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Optimization of maize (*Zea mays* L) cultivation in post tin mining land

Optimization of maize (*Zea mays* L) cultivation in post tin mining land

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Abstract: Post tin mining land can be used as agriculture land with ameliorant application and plant spacing modification. This research aimed to study the ameliorant type and plant spacing that affects the growth and yield of maize in post tin mining land. This research was conducted in Post-Tin mining land, Bangka, from February to May 2020. This research used Factorial Randomized Block Design with two factors and three replications. The first factor was ameliorant application consisted of Topsoil (K1), N, P, K + Topsoil (K2), Block compost of cassava peel waste + Topsoil (K3). The second factor was plant spacing (30cm x80 cm (J1); 50 cmx60 cm (J2); 70 cmx40 cm(J3)). The result showed that ameliorant application gave a significant effect on the growth and yield of maize parameters in post tin mining land. Plant spacing gave the best effect on cop production/ha, dry seed weight, and dry seed production/ha. NPK + Topsoil ameliorant with 30 cm x 80 cm plant spacing gave the best interaction on leaves number, cop diameter, and dry seed weight of maize in post tin mining land.

1. Introduction

Post tin mining land is one of the marginal lands in Bangka Belitung Province and has the potential to be used as agricultural land. The mining area of PT Timah reaches 473,401 ha consisting of 288,729 ha on land a[17]184,672 ha at sea [1]. Utilization of tin mining land as agricultural land has various obstacles such as acidic soil reaction, poor C-Organic content and Cation Exchange Capacity (CEC), poor macronutrients, and alkaline cation (K, Ca, Mg and Na) [2]. The tin mining area is also dominated by sand, high porosity, low water holding capacity, and nutrient solubilizing [3].

The ad[1]tion of inorganic and organic ameliorant is one of the efforts that can be done to improve the quality of post tin -mining land as agricultural land. Inorganic ameliorant that can be used is NPK fertilizer as a provider of N, P, and K nutrients in post-mining tin lands with low status [4]. Organic ameliorant that [13]n be utilized is cassava peel waste and topsoil. Cassava peel waste is one of organic waste that can improve soil physical, chemical, and biological properties [5]. Ameliorant of cassava peels waste can apply the innovation of blocks compost technology. Block compost is able to hold the water in the long term, to reduce the heat, to release the nutrient slowly according to the need of the plant [6]. Topsoil application in post-mining land contributed to the revegetation plant effort for rehabilitating the damaged tin mining [7].

Another effort that can be done besides add[1]g ameliorant is to manage the cropping patterns by modifying plant spacing. Plant spacing affects the growth and yield of crop production in post tin mining

land because it is related to the crop competition and space for plants to grow [8]. So that the plant competition for the nutrient and solar radiation in post-tin mining lands can be reduced [9]. The purpose of this study was to determine the type of ameliorant and spacing that affected the growth and yield of maize in post-mining land. Therefore, utilizing post tin mining land as agricultural land is one of the efforts to promote sustainable rehabilitation and environmental productivity.

2. Materials and Methods

The research was conducted in post tin mining land, Dwi makmur Village, Bangka Regency from February to May 2020. The materials and tools consisted of maize, inorganic fertilizer, block compost of cassava peel waste, topsoil, hoe, meter, chlorophyll meter, digital scale, and calipers. This research used Factorial Randomized Block Design with two factors. The first factor was ameliorant application consisted of (Topsoil (K1), N, P, K+ Topsoil (K2), Block compost of cassava peel waste + Topsoil (K3). The second factor was plant spacing (30cm x80 cm (J1); 50 cmx60 cm (J2); 70 cmx40 cm(J3)). This research consists of 9 combination treatments with 3 replications and 7 samples each block. There were 27 experiment units with 20 plants each block.

The procedures included land preparation, ameliorant application, plant spacing arrangement, planting, and harvesting. The first step was land cleared from weeds, then 27 plots made with 3 m x2 m. The next was an ameliorant application that was done by putting in a planting hole. Inorganic ameliorant was NPK (300 kg/ha urea, 200 kg/ha TSP, and 150 kg/ha KCl). Organic ameliorant was topsoil with 2 kg/hole and block compost of cassava peel waste with 10 tonnes/h Plant spacing arrangement was done with three types of plant spacing. The first plant spacing was 30 cm x 80 cm, and then 50 cm x 60 cm, and the last was 70 cm x 40 cm. Planting was done by putting one maize seed each planting hole in different plant spacing with following plant spacing treatment. Watering was done once in a day. Maize was observed and was ready to be harvested when its leaves, stem, and cop turned into yellow and dried.

