UJI EFEKTIVITAS PUPUK HAYATI MIKORIZA FUMYCO PADA BIBIT KELAPA SAWIT (*ELAEIS GUINEENSIS* JACQ.) DI NURSERY

Effectiveness Test of Fumyco Mycorrhizal Biofertilizer on Oil Palm (Elaeis Guineensis Jacq.) Seedlings in Nursery

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Abstract

Oil palm (*Elaeis quineensis* Jacq.) is one of the vegetable oil-producing plantation crops that is a leading commodity in Indonesia. The application of biological fertilizers is an alternative to help improve the growth of oil palm seedlings. This study aims to analyze the effect of the use of mycorrhizal biofertilizers on the growth of oil palm plants in the Nursery, analyze root infection and spore types by mycorrhiza and examine the effect of biofertilizers on soil biological and soil chemical properties. The study used a single-factor Completely Randomized Design (CRD) with 6 treatment levels and 10 replications, so that the total experimental units were 60 polybags. Biofertilizer test treatments based on Ministerial Regulation No.1 of 2019 are Control; Standard NPK Fertilizer (15-15-15) 2.5 g; 20 g Biofertilizer; Standard NPK+20 g Biofertilizer; 3/4 Standard NPK+20 g Biofertilizer; and 1/2 Standard NPK+20 g Biofertilizer. The combination treatment of 3/4 Standard NPK+20 g Biofertilizer gave the best growth results of oil palm seedlings in the parameters of height, diameter, and number of leaves. The Relative Agronomic Effectiveness (RAE) value in the 3/4 NPK+20 g mycorrhizal biofertilizer treatment showed the most effective results agronomically and economically. The mycorrhiza treatment was able to form colonization on the roots by 100% and the types of spores found were mostly from the Acaulospora sp and Glomus sp. The results of soil biological analysis showed that the highest total microbial population was found in the treatment of 1/2 NPK mycorrhizal biofertilizer + 20 g biofertilizer, which was 31.76 x 105 SPK/g, while the highest respiration was found in the treatment of 3/4 NPK biofertilizer + 20 g biofertilizer, which was 7.94 g C/day. Application of mycorrhiza to plants showed an increase in phosphorus availability in the soil.

Keywords: colonization, mycorrhiza, relative agronomic effectiveness, regosol.

Metodologi

Penelitian dilaksanakan pada bulan November 2022 hingga Maret 2023

Greenhouse Cikabayan IPB, Laboratorium Bioteknologi Tanah, Laboratorium Kimia dan Kesuburan Tanah, dan Laboratorium PT. Anugerah Sarana Hayati

Rancangan Penelitian

Rancangan percobaan yang digunakan adalah Rancangan Acak Lengkap (RAL) faktor tunggal dengan 6 taraf perlakuan dan 10 ulangan

6 Taraf Perlakuan

1. **A** = Kontrol
2. **B** = NPK Standar (15-15-15) 2,5 g
3. **C** = 20 g Pupuk hayati
4. **D** = 1 NPK Standar + 20 g Pupuk hayati
5. **E** = 3/4 NPK Standar + 20 g Pupuk hayati
6. **F** = 1/2 NPK Standar + 20 g Pupuk hayati

Hasil

Tabel 1 Hasil analisis Tanah Regosol Dramaga sebelum penanaman

Parameter	Hasil	Kriteria
pH H_2O	5.81	Agak masam
C-Organik (%)	1.60	Rendah
N-total (%)	0.13	Rendah
P-tersedia (Ppm)	8.48	Sedang
P-total (Ppm)	342	Sangat tinggi
K-total (Ppm)	258	Sangat tinggi

Tabel 5 Nilai RAE pupuk hayati mikoriza pada bibit kelapa sawit 12 MST

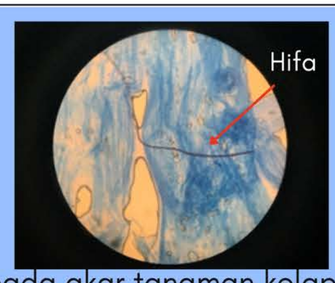
Perlakuan	Tinggi (%)	Diameter (%)	Jumlah Daun (%)	BK Tajuk (%)	BK Akar (%)
A (Kontrol)	-	-	-	-	-
B (NPK 2.5 g)	100.00	100.00	100.00	100.00	100.00
C (20 g Pupuk hayati)	318.52	614.71	318.51	176.66	276.36
D (1 NPK + 20 g Pupuk hayati)	420.37	552.94	420.37	331.66	266.36
E (3/4 NPK + 20 g Pupuk hayati)	504.63	758.82	504.62	378.33	291.81
F (1/2 NPK + 20 g Pupuk hayati)	426.85	544.12	426.85	308.33	229.09

Tabel 2 Pengaruh pemberian pupuk hayati mikoriza terhadap tinggi, diameter, dan jumlah daun, BKT, BKA pada bibit kelapa sawit umur 12 MST.

