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Effect of N,P,K Fertilizer Rate and Biofertilizer on Growth and Yield of IR42 Rice Paddy Variety

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Abstract
The research was carried out in the rice fields of Jaya Mukti Village, Blanakan District, Subang Regency, at an altitude of 10 meters above sea level. The experiment will be carried out from August 2022 to November 2022. This research aims to study the interaction effect of giving doses of N, P, K fertilizer and biological fertilizer on the growth and yield of lowland rice plants of the IR42 variety. This experiment used a Randomized Block Design (RAK) experimental design with a factorial pattern consisting of two factors, namely the first factor was N, P, K (p) fertilizer at 3 levels and the second factor was Biological Fertilizer (h) at 3 levels, both factors were repeated 3 times. There were 9 treatment combinations that were randomly assigned to each replication. The results of this research show that giving doses of N, P, K and biological fertilizers has an effect on growth (plant height at 21 DAP and number of tillers at 28 DAP), yield (grain weight per hill). The application of N, P, K fertilizer affects the yield components (number of productive tillers, panicle length and weight of 1000 grains). The N, P, K dose of 60% shows the best panicle length and weight of 1000 grains. Biofertilizer dosage of 30 kg ha -1 shows good results on plant height.

Keywords: Rice, NPK fertilizer, biological fertilizer

1. Introduction

IR42 rice is a type of irrigated rice seed that comes from the IR2042/CR94-13 variety, has a harvest age of 130 days and produces a production of 6 tons/ha, and is resistant to planthopper pest attacks. Planting IR42 rice seeds must use the jajar legowo system, because this system has the advantage of making it easier for sunlight to enter to help the photosynthesis process, in the fertilization process and can increase the growing rice population (Aini et al., 2013). Economically, the use of IR42 rice seeds in farming can increase production so that farmers' welfare increases and can increase added value and high consumer purchasing power. Farmers' attitudes towards the application of IR42 rice seeds are based on the sapta of farming, namely soil processing, superior seeds, fertilization, pest and disease control, irrigation, product processing and marketing (Rizky, 2019). The use of fertilizer is one of the key factors in increasing food production and achieving rice self-sufficiency in Indonesia. Applying inorganic fertilizer to the soil will increase the chemical fertility of the soil because it can provide nutrients quickly for plant growth, but if it is excessive it will damage the soil's chemical, physical and biological fertility. Biofertilizers are all functional groups of soil microbes that can function as providers of nutrients in the soil, thereby increasing fertilization efficiency.

2. Methods

The experiment was carried out in the rice fields of Jaya Mukti Village, Blanakan District, Subang Regency, at a height of 10 meters above sea level. The experiment will be carried out from August 2022 to November 2022. The materials used in the experiment are rice seeds of the IR42 variety (Appendix 2),Urea fertilizer (45% N), SP-36 (36% P2O5), KCl (60% K2O) and Biological Fertilizer (Pantoea sp, Azospirillum sp, Aspergillus niger,

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Penicillium sp, Streptomyces sp).Equipment usedare tractors, hand sprayers, hoes, rice threshers, sickles, meters, stationery, rulers, calculators, analytical scales, sample paper, sample plastic, and documentation tools. This experiment used a Randomized Group Design (RAK) experimental design with a factorial pattern consisting of two factors, namely the first factor was N, P, K (p) fertilizer at 3 levels and the second factor was Biological Fertilizer (h) at 3 levels, both factors were repeated 3 times. There were 9 treatment combinations that were randomly assigned to each replication.

Table 1. Treatment Variables

Variable Type	Sub Variable	Variable Indicator
Independent Variable (Treatment)	N,P,K fertilizer	p1 =N,P,K 100% (Urea 300 kg ha-1 + SP-36 50 kg ha-1 + KCl 50 kg ha-1) p2 =N,P,K 60% (Urea 180 kg ha-1 + SP-36 30 kg ha-1 + KCl 30 kg ha-1) p3 =N,P,K 20 % (Urea 60 kg ha-1 + SP-36 20 kg ha-1 + KCl 20 kg ha-1)
	Biological Fertilizer	h0 =Biological Fertilizer 0 kg ha-1 h1 =Biological Fertilizer 15 kg ha-1 h2 =Biological Fertilizer 30 kg ha-1

