

BAB V

KESIMPULAN DAN SARAN

A. Kesimpulan

Berdasarkan pengamatan dan penelitian yang telah dilakukan dapat disimpulkan sebagai berikut :

1. Aktivitas Nitrat Reduktase (ANR), kadar klorofil-a, klorofil-b, kandungan protein daun dan berat kering tertinggi pada kultivar Memberamo, diikuti oleh kultivar Cilosari, kultivar IR-64 dan terendah kultivar Cisadane.
2. Terdapat hubungan yang positif antara Aktivitas Nitrat Reduktase (ANR), klorofil-a, klorofil-b, protein daun dan berat kering total tanaman.
3. ANR, kadar klorofil-a, kadar klorofil-b dan kandungan protein daun optimal pada umur 2 minggu, masing-masing ANR sebesar $1,343 \mu \text{ mol NO}_2^-/\text{mg/jam}$, klorofil-a sebesar $0,769 \text{ mg/gr}$ daun, klorofil-b sebesar $0,605 \text{ mg/gr}$ daun dan protein daun sebesar $129,648 \text{ mg/gr}$ bahan.

B. Saran

Pada penelitian ini diperoleh hasil bahwa terdapat hubungan yang positif antara ANR, kadar klorofil-a, klorofil-b, kandungan protein dan berat kering total tanaman pada bibit padi. Namun seperti diketahui bahwa pertumbuhan suatu tanaman dipengaruhi oleh banyak faktor diantaranya hormon pertumbuhan dan pemupukan. Untuk itu perlu ada penelitian lebih lanjut mengenai pengaruh variasi

pemberian pupuk dan hormon pertumbuhan terhadap aktivitas nitrat reduktase (ANR), kadar klorofil daun, kandungan protein daun dan pertumbuhan bibit padi.



DAFTAR PUSTAKA

- Adjuwana, 1989, *Teknik Laboratorium Untuk Bidang Biologi dan Kimia, Petunjuk Laboratorium*, PAU Bioteknologi Institut Pertanian Bogor, Bogor, hal. 45-47
- Girisonta, 1990, *Budidaya Tanaman Padi*, Penerbit Kanisius, Yogyakarta, hal. 11-56
- Anonim, 1987, *Biokimia*, Bagian Biokimia, Fakultas Kedokteran, Universitas Gadjah Mada, Yogyakarta, hal. 28
- Beevers, C. and R.H. Hageman, 1969, Nitrate Reduction in Higher Plants, *Ann. Rev. Plants Physiology* (20) : 497-503
- Bidwell, R.G.S., 1979, *Plant Physiology*, 2^{ed}, Mac Millan Publishing Co., New York, pp. 152, 259-262
- Dalling. M.J. and R.H. Lyon, 1977, Level of Activity of Nitrate Reductase at Seedling Stage as A Predictor of Grain Nitrogen Yield in Wheat (*Triticum aestivum*, L.), *Aust. J. Res.* (28) : 1-4
- Devlin, R.M. and F.H. Witham, 1983, *Plant Physiology*, Willard Giant Press, Boston, pp. 152, 155-159
- Djunainah, Susanto T.W. dan H. Kasim, 1993, *Deskripsi Varietas Unggul Padi 1943-1992*, Pusat Penelitian Dan Pengembangan Pertanian, Departemen Pertanian, Jakarta, hal. 24-117
- Dwidjoseputro, D., 1992, *Pengantar Fisiologi Tumbuhan*, Penerbit Gramedia Pustaka Utama, Jakarta, hal. 16-20, 161-178
- Gardner, F.P., R.B. Pearce dan R.L. Mitchell, 1991, *Fisiologi Tanaman Budidaya*, Penerbit Universitas Indonesia, Jakarta, hal. 428
- Gaspersz, V., 1991, *Metode Perancangan Percobaan Untuk Ilmu-Ilmu Pertanian, Teknik, Biologi*, Armico, Bandung, hal. 92-103, 116-147, 226-243
- Guerrero, M.G., J.M. Vega and M. Losada, 1981, The Assimilatory Nitrate Reducing System and Regulation, *Plant Physiology* (32) : 170-204
- Guritno, B. dan S.M. Sitompul, 1995, *Analisis Pertumbuhan Tanaman*, Gadjah Mada University Press, Yogyakarta, hal. 4-12, 88-101, 160-161