The parameters in this research were plant height, leaves number, stem diameter, chlorophyll content, root length, tasseling days, cop number, cop length, cop diameter, cop production/ha, dry seed weight, and dry seed production/ha. The data analysis used the F test with a 95% significant level and if the data give a significant effect it will continue by using Duncan's Multiple Range Test.

3. Result and Discussion

The result of variance analysis showed that ameliorant application gave a significant effect on all parameters except tasseling days. Plant spacing treatment gave no significant effect on all parameters except cop production/ha, dry seed weight, and dry seed production/ha (Table 1).

Table 1. Analysis variance of maize growth and yield parameters with various ameliorant application and plant spacing in post tin mining land.

Parameters	Ameliorant		Plant spacing		Interaction		CV
	Mean	Pr >F	Mean	Pr >F	F hit	Pr >F	(%)
Plant height (cm)	84.94	<.0001**	0.53	0.5995^{ns}	2.44	0.0897^{ns}	13.04
Leaves number (strands)	70.81	<.0001**	2.98	0.0793^{ns}	4.34	0.0144*	13.89
Stem diameter (cm)	12.61	0.0005**	0.46	0.6396^{ns}	0.76	0.5649^{ns}	31.74
Chlorophyll content (cci)	106.1	<.0001**	1.78	0.2002^{ns}	1.18	0.3554^{ns}	22.10
Tasseling days (dap)	0.37	0.6996^{ns}	0.45	0.6454^{ns}	1.04	0.4162^{ns}	32.71
Root length (cm)	16.09	0.0001**	0.30	0.7445^{ns}	1.60	0.2217^{ns}	16.99
Cop number (piece)	10.86	0.0010**	0.37	0.6979^{ns}	0.31	0.8658^{ns}	35.72
Cop length (cm)	30.81	<.0001**	0.42	0.6663^{ns}	0.82	0.5283^{ns}	27.10
Cop diameter (cm)	55.00	<.0001**	0.52	0.6031^{ns}	2.99	0.0509*	23.62
Cop production/ha(tonnes)	80.60	<.0001**	3.66	0.0490*	2.98	0.0515^{ns}	36.51
Dry seed weight (g)	77.92	<.0001**	5.28	0.0174*	4.71	0.0105*	34.67
Dry seed production/ha (tonnes)	64.79	<.0001**	4.38	0.0305*	2.88	0.0567^{ns}	40.72

Notes: CV = Coefficient of variation; ** = Significant at 1% level; * = Significant at 5% level; ns = Not significant; Pr > F = Probability value.

The result of the *Duncan's Multiple Range Test (DMRT)* test (Table 2 and Table 3), inorganic ameliorant (N, P, and K) + Topsoil produced higher than others on plant height, chlorophyll content, cop length, cop diameter, cop production/ha, dry seed weight and dry seed production/ha. N, P, K nutrients are essential nutrients for the growth and the yield of maize [10]. In addition, N nutrient has a direct role in plant vegetative part formation and plays a major role in chlorophyll synthesis to increase the photosynthesis process [11]. Inorganic ameliorant (N, P, and K) + Topsoil gave the best effect not significantly different from organic ameliorant (block compost of cassava peel waste) +Top soil on leaves number, stem diameter, root length, and cop number and very significantly different with Topsoil ameliorant.

Table 2. The result of the DMRT test of ameliorant application on the growth of maize in post tin mining land

Ameliorant	Plant height (cm)	Leaves number (strands)	Stem diameter (cm)	Chlorophyll content (cci)	Root length (cm)	Tasseling day (DAP)
Topsoil	44.458 c	3.921 b	6.284 b	4.9544 b	16.102 b	50.89
NPK+ Topsoil	106.716 a	8.9289 a	13.749 a	17.2222 a	25.627 a	58.00
Block compost+Topsoil	89.627 b	8.4756 a	13.211 a	5.3644 b	22.727 a	55.56

Note: Numbers are followed by the same letter in the same column showed no significantly different effect at the Duncan Multiple Range Test (DMRT), α=0.05.
DAP: Day after planting

Table 3. The result of DMRT test of ameliorant application on the yield of maize in post tin mining land