Table 2. Combination Treatment of N, P, K Fertilizer and Biological Fertilizer

N,P,K Fertilizer (p)	Biological Fertilizer (h)		
	h0	h1	h2
p1	p1 h0	p1 h1	p1 h2
p2	p2 h0	p2 h1	p1 h2
p3	p3 h0	p3 h1	p1 h2

Table 3. Dependent Variable

Variable Type	Sub Variable	Indicator
Dependent Variable (Response)	1. Growth Characteristics	1. Plant Height 2. Number of Cubs
	2. Result Components	1. Number of Productive Tillers 2. Panicle Length 3. Grain Weight per Malai
	3. Rice Crop Results	1. Harvested dry grain weight per Clump 2. Weight of 1000 items

Table 4. List of Random Variance Analysis Group Factorial Patterns

Variety Source	DB	JK	KT	F. Hit	F.05
Deuteronomy (r)	3	∑Xi..2/tX...2/rt	JKr/BDr	Ktr/KTg	4.46
Treatment (t)	9	∑X.jh2/rX...2/rt	JKt/BDr	KTt/KTg	3.44
NPK Fertilizer (p)	3	∑Xj2/rn-X...2/rt	JKp/BDh	KTh/KTg	4.46
Biological Fertilizer (h)	3	∑X..k2/rz-X...2/rt	JKi/DBp	ID card/KTg	4.46
L x H	9	∑JKt-JKh-JKp	JKpi/DBhp	KThp/KTg	3.84
Error (G)	27	∑JKtotal-JKt-JKt	JKg/DBg	-	-
Total (T)	54	∑Xijk2-X…2/rt	-	-	-

Source: Toto Warsa and Cucu SA (1982)

3. Results and Discussion

3.1 Observation of Plant Height

The results of the independent test analysis showed that the application of N, P, K fertilizer and biological fertilizer showed significantly different results on the height growth of plants aged 21 DAT and 35 DAP.

Table 5. Effect of N, P, K fertilizer and biological fertilizer on plant height at age, 14, 21, 28 and 35 HST.

Treatment	Average Plant Height (cm)			
	14 HST	21 HST	28 HST	35 HST
N,P,K fertilizer				
p1 (100 %)	19.23 a	36.28 a	49.71 a	52.54 a
p2 (60 %)	18.41 a	38.44 b	50.06 a	52.11 a
p3 (20%)	20.00 a	35.89 a	47.49 a	50.78 a
Biological Fertilizer				
h0 (0 kg ha-1)	18.44 a	35.40 a	47.64 a	50.33 a
h1 (15 kg ha-1)	19.51 a	37.43 b	49.68 a	52.16 ab
h2 (30 kg ha-1)	19.69 a	37.78 b	49.93 a	59.94 b

Note: Average numbers followed by the same letter in the same column are not significantly different based on the Duncant Multiple Range Test at a 5% Significance Level.

3.2 Observation of the Number of Tillers

The results of the independent test analysis showed that the application of N, P, K fertilizer and biological fertilizer showed significantly different results on the number of tillers aged 28 HST.

Table 6. The effect of N, P, K fertilizer and biological fertilizer on the number of tillers aged 14, 21, 28 and 35 HST.

Treatment	Average Number of Tillers (clump)			
	14 HST	21 HST	28 HST	35 HST
N,P,K fertilizer				
p1 (100 %)	6.00 a	12.11 a	18.67 ab	28.67 a
p2 (60 %)	5.67 a	12.67 a	20.67 c	29.67 a
p3 (20%)	4.33 a	11.44 a	17.11 a	28.33 a
Biological Fertilizer				
h0 (0 kg ha-1)	4.78 a	11.00 a	17.67 a	28.33 a
h1 (15 kg ha-1)	5.56 a	12.22 a	18.00 ab	28.33 a
h2 (30 kg ha-1)	5.67 a	13.00 a	20.78 c	30.00 a

Note: Average numbers followed by the same letter in the same column are not significantly different based on the Duncant Multiple Range Test at a 5% Significance Level.

3.3 Observation of the number of productive offspring

The results of the independent test analysis showed that the application of N, P, K fertilizer showed significantly different results on the number of productive tillers.

Table 7. The effect of N, P, K fertilizer and biological fertilizer on the number of productive tillers.

Treatment	Average Number of Productive Tillers (clump)
N,P,K fertilizer	
p1 (100 %)	17.78 a
p2 (60 %)	18.56 b
p3 (20%)	15.53 a
Biological Fertilizer	
h0 (0 kg ha-1)	16.33 a
h1 (15 kg ha-1)	17.00 a
h2 (30 kg ha-1)	18.56 a

Note: Average numbers followed by the same letter in the same column are not significantly different based on the Duncant Multiple Range Test at a 5% Significance Level.