- Harborne, J.B., 1987, *Metode Fitokimia*, Institut Teknologi Bandung, Bandung, hal. 259-260
- Harjadi, S.S., 1979, *Pengantar Agronomi*, Gramedia, Jakarta, hal. 103-105
- Hartiko, H., 1983, *Leaf and Root in Vivo Nitrate Reductase Activity of Coconut (Cocos nucifera L.) Cultivars and Hibrid*, Ph.D., Desertation of University of Phillipines, Las Banos, pp. 227-232
- Hawab, 1973, Sekelumit Tentang Zat Hijau Daun dalam Kehidupan, *Bulletin Biokimia*
- Johnson, C.B., W.J. Whittington and G.C. Blackwood, 1976, Nitrate Reductase as A Possible Predictive Test of Crop Yield, *Nature* (262) : 133-134
- Kamil, J., 1982, *Teknologi Benih*, Angkasa, Bandung, hal. 99-102
- Kristina, 1999, Pengaruh Molibdenum (Mo) Terhadap Aktivitas Nitrat Reduktase Daun, Pembentukan Bintil Akar Dan Pertumbuhan Kacang Tanah (*Arachis hypogae* Linn.), *Skripsi S-1*, Universitas Atma Jaya, Yogyakarta
- Lawrence, G.H.M., 1964, *Taxonomy of Vascular Plant*, MacMillan Publishing Co., Inc., New York, pp. 1320-1323
- Lehninger, A.L., 1975, *Biochemistry : The Molecular Basis Cell Structure and Fuction*, 2^{ed}, Worth Publisher, Inc., New York, pp. 1104-1106
- Loveless, A.R., 1991, *Prinsip-Prinsip Biologi Tumbuhan untuk Daerah Tropik I*, Penerbit Gramedia Jakarta, hal. 339-341
- Mohr, H. and P. Schopfer, 1995, *Plant Physiology*, Springer – Verlag, Berlin, pp. 379-381
- Mulyani, M.S., A.G. Kartisapoetro dan R.O.S. Sastroatmodjo, 1991, *Mikrobiologi Tanah*, Rineka Cipta, Jakarta, hal. 177-192
- Naik, M.S., Y.P. Abrol, T.V.R. Nair and C.S. Ramarao, 1982, Review Nitrate Assimilation, Its Regulation and Relationship to Reduced Nitrogen in Higher Plants, *Phytochemistry*, Vol. 21 No. 3
- Nicholas, D.J.D. and A. Nason, 1957, Determination of Nitrate and Nitrite, *Methods Enzymologi* (3) : 981-984
- Noggle, G.R. and G.J. Firtz, 1979, *Introduction of Plant Physiology*, Prentice-Hall of India, Privated Limited, New Dehli, pp. 272-281

- Prawiranata, Haran dan Tjitronegoro, 1981, *Dasar-Dasar Fisiologi Tumbuhan*, Jilid II, Departemen Botani, Institut Pertanian, Bogor, hal. 1-8
- Putranto, B., 1996, Pengaruh Ion Chromat terhadap Kandungan Klorofil, Aktivitas Nitrat Reduktase (in vivo), Jumlah Bintil Akar Yang Efektif, berat Kering dan Kandungan Protein Biji Tanaman Kedelai (*Glycine max* (L) Meriill), *Skripsi S-I*, Universitas Atma Jaya, Yogyakarta
- Salisbury, B.F. and C. Ross, 1995, *Fisiologi Tumbuhan*, Edisi keempat, Institut Teknologi Bandung, Bandung, hal. 10-39, 67-85, 112-130
- Schweitzer, L.E. and J.E. Harper, 1985, Leaf Nitrate Reductase, D-Ribulose-1,5-Biphosphate Carboxylase, And Root Nodule Development Of Genetic Male-Sterile And Fertile Soybean Isolines, *Plant Physiology*, (78) : 61-65
- Siregar, H., 1981, *Budidaya Tanaman Padi Di Indonesia*, Sastra Hudaya, Jakarta, hal. 55-78
- Suparyono dan A. Setyono, 1993, *Padi*, Penebar Swadaya, Jakarta, hal. 1-3, 35-38
- Suryo, 1986, *Genetika*, Gajah Mada University Press, hal. 100-103
- Suseno, H., 1974, *Fisiologi Tumbuhan, Metabolisme Dasar dan Beberapa Aspeknya*, Institut Pertanian Bogor, Bogor, hal. 79-93
- Tjitrosomo, S.S., 1983, *Botani Umum 2*, Angkasa, Bandung, hal. 23-28
- Wahyuni, T., 1997, Pengaruh Lama Keberadaan Herbisida MCPA Dalam Tanah Terhadap Aktivitas Nitrat Reduktase, Kandungan Klorofil Dan Pertumbuhan Tanaman Bayam Cabut (*Amaranthus tricolor* L), *Skripsi S-I*, Universitas Atma Jaya, Yogyakarta

