. H_1: Fertilizer and spacing have different effects on the growth and production of peanuts Cv. Bonci DM 2 between coconut and banana stands.

Materials and methods

The research was conducted from June to September 2022. The location of the research was the location of the BPSIP North Maluku Genetic Resources (SDG) collection garden, in Kusu Village, North Oba District, Tidore Islands City, North Maluku Province. The research site is located at an altitude of about 3-5 m above sea level at 0o41'40" North Latitude and 127o33'20" East Longitude. The research area includes dry land, wet climate, lowland, and alluvial plains. The classification of the soil where the research was carried out was included in entisols (BPTP North Maluku, 2014). The download results from the Google Earth 2022 satellite imagery where the research is located are presented in Figure 1 below.

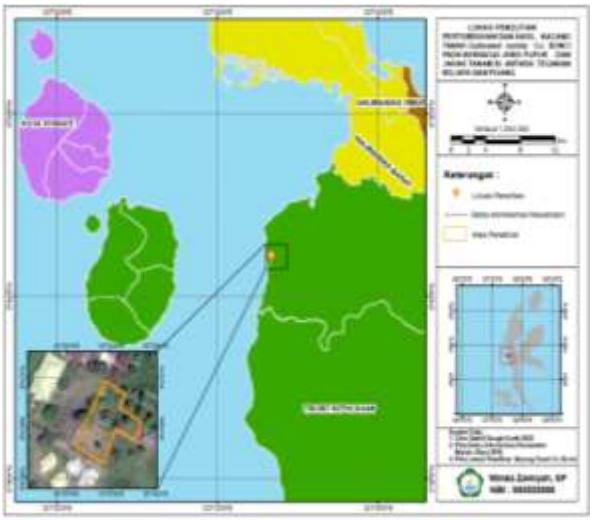

Figure 1. Research locations on the growth and yield of Cultivated variety (Cv.) Bonci peanuts on various types of fertilizers and the spacing between coconut and banana stands

Materials and tools used in the research included: seeds, fertilizers (Compost, Urea, TSP, KCl, and Nasa POC), water, hoes, meter/ruler, table boards, buckets, scales, bamboo, stationery, plastic, camera, drying mat, PUTK (Dry Soil Testing Device), light intensity meter (the mini light meter) brand UNI-T type UT383 and boots.

Preparation for planting by cultivating the land until it is loose, then the land is cleaned of remaining grass manually and plotted (made beds) according to the number of treatment units. The width of the beds is 110 cm with a length of 400 cm. Between the beds, a channel is made with a depth of 25-30 cm and a width of 30 cm which will function as a drainage channel to reduce excess water as well as an irrigation channel when water is needed. The seeds used came from Cv. Bonci DM 2 was obtained from Ibu District, West Halmahera Regency. Seeds are sown in the drill to a depth of 2-3 cm and one seed per planting hole. Planting is done with some spacing that has been determined.

Fertilizer application time consists of two stages of fertilization, namely basic fertilizer and follow-up fertilizer. Basic fertilizer is given before planting. Follow-up fertilizer is given at 21-24 HST by digging the left and right rows of plants as deep as 5-7 cm. POC is sprayed on the plants every 2 weeks starting at the age of the plants 14 HST to 42-56 HST. The dose of POC given was 3.5 cc plus 1.5 liter of water applied before planting; 1.4 cc plus 1 liters of water applied by spraying it at 14 HST; 1.4 cc plus 1 liter of water applied by spraying at 28 HST; and 1.4 cc plus 1lt of water applied by spraying it at 42-56 HST. The amount of supplementary fertilizer per hectare used according to PTT for peanut cultivation is around 50 kg of Urea, 50 kg of TSP, and 50 kg of KCl.

The phases of plant growth that are very sensitive to water shortages are the beginning of vegetative growth (15-20 DAP), during flowering (30-40 DAP), and pod filling (60-70 DAP). When it rains, there is no need for watering. Weeding is done 2 times during plant growth. The first weeding is done when the plants are 20 HST before flowering or depending on the weed population. The second weeding was carried out at 45 HST after the gynophore entered the soil. Weeding should not be done during pod formation because it can cause the failure of pod formation. Hoarding follows the second weeding time. Hoarding will be carried out according to the environment until the age of harvest. Pest and disease control is carried out based on monitoring. Control is carried out biologically (biologically) by picking pests manually or removing infected plants to reduce environmental pollution, but if they

continue to attack, spraying with pesticides is carried out. Spraying is done if the level of leaf damage is more than 15%. Harvesting is done around 90 days which is characterized by the hard, fibrous skin of the pods, when pressed the pods break easily and the seeds are red.

The data observed included growth components (number of branches, number of compound leaves, plant height, number of gynophores, and number of flowers), as well as productivity and peanut production Cv. Bonci DM 2. Observations were made on plants by randomly taking 8 plants from each plot to be sampled. Productivity based on total yield per plot is converted to yield per hectare (tonnes/ha).