3.4 Panicle Length Observations

The results of the independent test analysis showed that the application of N, P, K fertilizer showed significantly different results on the number of productive tillers.

Table 8. Effect of N, P, K fertilizer and biological fertilizer on panicle length.

Treatment	Average Panicle Length (cm)
N,P,K fertilizer	
p1 (100 %)	20.03 ab
p2 (60 %)	22.36 b
p3 (20%)	18.80 a

Biological Fertilizer	
h0 (0 kg ha-1)	19.87 a
h1 (15 kg ha-1)	20.12 a
h2 (30 kg ha-1)	21.20 a

Note: Average numbers followed by the same letter in the same column are not significantly different based on the Duncant Multiple Range Test at a 5% Significance Level.

3.5 Observation of Grain Weight per Panicle

The results of the independent test analysis showed that the application of N, P, K fertilizer and Biological Fertilizer showed insignificantly different results on grain weight per panicle.

Table 9. Effect of N, P, K fertilizer and biological fertilizer on grain weight per panicle.

Treatment	Average Number of Grain Weights Per Panicle (g)
N,P,K fertilizer	
p1 (100 %)	2.13 a
p2 (60 %)	2.10 a
p3 (20%)	1.86 a
Biological Fertilizer	
h0 (0 kg ha-1)	1.97 a
h1 (15 kg ha-1)	2.01 a
h2 (30 kg ha-1)	2.12 a

Note: Average numbers followed by the same letter in the same column are not significantly different based on the Duncant Multiple Range Test at a 5% Significance Level.

3.6 Observation of Grain Weight per Clump

The results of the independent test analysis showed that the application of N, P, K fertilizer and Biological Fertilizer showed significantly different results on the weight of grain per hill.

Table 10. Effect of N, P, K fertilizer and biological fertilizer on grain weight per hill.

Treatment	Average Total Weight of Grain Per Clump (g)
N,P,K fertilizer	
p1 (100 %)	83.43 b
p2 (60 %)	84.37 b
p3 (20%)	79.87 a
Biological Fertilizer	
h0 (0 kg ha-1)	80.56 a
h1 (15 kg ha-1)	82.33 ab
h2 (30 kg ha-1)	84.78 b

Note: Average numbers followed by the same letter in the same column indicate that they are not significantly different based on the Duncant Multiple Range Test at Level of Significance 5%.

3.7 Observation of the Weight of 1000 Items

The results of the independent test analysis showed that the application of N, P, K fertilizer showed significantly different results for the weight of 1000 grains in the p2 treatment (60%) showed the highest results compared to other treatments, while the application of biological fertilizer had no significant difference for the weight of 1000 grains.

Table 11. The effect of N, P, K fertilizer and biological fertilizer on the weight of 1000 grains

Treatment	Average Total Weight of 1000 Items (g)
N,P,K fertilizer	
p1 (100 %)	24.62 b
p2 (60 %)	25.98 b

p3 (20%)	22.16 a
Biological Fertilizer	
h0 (0 kg ha-1)	23.68 a
h1 (15 kg ha-1)	23.82 a
h2 (30 kg ha-1)	25.26 a

Note: Average numbers followed by the same letter in the same column are not significantly different based on the Duncant Multiple Range Test at a 5% Significance Level.

4. Conclusion

Providing doses of N, P, K fertilizer and biological fertilizer affected growth (plant height 21 DAP and number of tillers 28 DAP), yield (grain weight per hill). The application of N, P, K fertilizer affects the yield components (number of productive tillers, panicle length and weight of 1000 grains). The N, P, K dose of 60% shows the best panicle length and weight of 1000 grains. Biofertilizer dosage of 30 kg ha -1 shows good results on plant height.

References

Abidin Agus. 2014. Agronomi Tanaman Padi (Oryza sativa L.). Teori Pertumbuhan dan Meningkatkan Hasil Padi. Lembaga Penelitian Pertanian, Jakarta.

Anggraini, F., Suryanto, A., & Aini, N. (2013). Sistem Tanam dan Umur Bibit pada Tanaman Padi Sawah (Oryza Sativa L.) Varietas INPARI 13. Jurnal Produksi Tanaman, 1(2), 52–60.