Ameliorant	Cop number (piece)	Cop length (cm)	Cop diameter (cm)	Cop production/ha (tonnes)	Dry seed weight (g)	Dry seed production/ha (tonnes)
Topsoil	0.5556 b	6.948 c	5.940 c	0.0967 c	3.186 c	0.0419 c
NPK+ Topsoil	1.3033 a	21.443 a	25.264 a	2.3611 a	53.512 a	1.2374 a
Block compost+Topsoil	1.0467 a	15.078 b	20.673 b	0.7444 b	18.993 b	0.4039 b

Note: Numbers are followed by the same letter in the same column showed no significantly different effect at the Duncan Multiple Range Test (DMRT), α=0.05.

According to the data (Table 2 and Table 3) N, P, K is the best ameliorant to promote the growth and the yield of maize in post tin mining land because it provides macronutrients for plant development [12]. N, P, K ameliorant increase leaves number, stem diameter, root length, and cop number of maize. Similarly, the ameliorant of block compost of cassava peel increases leaves number, stem diameter, root length, and cop number of maize in post tin mining land. Not only inorganic ameliorant is required for the growth and the yield of the plant but also organic ameliorant. It is similar to the [13] reported that organic ameliorant improves soil structure and nutrient availability.

Management of plant density in marginal land is crucial in order to improve maize production. According to [14], the yield of maize will increase if planted in optimum space. Two tables (Table 4 and Table 5) represent that plant spacing has no significant effect on plant height, leaves number, stem diameter, chlorophyll content, root length, tasseling days, cop number. Though plant spacing not significant to the growth of and the yield of maize in post tin mining land, plant spacing of 30 cm x 80 cm has the highest value on plant height, leaves number, tasseling days, cop number, cop length, and cop diameter are compared to others treatment. Plant spacing treatment (50 cm x 60 cm) gave the highest value on stem diameter and chlorophyll content than other treatments while plant spacing 70 cm x 40 cm gave the highest result on root length. The root system in this research developed w under low plant populations or wide plant spacing. Similarly, the result from [15] reported that plant spacing of 70 cm x40 cm provided sufficient opportunity for the roots to feed extensively within the nutrient and water

without interrupting and competition. In contrast, the result from [16] reported that denser plant spacing helped maintain a larger root system under a high population.

Table 4. The result of DMRT test of plant spacing on the growth of maize on post tin mining land

Ameliorant	Plant height (cm)	Leaves number (str, ands)	Stem diameter (cm)	Chlorophyll content (cci)	Root length (cm)	Tasseling day (DAP)
30 cm x80 cm	82.64a	7.64a	10.22a	9.4a	21.78a	59.44a
50 cm x 60 cm	80.57a	7.17a	11.78a	9.95a	20.72a	52.56a
70 cm x40 cm	77.59a	6.51a	11.24a	8.19a	21.95a	52.44a

Note: Numbers are followed by the same letter in the same column showed not really different significantly effect at the Duncan Multiple Range Test (DMRT), α=0.05.
DAP: Day after planting

The result of the DMRT test (Table 5), plant spacing treatment gave significantly different effects on maize yield in post tin mining land. Plant spacing (30 cm x80 cm) gave the highest value on cop production/ha, dry seed weight, and dry seed production/ha. Plant spacing of 30 cmx80 cm gave the highest result not significantly different with a plant spacing of 50 cmx60 cm on cop production/ha and very significantly different with a plant spacing of 70 cm x 40 cm. Wider plant spacing declined the plant competition for nutrient and root development in marginal land like post tin mining land [17]. In addition, there is no competition for sunlight absorption because the position of leaves between plants does not cover each other [18]. Meanwhile denser plant spacing can increase plant competition for nutrients, air, water, sunlight, and limited growing space in marginal land because it is related to the plant density or plant population [19]. A higher plant population will decrease the grain-filling stage because of the root competition in nutrient absorption. This result in line with [20] showed that root reductive activity in all root zones were decreased under narrow plant spacing.