This research was conducted using a Randomized Block Design (RBD) Factorial Pattern 2 factors with 3 (three) replications. The factors studied were the type of fertilizer as the first factor and spacing as the second factor. Fertilizer type factor consists of 4 levels, namely without fertilizer, Urea + TSP + KCl fertilizer, Nasa POC fertilizer, and Nasa Urea + TSP + KCl + POC fertilizer combination. The spacing factor consists of 4 levels, namely 30 x 15 cm, 30 x 20 cm, 30 x 25 cm and 30 x 30 cm. Thus there were 16 treatment combinations with three repetitions and there were 48 experimental units. Research data on the growth and yield components were analyzed by analysis of variance at the 95% level of confidence and follow-up testing to differentiate between treatments was carried out by the Tukey test at a 5% significance level.

Results and Discussions

The number of branches

The results of variance showed that the fertilizer treatment had a significant effect on the number of branches at the ages of 11, 20, 31 and 40 DAP. While the spacing treatment only had a significant effect on the number of branches 31 HST. The P3 treatment (Urea+TSP+KCl+POCNasa) showed the highest number of branches compared to P0 at 11 and 40 DAP. This shows that the role of the element Nitrogen (N) is very necessary for the formation or vegetative growth of plants such as leaves, stems and roots. According to Rina (2015) states that Nitrogen (N) functions to compile amino acids (proteins), nucleic acids, nucleotides, and chlorophyll in plants, so that in the presence of N, it accelerates plant growth (height, number of tillers, and number of branches). The results of calculating the average number of branches of peanut Cv. Bonci DM 2 can be seen in table 1 below.

Table 1. Average number of peanut branches Cv. Bonci DM 2 on various types of fertilizer among coconut and banana stands

Treatment	Average number of branches			
	11 HST	20 HST	31 HST	40 HST
P0	1,73958b	1,95833b	4,18750b	5,04167b
P1	1,93750ab	2,79167a	4,84375a	5,75000a
P2	1,93750ab	2,34375ab	4,66667ab	5,66667ab
P3	2,25000a	2,76042a	4,84375a	5,78125a

Note: The numbers in the same column followed by the same letter show no significant difference based on Tukey's follow-up test at a significance level of α=5%.

The results of observations of the spacing treatment after the tukey advanced test was carried out with a level of 5% (Table 2) showed that the average number of branches in the J3 treatment (30x25 cm) was 5.04167 and was significantly different from the J2 treatment (30x20 cm).

Table 2. Average number of peanut branches Cv. Bonci DM 2 at various plant spacing between coconut and banana stands

Treatment	Average number of branches 31 HST
J1	4,55208 ab
J2	4,37500 b
J3	5,04167 a
J4	4,57292 ab

Note: The numbers in the same column followed by the same letter show no significant difference based on Tukey's follow-up test at a significance level of α=5%.

Table 2 shows that the J3 treatment will affect the growth of the number of branches to be more. Spacing spacing causes the rate of photosynthesis received by plants to stimulate the formation of leaves, branches, increase in plant dry weight, root canopy ratio and is followed by an increase in yield (Pangli, 2014).

The number of compound leaves

The results of calculating the average number of compound leaves of peanut plants Cv. Bonci DM 2 can be seen in table 3 below.

Table 3. The average number of compound leaves of peanut Cv. Bonci DM 2 on various types of fertilizer among coconut and banana stands

Treatment	Average number of compound leaves		
	20 HST	31 HST	40 HST
P0	6,91667 b	16,3542 b	28,7292 b
P1	8,65625 a	20,2917 a	34,4479 a
P2	8,02083 ab	18,7292 ab	32,4375 ab
P3	8,97917 a	19,5937 ab	33,7917 ab

Note: The numbers in the same column followed by the same letter show no significant difference based on Tukey's follow-up test at a significance level of α=5%.

The results showed that the average number of leaves of the peanut plant Cv. The highest number of DM 2 seedlings after giving P3 treatment at 20 HST was 8.97917 and P1 treatment (Urea, TSP, and KCl) at 31 and 40 HST were 20.2917 and 34.4479. The results of Tukey's follow-up test analysis at the 5% level showed that the P1 treatment at 31 and 40 HST gave significantly different results from the P0 treatment. According to Bagaskara (2011) in Susilo et al. (2019), the macro elements N, P, and K have their respective roles for plants including the nitrogen element needed for leaf growth and the formation of stems and branches. Phosphorus treatment resulted in a higher number of leaves. Phosphorus treatment can increase the number of leaves. There is a tendency that KCl produces the highest number of leaves.

The height of plant

Peanut plant height was measured from the base of the stem to the first bud and was carried out every week until the plants were in the final vegetative stage. Fertilizer treatment and spacing had no significant effect on plant height. This shows that peanut Cv. DM 2 seedlings had the same response to

different types of fertilizer and spacing under standing conditions. This is presumably because the nutrients in the soil have provided enough nutrients according to plant needs, especially to support plant height growth. The availability of nutrients in the soil before planting is thought to be the cause of the absence of a significant response to different fertilizer treatments and spacing (Hidayat, 2014).