Arifin. 2005. Ekonomi Kelembagaan Pangan. Jakarta : LP3ES.

Badan Pusat Statistik .2021. Produksi Tanaman Padi Seluruh Provinsi. http://bps.tnmnpgn.go.id. Diakses Juli 2022.

Badan Penelitian Dan Pengembangan Pertanian. 2020. Rekomendasi Pupuk N,P,K Spesifik Lokasi Untuk Tanaman Padi, Jagung, Kedelai Pada Lahan Sawah (Per Kecamatan), Jakarta.

Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian. 2010. Pupuk Organik dan Pupuk Hayati. Balai Penelitian Tanah, Bogor.

Balai Besar Penelitian Tanaman Padi. 2013. GRENDEL HDB. Balai Besar Penelitian Tanaman Padi, Kementrian Pertanian, Jakarta. http://bbpadi.litbang.pertanian.go.id/index.php/ varietas/inbrida-padi-sawah-irigasi-inpari/content/item/35-inpari-32-hdb. Diakses pada 22 April 2018.

Board, N. 2012. The complete Technology Book on: Biofertilizers and Organic Farming. Niir Project Consultansy Services. 2010 – 2014 106-E, Kamla Nagar, Delhi-110007 (India). ISBN: 978-93-81039-07-6.

Boraste A, KK Vamsi, A. Jhadav, Y Khairnar, N Gupta, S Trivedi and B Joshi. 2009. Biofertilizers: A novel tool for agriculture.InternationalJournal of Microbiology Researc, 1(2): 2- 31

Budi, D. S dan J. Munarso. 2000. Perbaikan Produktivitas dan Mutu Hasil Padi Gogorancah Melalui Pemupukan Kalium dan Pengelolaan Pupuk *Kandang.* Penelitian Pertanian Tanaman Pangan, PPPTP Badan Penelitian dan Pengembangan Pertanian. Vol 20 No. 2. Aksara. Jakarta.

Eka, D. 2015. Syarat Tumbuh Tanaman Padi Gogo dan Padi Sawah. Tanaman Pangan, Jakarta.

Fahmi, Fahrizal, and Siti Balkis. 2017. "The role of farmer group on application the sapta usahatani programs lowland rice farming at Bunga Jadi Village, Muara Kaman District, Kutai Kartanegara Regency." Agrifor: Jurnal Ilmu Pertanian Dan Kehutanan 16.2 (2017): 171-182.

Fairhurst, T., C. Witt, R. Buresh, and A.Doberman, 2007. Padi :Panduan Praktis Pengelolaan Hara. Diterjemahkan oleh A. Widjono.IRRI.Aksi Agraris

Fitriatin, B. N. dan T. Simarmata. 2005. Efek Metode Perlakuan Benih dengan Kinetin dan Suspensi bakteri Pelarut Fosfat Penghasil Fitohormon terhadap pertumbuhan dan hasil Tanaman Padi Gogo. Jurnal Agrikultura, Vol. 16,2 : 84-88

Fitriatin, B.N and D. Maulana. 2012. The effect of phospate solubilizing bacteria on soil P. Phospatase activity, P uptake and yield of sweet corn (zea mays var. Saccharata Sturt L) in Ultisols and Andisols. Proceeding *8^{ht}* International Soil Science Congress *"Land Degradation and Challengs in Soil Management"* Ceseme – Izmir, Turkey.

Hasanah, I. 2007. Bercocok Tanam Padi. Azka Mulia Media. Jakarta. 68 hal.

Hasibuan, 2006. Pupuk dan Pemupukan.Fakultas Pertanian Universitas Sumatra Utara, Medan.

Ihsan, S. 2012. Role of Participatory Rural Appraisal in Community Development. International Journal of Academic Research in Business and Social Sciences. 2 (8), hal 25-38

Isroi, 2008. Pupuk Hayati dan Kimia (Online). (http://www.mpg.de. news01/new0103.htlm), diakses tanggal 20 Juli 2022.

Kamsurya M.Y, H. T Sebayang, dan B. Guritno. 2002. Pengaruh Pemupukan Nitrogen Pada Lahan Tanpa Olah Tanah dengan Herbisida Glifosat terhadap pertumbuhan beberapa varietas padi. Fakultas Peranian Universitas Brawijaya Malang.

Kloepper, J.W. 1993. Plant growth-promoting rhizobacteria as biological control agents. p. 255-274. In F.Blaine Metting, Jr. (Ed.). Soil Microbiology Ecology, Applications in Agricultural and Environmental Management. Marcel Dekker, Inc., New York.