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LAMPIRAN



Lampiran 1. ANR daun ($\mu \text{ mol NO}_2^- / \text{ mg / jam}$) bibit padi kultivar Cisadane, IR-64, Cilosari dan Memberamo.

Umur (Minggu)	Kelompok	Kultivar				Total	Rata-rata
		Cisadane	IR-64	Cilosari	Memberamo		
I	1.	0,528	0,634	0,704	0,810	13,064	0,653
	2.	0,563	0,599	0,634	0,775		
	3.	0,563	0,634	0,634	0,775		
	4.	0,528	0,563	0,669	0,845		
	5.	0,493	0,599	0,704	0,810		
Subtotal		2,675	3,029	3,345	4,015		
Rata-rata		0,535	0,606	0,669	0,803		
II	1.	1,162	1,303	1,444	1,549	26,867	1,343
	2.	1,232	1,268	1,408	1,444		
	3.	1,197	1,268	1,444	1,444		
	4.	1,127	1,338	1,373	1,514		
	5.	1,197	1,303	1,373	1,479		
Subtotal		5,915	6,480	7,042	7,430		
Rata-rata		1,183	1,296	1,408	1,486		
III	1.	0,493	0,493	0,599	0,599	11,093	0,555
	2.	0,493	0,528	0,563	0,634		
	3.	0,528	0,528	0,634	0,634		
	4.	0,458	0,563	0,599	0,599		
	5.	0,458	0,493	0,528	0,669		
Subtotal		2,430	2,605	2,923	3,135		
Rata-rata		0,486	0,521	0,585	0,627		
IV	1.	0,176	0,246	0,246	0,282	4,785	0,239
	2.	0,211	0,211	0,246	0,246		
	3.	0,176	0,211	0,282	0,282		
	4.	0,211	0,246	0,211	0,317		
	5.	0,246	0,176	0,246	0,317		
Subtotal		1,020	1,090	1,231	1,444		
Rata-rata		0,204	0,218	0,246	0,289		
Total		12,040	13,204	14,541	16,024	55,809	
Rata-rata		0,602	0,660	0,727	0,801		0,697
Kelompok	1	2	3	4	5		
Total	11,268	11,055	11,234	11,161	11,091		

Lampiran 1.1. ANR daun ($\mu \text{ mol NO}_2^- / \text{ mg / jam}$)

Minggu	Kultivar				Rata-rata
	Cisadane	IR-64	Cilosari	Memberamo	
I	0,535 ^g	0,606 ^l	0,669 ^k	0,803 ^l	0,653 ^r
II	1,183 ^m	1,296 ⁿ	1,408 ^o	1,486 ^p	1,343 ^s
III	0,486 ^e	0,521 ^f	0,585 ^h	0,627 ^j	0,555 ^q
IV	0,204 ^a	0,218 ^b	0,246 ^c	0,289 ^d	0,239 ^p
Rata-rata	0,602 ^a	0,660 ^b	0,727 ^c	0,801 ^d	