The average plant height at 11 DAP was almost the same in all treatments. Differences began to occur at the average plant height of 20 HST. When the plants were at 40 HST, the average plant height varied. This can be seen in Figure 2 below.

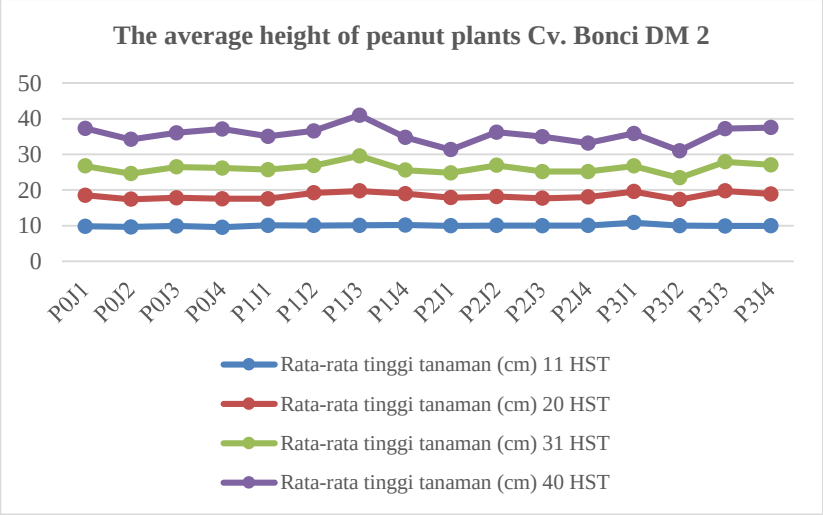

Figure 2. Graph of the average height of peanuts Cv. Bonci DM 2 on various types of fertilizers and spacing between coconut and banana stands.

The number of gynophores

The results of the analysis of variance showed that there were significant differences with the fertilizer treatment on the gynophore number variable. This shows that the application of fertilizers has an effect on the amount of gynophore of peanut Cv. Bonci DM 2. Calculation results of the average number of gynophores for peanuts Cv. DM 2 Bonci can be seen in the following table.

Table 4. The average number of peanut gynophores Cv. Bonci DM 2 on various types of fertilizer among coconut and banana stands

Treatment	The average number of gynophores
P0	2,39583 b
P1	3,80208 a
P2	2,92708 ab
P3	4,07292 a

Note: The numbers in the same column followed by the same letter show no significant difference based on Tukey's follow-up test at a significance level of α=5%.

Table 4 shows that the total gynophore of peanut Cv. Bonci DM 2 after Tukey's follow-up test analysis at 5% level was significantly different in treatment P0 with treatment P1 and P3. The highest average number of gynophores was in the P3 treatment of 4.07292. According to Agustina, et al. (2017) low light intensity during the formation of gynophores will reduce the number of gynophores. If there are many ginophores formed, it can be said that the light intensity received by plants is quite high.

The number of flowers

The results of calculating the average number of flowers of peanut plants Cv. Bonci DM 2 at 31 HST can be seen in the following table.

Table 5. The average number of peanut flowers Cv. Bonci DM 2 on various types of fertilizer among coconut and banana stands

Treatment	The average number of flowers
P0	1,93750 b
P1	3,33333 a
P2	3,03125 a
P3	3,44792 a

Note: The numbers in the same column followed by the same letter show no significant difference based on Tukey's follow-up test at a significance level of α=5%.

The results of calculating the average number of flowers Table 5 shows that there is a significant difference in treatment P0 to treatment P1, P2, and P3. The highest average number of flowers with P3 treatment was 3.44792. According to Sutedjo (2008) in Aslamiah & Sularno (2017), phosphorus functions for seed ripening. Apart from that, as a phosphorus-forming material, it is scattered in the plant body. The parts of the plant body concerned with generative propagation, such as flower leaves, stamens, anthers, pollen grains, fruit leaves and ovaries contain phosphorus. So if you want to encourage the formation of flowers and fruit, you need a very large amount of phosphorus.

Summary

The combination of fertilizer treatment and spacing had no significant effect on all component variables of peanut growth Cv. Bonci DM 2. This proves that in this study the growth of Cv. DM 2 seedlings were not affected by the interaction between fertilizer and spacing. Fertilizer treatment had a significant effect on the variables of the number of branches, the number of compound leaves 20 and 40 DAP, the number of gynophores, and the number of flowers 31 DAP. The application of P3 fertilizer (Urea+TSP+KCl+POC) gave a positive response to the growth of these plants. In the treatment of J3 spacing (30 x 25 cm) it had a significant effect on the number of branches 31 HST.

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