Table 5. The result of DMRT test of plant spacing on the yield of maize on post tin mining land

Ameliorant	Cop number (piece)	Cop length (cm)	Cop diameter (cm)	Cop production/ha (tonnes)	Dry seed weight (g)	Dry seed production/ha (tonnes)
30 cm x 80 cm	1.02a	15.11a	18.22a	1.2456 a	32.433 a	0.6924 a
50 cm x 60 cm	0.89a	13.53a	16.26a	1.1733 a	24.069 ab	0.6069 ab
70 cm x 40 cm	1a	14.83a	17.39a	0.7833 b	19.189 b	0.3839 b

Note: Numbers are followed by the same letter in the same column showed not really different significantly effect at the Duncan Multiple Range Test (DMRT), α=0.05.

The result of *Duncan's Multiple Range Test (DMRT)* showed that the combination of N, P, K +*Topsoil* ameliorant with a plant spacing of 30 cm x 80 cm gave the highest result not significantly different with a combination of block compost+*Topsoil* ameliorant with a plant spacing of 30 cm x 80 cm on leaves number. N, P, K +*Topsoil* ameliorant with a plant spacing of 30 cm x 80 cm gave the highest leaves number very significantly different with the combination of topsoil ameliorant with a plant spacing of 30 cm x 80 cm of maize in post tin mining land. The combination of N, P, K +*Topsoil* ameliorant with a plant spacing of 30 cm x 80 cm is significantly different from other treatment on cop diameter and dry seed weight (Table 6.) These results are similar to [21] showed that NPK fertilizer application with optimum plant spacing might have more efficient utilization of sunlight and performed perfectly assimilate translocation leading to a higher yield of seed.

Table 6. The result of the DMRT test at combination treatment of ameliorant application with plant spacing on leaves number, cop diameter, and dry seed weight of maize in post tin mining land.

Plant spacing	Ameliorant		
	Topsoil	N,P,K + Topsoil	Block compost +Topsoil
		Leaves number	
30 cm x 80 cm	3.58Ab	10.01Aa	9.33Aa
50 cm x 60 cm	3.29Ab	9.24ABa	9.00Aa
70 cm x 40 cm	4.10Ab	7.54Ba	7.10Aab
		Cop diameter	
30 cm x 80 cm	3.59Ab	28.31Aa	22.77Aa
50 cm x 60 cm	2.86Ab	25.40ABa	20.54Aa
70 cm x 40 cm	11.37Aa	22.08Ba	18.71Aa
		Dry seed weight	
30 cm x 80 cm	0.05Ab	70.63Aa	26.62Ab
50 cm x 60 cm	0.25Ac	53.51ABa	18.44Ab
70 cm x 40 cm	9.25Ab	36.4Ba	11.92Ab

Notes: Numbers are followed by the same letter in the same line or column showed not really different significantly effect at DMRT test, α=0.05. Uppercase notations are read vertically and lowercase letters are read horizontally.

4. Conclusion

N, P, K + Topsoil ameliorant was the best ameliorant to promote the growth and the yield of maize in post tin mining land, and the wider plant spacing is recommended for planting maize in marginal land.

References

[1] PT Timah. 2018. *Laporan Tahunan tahun 2018* (Pangkal Pinang: PT Timah)
[2] Asmarhansyah, Badayos RB, Sanchez PB, Cruz PCS, and Florece LM 2017 Suitability Evaluation of Ab, andoned Tin Mining Areas for Agriculture Development in Bangka Isl, and, Indonesia *Journal of Degraded, and Mining L, and Management,* **4** pp 907-918
[3] Nurtjahya E, Fralnklin J, Umroh, and Agustina F 2017 The Impact of Tin Mining in Bangka Belitung, and its Reclamation Studies. MATEC Web of Conferences **101** pp 1-16
[4] Lestari T, Apriyadi R, and Azan I 2019 Optimization of Sorghum Cultivation (*Sorghum bicolor*) with Ameliorant Addition in The Post Tin Mining of Bangka, Indonesia. *International Conference on Maritime, and Archipelago (IcoMA 2018)* **167** pp 1-4
[5] Nweke IA 2016 Effect of Cassava Peel Compost, and Earthworm (*Eudriluseugenae*) Activities on the Rheological, Physical, and Biological Properties of Oil Polluted Soil *International Journal of Agricultural, and Environment Sciences* **1** pp 26-32
[6] Agus C, Wul, andari D, Cahyanti PAB, Bantara I, Hutahean BP, and Lestari T 2019 Environmental Side Engineering, and Intregated Bio-cycles Management for Rehabilation of Degraded Tin Mining L, and in Tropycal System. *International Conference on Resources, and Environment Sciences* **398** pp 1-10.
[7] Agus C, Hendryan A, Harianja V, Faridah E, Atmanto WD, Cahyanti PAB, Wul, andari D, Peritiwiningrum A, Suhartanto B, Bantara I, Hutahean BP, Suparto B, and Lestari T 2019 Role of Organic Soil Amendment of Paramagnetic Humus, and Compost for Rehabilitation of Post Tin-mined Tropical L *International Journal of Smart Grid, and Clean Energy* **8** pp 556-561
[8] Kartika T 2018 Pengaruh Jarak Tanam terhadap Pertumbuhan dan Produksi Jagung (*Zea mays* L) Non Hibrida di Lahan Balai Agro Teknologi Terpadu (ATP) *Jurnal Ilmiah Matematika dan Ilmu Pengetahuan Alam* **15** pp 129-139
[9] Irawan S, Safruddin, and Mawarni R 2019 Pengaruh Perlakuan Jarak Tanam dan Pemberian Pupuk NPK terhadap Pertumbuhan dan Produksi Tanaman Jagung (*Zea mays* L) *Bernas Agricultural Research Journal* **15** pp 174-184
[10] Waramui Y, Islami T, and Sudiarso. 2019 Effects of Ameliorant, and Fertilizer on the growth, and yield of maize grown in peatl, ands soil of West Kalimantan, Indonesia *Journal of Degraded, and Mining L, and Management* **6** pp 1779-1787