Perlakuan	Tinggi (cm)	Diameter (mm)	Jumlah Daun	Berat Kering Tajuk (g)	Berat Kering Akar (g)
A (Kontrol)	20.27^{c}	5.55^{bc}	20.27^{c}	0.43^{d}	1.73^{b}
B (NPK 2.5 g)	21.35^{bc}	5.89^{b}	21.35^{bc}	0.63^{cd}	2.1^{ab}
C (20 g Pupuk hayati)	23.71^{ab}	7.64^{a}	23.71^{ab}	0.79^{bc}	2.74^{a}
D (1 NPK + 20 g Pupuk hayati)	24.81^{a}	7.43^{a}	24.81^{ab}	1.10^{a}	2.71^{a}
E (3/4 NPK + 20 g Pupuk hayati)	25.72^{a}	8.13^{a}	25.72^{a}	1.19^{a}	2.80^{a}
F (1/2 NPK + 20 g Pupuk hayati)	24.88^{a}	7.40^{a}	24.88^{a}	1.05^{ab}	2.57^{a}

Tabel 3 Pengaruh pemberian pupuk hayati mikoriza terhadap infeksi akar bibit kelapa sawit 12 MST

Perlakuan	Infeksi akar (%)	Kriteria
A (Kontrol)	-	Sangat rendah
B (NPK 2.5 g)	-	Sangat rendah
C (20 g Pupuk hayati)	30 c	Sedang
D (1 NPK + 20 g Pupuk hayati)	40 b	Sedang
E (3/4 NPK + 20 g Pupuk hayati)	100 a	Sangat Tinggi
F (1/2 NPK + 20 g Pupuk hayati)	40 b	Sedang

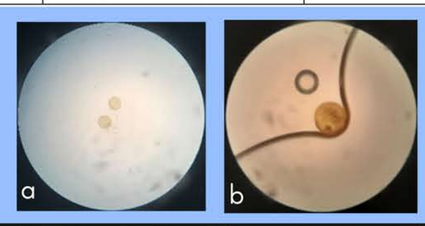


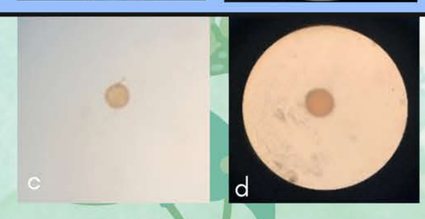
Gambar 1 Infeksi mikoriza pada akar tanaman kelapa sawit

Tabel 4 Hasil Analisis Akhir Biologi dan Kimia Tanah

Perlakuan	Total Mikrob (x 10^5 SPK/g tanah BKM)	Respirasi Tanah (g C/hari)	P-Total (ppm)	P-Tersedia (ppm)
Sebelum perlakuan	3.10	4.34	342	8.48
A (Kontrol)	13.98 b	4.91 a	757.58 b	11.28 c
B (NPK 2.5 g)	17.49 b	5.09 a	961.54 a	29.59 bc
C (20 g Pupuk hayati)	17.65 b	5.49 a	751.75 b	11.58 c
D (1 NPK + 20 g Pupuk hayati)	31.76 a	6.97 a	879.95 ab	68.98 a
E (3/4 NPK + 20 g Pupuk hayati)	28.67 a	7.94 a	920.75 ab	49.97 ab
F (1/2 NPK + 20 g Pupuk hayati)	30.57 a	7.83 a	900.35 ab	35.76 b

Perlakuan	Jenis Spora	Jumlah Spora/10 g tanah
A (Kontrol)	*Acaulospora sp1* = 2; *Acaulospora sp2* = 9	14
	Glomus sp1 = 3	
B (NPK 2.5 g)	*Acaulospora sp1* = 4; *Acaulospora sp2* = 9	23
	Glomus sp1 = 3 ; *Glomus sp2* = 7	
C (20 g Pupuk hayati)	*Acaulospora sp1* = 11; *Glomus sp1* = 11	71
	Acaulospora sp2 = 21; *Glomus sp2* = 5	
	Acaulospora sp3 = 14; *Glomus sp3* = 9	
D (1 NPK + 20 g Pupuk hayati)	*Acaulospora sp1* = 7; *Acaulospora sp3* = 2	94
	Acaulospora sp2 = 28	
	Glomus sp1 = 40; *Glomus sp2* = 17	
E (3/4 NPK + 20 g Pupuk hayati)	*Acaulospora sp1* = 5; *Glomus sp1* = 6	91
	Acaulospora sp2 = 54; *Glomus sp2* = 15	
	Acaulospora sp3 = 10; *Glomus sp3* = 1	
F (1/2 NPK + 20 g Pupuk hayati)	*Acaulospora sp2* = 5; *Acaulospora sp3* = 7	31
	Glomus sp1 = 9; *Glomus sp2* = 10	





Gambar 2 Bentuk spora Acaulospora sp2 (a), Acaulospora sp3 (b), Glomus sp1 (c), Glomus sp2 (d)

Kesimpulan

1. Pemberian pupuk hayati mikoriza berpengaruh nyata dalam meningkatkan tinggi tanaman, diameter batang, jumlah daun, berat kering tajuk, serta berat kering akar bibit kelapa sawit pada umur 12 MST.
2. Nilai Relative Agronomic Effectiveness (RAE) pada perlakuan 3/4 NPK + 20 g pupuk hayati mikoriza memiliki nilai RAE paling tinggi yaitu RAE tinggi 504.63%, diameter 758.82%, jumlah daun 504.62%, BK tajuk 378.33%, dan BK akar 291.81%.
3. Hasil analisis menunjukkan bahwa perlakuan pupuk hayati mikoriza mampu membentuk kolonisasi mikoriza pada akar sebesar 100% dan jenis spora yang paling banyak ditemukan berasal dari jenis spora Acaulospora sp dan Glomus sp. Hasil analisis biologi tanah menunjukkan bahwa total populasi mikrob dan nilai respirasi tanah tertinggi terdapat pada perlakuan pupuk hayati mikoriza 3/4 NPK + 20 g Pupuk hayati, yaitu 20.47 X 106 SPK/g dan 7.94 g C/hari. Pemberian mikoriza pada tanaman menunjukkan adanya peningkatan ketersediaan fosfor dalam tanah.