Angka yang diikuti huruf berbeda, menunjukkan beda nyata ($\alpha = 5\%$)

$$FK = \frac{(55,809)^2}{5 \times 4 \times 4}$$

$$= 38,933$$

$$JKT = (0,528)^2 + (0,563)^2 + \dots + (0,317)^2 + (0,317)^2 - 38,933$$

$$= 13,596$$

$$JKP = \frac{(2,675)^2 + (3,029)^2 + \dots + (1,231)^2 + (1,444)^2}{5} - 38,933$$

$$= 13,528$$

$$JKK = \frac{(11,268)^2 + (11,055)^2 + (11,234)^2 + (11,161)^2 + (11,091)^2}{4 \times 4} - 38,933$$

$$= 0,002$$

$$JKG = 13,596 - 13,528 - 0,002$$

$$= 0,066$$

$$db \text{ perlakuan} = (4)(4) - 1 = 15$$

$$db \text{ kelompok} = (5 - 1) = 4$$

$$db \text{ galat} = (5 - 1)(16 - 1) = 60$$

$$db \text{ total} = (5)(4)(4) - 1 = 79$$

$$JK(A) = \frac{(12,040)^2 + (13,204)^2 + (14,541)^2 + (16,024)^2}{5 \times 4} - 38,933$$

$$= 0,443$$

$$JK(B) = \frac{(13,064)^2 + (26,867)^2 + (11,093)^2 + (4,785)^2}{5 \times 4} - 38,933$$

$$= 12,990$$

$$\begin{aligned} \text{JK (AB)} &= 13,528 - 0,443 - 12,990 \\ &= 0,095 \end{aligned}$$

$$\text{db faktor A} = 4 - 1 = 3$$

$$\text{db faktor B} = 4 - 1 = 3$$

$$\text{db interaksi} = 3 \times 3 = 9$$

Lampiran 2. Rekapitulasi ANAVA ANR daun ($\mu \text{ mol NO}_2^- / \text{ mg / jam}$)

Sumber variasi	Db	JK	KT	F hitung	F tabel
Kelompok	4	0,002			
Perlakuan	15	13,528			
A	3	0,443	0,148	134,545*	2,76
B	3	12,990	4,330	3936,364*	2,76
AB	9	0,095	0,010	9,091*	2,04
Galat	60	0,066	0,0011		
Total	79	13,596			

Keterangan : tanda * berarti beda nyata

Uji DMRT :

$$S_{\square} = \left(\frac{\text{KTG}}{r} \right)^{1/2}$$

$$= \left(\frac{0,0011}{5} \right)^{1/2}$$

$$= 0,0148$$

$$\text{Rp} = (2) 2,88 \times 0,0148 = 0,0426$$

$$= (3) 2,98 \times 0,0148 = 0,0441$$

$$= (4) 3,04 \times 0,0148 = 0,0456$$

Ranking perlakuan kultivar :

	0,602	0,660	0,727	0,801
0,801	0,199	0,141	0,074	0
0,727	0,125	0,067	0	
0,660	0,058	0		
0,602	0			
	1 a	2 b	3 c	4 d

Ranking perlakuan umur tanaman :

	0,239	0,555	0,653	1,343
1,343	1,104	0,788	0,690	0
0,653	0,414	0,098	0	
0,555	0,316	0		
0,239	0			
	IV p	III q	I r	II s

Ranking interaksi umur dan kultivar :

	0.204	0.218	0.246	0.289	0.486	0.521	0.535	0.585	0.606	0.63	0.669	0.803	1.183	1.296	1.408	1.486
1.486	1.282	1.268	1.24	1.197	1	0.965	0.951	0.901	0.88	0.86	0.817	0.683	0.303	0.190	0.078	0
1.408	1.204	1.19	1.162	1.119	0.922	0.887	0.873	0.823	0.802	0.78	0.739	0.605	0.225	0.112	0	
1.296	1.092	1.078	1.05	1.007	0.81	0.775	0.761	0.711	0.69	0.67	0.627	0.493	0.113	0		
1.183	0.979	0.965	0.937	0.894	0.697	0.662	0.648	0.598	0.577	0.56	0.514	0.38	0			
0.803	0.599	0.585	0.557	0.514	0.317	0.282	0.268	0.218	0.197	0.18	0.134	0				
0.669	0.465	0.451	0.423	0.38	0.183	0.148	0.134	0.084	0.063	0.04*	0					
0.627	0.423	0.409	0.381	0.338	0.141	0.106	0.092	0.042*	0.021*	0						
0.606	0.402	0.388	0.36	0.317	0.12	0.085	0.071	0.021*	0							
0.585	0.381	0.367	0.339	0.296	0.099	0.064	0.05	0								
0.535	0.331	0.317	0.289	0.246	0.049	0.014*	0									
0.521	0.317	0.303	0.275	0.232	0.035*	0										
0.486	0.282	0.268	0.24	0.197	0											
0.289	0.085	0.071	0.043*	0												
0.246	0.042*	0.028*	0													
0.218	0.014*	0														
0.204	0															