Kumolontang, W.J.N. 2008. Seleksi Bahan Organik dalam Peningkatan Sinkronisasi N dan P oleh tanaman pada tanah Masam 6 (2): 98-102.

Makarim, AK., Suhartatik E. 2009. Morfologi dan fisiologi tanaman padi dalam Suyamto, IN Widiarta, Satoto, editor. Padi: Inovasi Teknologi dan Ketahanan Pangan. Ed ke-1. Jakarta: LIPI Press. hlm 295-330.

Novizan. 2003. *Petunjuk Pemupukan yang Efektif*. Agromedia Pustaka. Jakarta.

Novizan. 2003. *Petunjuk Pemupukan yang Efektif*. Agromedia Pustaka. Jakarta.

Prabhandaru,I dan Saputro. 2017. Respon Perkecambahan Benih Padi (Oryza sativa L.) Varietas Lokal SiGadis Hasil Iradiasi Sinar Gamma. JURNAL SAINS DAN SENI ITS Vol. 6, No. 2.

Pranata, S. 2010. Meningkatkan Hasil Panen Dengan Pupuk Organik. AgroMedia Pustaka, Jakarta

Rahayu, M. Prajitno D & Syukur, A. 2009. Pertumbuhan Vegetatif Padi Gogo dan Beberapa Varietas Nanas dalam Sistem Tumpangsari di Lahan Kering Gunung.

Ramadhan, F. 2014. Parameter genetik Beberapa Varietas Padi (*Oryza sativa* L.) Padi Kondisi Media Berbeda. Universitas Syiah Kuala. Skripsi Banda Aceh.

Rosmarkam, Afandhie dan Nasih Widyia Yuwono. 2002. *Ilmu Kesuburan Tanah.* Kanisius, Yogyakarta

Sapartka, N. 2003. Phospatase activities (ACP, ALP) in Agroecosystem Soils. Doctoral Thesis. Swedish University of Agriculture Sciences. Uppsala. Dissepsilon.Slu.se/archive/ 00000285/01/Agraria 396 Docutech Tryckfil. [Diakses 15 Desember 2008]

Simanungkalit RDM, DA Suriadikarta, R Saraswati, dan W Hartatik. 2006. Pupukorganik dan pupuk hayati. Balai Besar Penelitian dan Pengembangan Sumber Daya Lahan Pertanian, Bogor.

Singh T and S.S Purohit. 2011. Biofertilizers Tecnology. Agrobios (India). ISBN. 13:978-81-7754-382-7

Suardi, D. 2002. Perakaran padi dalam hubungannnya dengan toleransi tanaman terhadap kekeringan dan hasil. J Litbang Pertan 21(3): 100-108.

Suhartatik. 2008. Morfologi dan Fisiologi Tanaman Padi. http://www.google.com/url.litbang.deptan.go.id%spesial%padi2009. Diakses 10 November 2018.

Soplanit, R., & Nukuhaly, S. H. (2018). Pengaruh Pengelolaan Hara NPK Terhadap Ketersediaan N Dan Hasil Tanaman Padi Sawah (Oryza Sativa L.) Di Desa Waelo Kecamatan Waeapo Kabupaten Buru. Agrologia, 1(1), 82–90. https://doi.org/10.30598/a.v1i1.302

Sutanto, R.2004.Penerapan Bahan Organik.Kanisius.Yogyakarta.

Sutanto, Rachman. 2002. Penerapan Pertanian Organik. Kanisius. Yogyakarta.

Sutejo, M. 2002. Pupuk dan Cara Pemupukan. Rineka Cipta, Jakarta.

Sutrisno. 2014. Resistensi wereng batang coklat terhadap insektisida di Indonesia. AgroBiogen. 10(3): 115-124

Widyawati, R. 2007. *Kandungan N tanah sawah dan Kualitas Tanaman Padi (Oryza sativa* L.) *akibat Pemberian Pupuk Organik dan Pupuk Anorganik Di Mojogedang*. Judul Skripsi S1 Fakultas Pertanian UNS. Surakarta.

Withelaw. 2000. Growth Promotion of Plants Inoculated with Phospate Solubilizing fungi. Adv. Agron. 69 : 99-151.

Yoshida S. 1981. Fundamentals of rice Crop Science. Los Banos, Phillippines: International Rice Research Institute.