[11] Asibi AE, Chai Q, and Coulter JA 2019 Mechanisms of Nitrogen Use in Maize *Journal of Agronomi* **9** pp 1-16
[12] Sofyan ET, Sara SD, and Machfud Y 2019 The Effect of Organic, and Inorganic fertilizer application on N, P-uptake, K-uptake, and Yield of Sweet Corn (*Zea mays saccaharata* Sturt*). International Seminar, and Congress of Indonesia Soil Science Society* **393** pp1-6
[13] Bhatt MK, Labanya R, and Joshi HC 2016 Influence of Long-term Chemical Fertilizer, and Organic Manures on Soil Fertility *Universal of Agriculture Research* **7** pp 177-188
[14] Sher A, Khan A, Chai LJ, Ahmad MI, Ashari U, and Jamari SA 2017 Response of Maize Grown Under High Plant Density; Performance, Issues, and Management. *Advances in Crop Science, and Technology Journal* **5** pp 1-8
[15] Ubi W, Ubi GM, Ubi WM, Okweche T, and Ojei PW 2016 Optimizing NPK Fertilizer, and Plant Spacing in Maximizing Yield, and Yield Attributes of Maize (*Zea mays*) in Southern Nigeria *Direct Research Journal of Agriculture, and Food Science* **4** pp 208-213
[16] Bernhard BJ, and Below FE 2020 Plant Population, and Row Spacing Effects on Corn: Plant Growth, Phenology, and Grain Yield *Agronomy Journal* **112** pp 2456-2465
[17] Sarker SK, Paul SK, Sarkar MAR, and Sarkar SK 2020 Impact of Planting Spacing, and Nitrogen Level on Growth, Yield , and Quality of Baby Maize, and Green Fodder from The Same Crop *Journal of Bangladesh Agricultural University* **18** pp 55-60
[18] Hadiyompamungkas B, Sulistiyaningsih E, Utami SNH, Sosiowan H, and Yusuf WA 2019 Effect of Plant Spacing, and Type of P Fertilizer on soil chemical properties, and Yield of Maize on C Type Swampl, and South Kalimantan. *International Seminar, and Congress of Indonesia Soil Science Society* **393** pp1-10
[19] Fattah KM, Sensoy S, and Akram OE 2019 The Effect of Plant Density, and Organic Fertilizer on Growth, and Yield of Sweet Corn (*Zea mays* L. var saccharata Sturt) *YYU FEBD (YYU JNAS).* **24** pp 43-55
[20] Jiang W, Wang K, Wu Q, Dong S, Liu P, and Zhang J 2013 Effect of Narrow Plant Spacing on Root Distribution, and Physiological Nitrogen Use Effeciency in Summer Maize *The Crop Journal* **1** pp 77-83
[21] Kumar A and Narayan A 2018 Influence of Planting Methods, Spacing, and Fertilization on Yield, and Quality of Sweet Corn (*Zea mays* L.,) *International Journal of Current Microbilog, and Applied Sciences* **7** pp 1232-1237

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