Lampiran 2. Perbandingan Klorofil-a Daun (mg klorofil / g daun) Bibi Padi
Varietas Cisadane, IR-64, Cilosari dan Memberamo

Umur (Minggu)	Kelompok	Varietas				Total	Rata-rata
		Cisadane	IR-64	Cilosari	Memberamo		
I	1.	0,504	0,509	0,523	0,533	10,444	0,522
	2.	0,509	0,515	0,528	0,536		
	3.	0,512	0,509	0,519	0,541		
	4.	0,507	0,521	0,531	0,548		
	5.	0,509	0,513	0,533	0,544		
Subtotal		2,541	2,567	2,634	2,702		
Rata-rata		0,508	0,513	0,527	0,540		
II	1.	0,712	0,738	0,784	0,837	15,376	0,769
	2.	0,728	0,730	0,781	0,838		
	3.	0,719	0,728	0,790	0,842		
	4.	0,712	0,743	0,787	0,833		
	5.	0,723	0,726	0,789	0,836		
Subtotal		3,594	3,665	3,931	4,186		
Rata-rata		0,719	0,733	0,786	0,837		
III	1.	0,572	0,600	0,662	0,719	12,755	0,638
	2.	0,568	0,607	0,672	0,707		
	3.	0,559	0,604	0,664	0,707		
	4.	0,577	0,613	0,666	0,715		
	5.	0,572	0,600	0,670	0,701		
Subtotal		2,848	3,024	3,334	3,549		
Rata-rata		0,570	0,605	0,667	0,710		
IV	1.	0,506	0,532	0,557	0,581	10,832	0,542
	2.	0,515	0,521	0,538	0,568		
	3.	0,517	0,525	0,551	0,589		
	4.	0,510	0,517	0,555	0,583		
	5.	0,508	0,530	0,542	0,587		
Subtotal		2,556	2,625	2,743	2,908		
Rata-rata		0,511	0,525	0,549	0,582		
Total		11,539	11,881	12,642	13,345	49,407	
Rata-rata		0,577	0,594	0,632	0,667		0,618
Kelompok	1	2	3	4	5		
Total	9,869	9,861	9,876	9,918	9,883		

Lampiran 2.1. Klorofil-a Daun (mg klorofil / g daun)

Minggu	Varietas				Rata-rata
	Cisadane	IR-64	Cilosari	Memberamo	
I	0,508	0,513	0,527	0,540	0,522 ^p
II	0,719	0,733	0,786	0,837	0,769 ^s
III	0,570	0,605	0,667	0,710	0,638 ^r
IV	0,511	0,525	0,549	0,582	0,542 ^q
Rata-rata	0,577 ^a	0,594 ^b	0,632 ^c	0,667 ^d	

Angka yang diikuti huruf berbeda, menunjukkan beda nyata ($\alpha = 5\%$)

$$FK = \frac{(49,407)^2}{5 \times 4 \times 4}$$

$$= 30,513$$

$$JKT = (0,504)^2 + (0,509)^2 + \dots + (0,583)^2 + (0,587)^2 - 30,513$$

$$= 0,885$$

$$JKP = \frac{(2,541)^2 + (2,567)^2 + \dots + (2,743)^2 + (2,908)^2}{5} - 30,513$$

$$= 0,883$$

$$JKK = \frac{(9,869)^2 + (9,861)^2 + (9,876)^2 + (9,918)^2 + (9,883)^2}{4 \times 4} - 30,513$$

$$= 0,00027$$

$$JKG = 0,885 - 0,883 - 0,00027$$

$$= 0,0017$$

$$db\ perlakuan = (4)(4) - 1 = 15$$

$$db\ kelompok = (5 - 1) = 4$$

$$db\ galat = (5 - 1)(16 - 1) = 60$$

$$db\ total = (5)(4)(4) - 1 = 79$$

$$JK(A) = \frac{(11,539)^2 + (11,881)^2 + (12,642)^2 + (13,345)^2}{5 \times 4} - 30,513$$

$$= 0,098$$

$$JK(B) = \frac{(10,444)^2 + (15,376)^2 + (12,755)^2 + (10,832)^2}{5 \times 4} - 30,513$$

$$= 0,763$$

$$\begin{aligned} \text{JK (AB)} &= 0,883 - 0,098 - 0,763 \\ &= 0,022 \end{aligned}$$

$$\text{db faktor A} = 4 - 1 = 3$$

$$\text{db faktor B} = 4 - 1 = 3$$

$$\text{db interaksi} = 3 \times 3 = 9$$

Tabel 4. Rekapitulasi ANAVA klorofil-a daun (mg klorofil / gr daun)

Sumber variasi	db	JK	KT	F hitung	F tabel
Kelompok	4	0,00027			
Perlakuan	15	0,883			
A	3	0,098	0,0327	1155,477*	2,76
B	3	0,763	0,2543	8137,6*	2,76
AB	9	0,022	0,0024	76,8*	2,04
Galat	60	0,0017	0,0000283		
Total	79	0,885			

Keterangan : tanda * = beda nyata

Uji DMRT :

$$\begin{aligned} S_{\square} &= \left[\frac{\text{KTG}}{r} \right]^{1/2} \\ &= \left[\frac{0,0000283}{5} \right]^{1/2} \\ &= 0,00238 \end{aligned}$$

$$\text{Rp} = (2) 2,88 \times 0,00238 = 0,00685$$

$$= (3) 2,98 \times 0,00238 = 0,00709$$

$$= (4) 3,04 \times 0,00238 = 0,00733$$

Ranking perlakuan kultivar :

	0,006 0,577	0,007 0,594	0,007 0,632	0,667
0,667	0,090	0,073	0,035	0
0,632	0,055	0,038	0	
0,594	0,017	0		
0,577	0			
	1 a	2 b	3 c	4 d

Ranking perlakuan umur tanaman :

	0,522	0,542	0,638	0,769
0,769	0,247	0,227	0,131	0
0,638	0,116	0,096	0	
0,542	0,020	0		
0,522	0			
	I p	IV q	III r	II s

Lampiran 5. Klorofil-b daun (mg klorofil / gr daun) bibit padi kultivar Cisadane, IR-64, Cilosari dan Memberamo

Umur (Minggu)	Kelompok	Kultivar				Total	Rata-rata
		Cisadane	IR-64	Cilosari	Memberamo		
I	1.	0,248	0,252	0,261	0,266	5,188	0,260
	2.	0,252	0,256	0,263	0,267		
	3.	0,255	0,252	0,259	0,269		
	4.	0,251	0,258	0,264	0,272		
	5.	0,252	0,255	0,266	0,270		
Subtotal		1,258	1,273	1,313	1,344		
Rata-rata		0,252	0,255	0,263	0,269		
II	1.	0,571	0,589	0,607	0,648	12,094	0,605
	2.	0,582	0,582	0,597	0,655		
	3.	0,578	0,581	0,612	0,660		
	4.	0,571	0,593	0,608	0,643		
	5.	0,582	0,578	0,611	0,646		
Subtotal		2,884	2,923	3,035	3,252		
Rata-rata		0,577	0,585	0,607	0,650		
III	1.	0,409	0,434	0,479	0,512	9,170	0,458
	2.	0,407	0,439	0,487	0,505		
	3.	0,400	0,436	0,481	0,505		
	4.	0,413	0,443	0,482	0,508		
	5.	0,409	0,434	0,486	0,501		
Subtotal		2,038	2,186	2,415	2,531		
Rata-rata		0,408	0,437	0,483	0,506		
IV	1.	0,280	0,292	0,325	0,341	6,163	0,308
	2.	0,284	0,286	0,314	0,334		
	3.	0,286	0,289	0,321	0,346		
	4.	0,282	0,284	0,323	0,343		
	5.	0,281	0,291	0,316	0,345		
Subtotal		1,413	1,442	1,599	1,709		
Rata-rata		0,283	0,288	0,320	0,342		
Total		7,593	7,824	8,362	8,836	32,615	
Rata-rata		0,380	0,391	0,418	0,442		0,408
Kelompok	1	2	3	4	5		
Total	6,514	6,510	6,530	6,538	6,523		

Lampiran 5.1. Klorofil-b daun (mg klorofil / gr daun)

Minggu	Kultivar				Rata-rata
	Cisadane	IR-64	Cilosari	Memberamo	
I	0,252 ^a	0,255 ^a	0,263 ^a	0,269 ^{ab}	0,260 ^p
II	0,577 ^h	0,585 ⁱ	0,607 ^j	0,650 ^k	0,605 ^s
III	0,408 ^d	0,437 ^e	0,483 ^f	0,506 ^g	0,458 ^r
IV	0,283 ^{ab}	0,288 ^{ab}	0,320 ^b	0,342 ^c	0,308 ^q
Rata-rata	0,380 ^a	0,391 ^b	0,418 ^c	0,442 ^d	

Angka yang diikuti huruf berbeda, menunjukkan beda nyata ($\square = 5\%$)

$$FK = \frac{(32,615)^2}{5 \times 4 \times 4}$$

$$= 13,296$$

$$JKT = (0,248)^2 + (0,252)^2 + \dots + (0,343)^2 + (0,345)^2 - 13,296$$

$$= 1,526$$

$$JKP = \frac{(1,258)^2 + (1,273)^2 + \dots + (1,599)^2 + (1,709)^2}{5} - 13,296$$

$$= 1,525$$

$$JKK = \frac{(6,514)^2 + (6,510)^2 + (6,530)^2 + (6,538)^2 + (6,523)^2}{4 \times 4} - 13,296$$

$$= 0,0007$$

$$JKG = 1,526 - 1,525 - 0,0007$$

$$= 0,0003$$

$$db \text{ perlakuan} = (4)(4) - 1 = 15$$

$$db \text{ kelompok} = (5 - 1) = 4$$

$$db \text{ galat} = (5 - 1)(16 - 1) = 60$$

$$db \text{ total} = (5)(4)(4) - 1 = 79$$

$$JK(A) = \frac{(7,593)^2 + (7,824)^2 + (8,362)^2 + (8,836)^2}{5 \times 4} - 13,296$$

$$= 0,047$$

$$JK(B) = \frac{(5,188)^2 + (12,094)^2 + (9,170)^2 + (6,163)^2}{5 \times 4} - 13,296$$

$$= 1,467$$

$$\begin{aligned} \text{JK (AB)} &= 1,525 - 0,047 - 1,467 \\ &= 0,012 \end{aligned}$$

$$\text{db faktor A} = 4 - 1 = 3$$

$$\text{db faktor B} = 4 - 1 = 3$$

$$\text{db interaksi} = 3 \times 3 = 9$$

Tabel 6. Rekapitulasi ANAVA klorofil-b daun (mg klorofil / gr daun)

Sumber variasi	db	JK	KT	F hitung	F tabel
Kelompok	4	0,0007			
Perlakuan	15	1,525			
A	3	0,047	0,01567	3134*	2,76
B	3	1,467	0,489	97800*	2,76
AB	9	0,012	0,0013	260*	2,04
Galat	60	0,0003	0,000005		
Total	79	1,526			

Keterangan : tanda * = beda nyata

Uji DMRT :

$$\begin{aligned} S_{\square} &= \left[\frac{\text{KTG}}{r} \right]^{1/2} \\ &= \left[\frac{0,000005}{5} \right]^{1/2} \\ &= 0,001 \end{aligned}$$

$$\text{Rp} = (2) 2,88 \times 0,001 = 0,00288$$

$$= (3) 2,98 \times 0,001 = 0,00298$$

$$= (4) 3,04 \times 0,001 = 0,00304$$

Ranking perlakuan kultivar :

	0,380	0,391	0,418	0,442
0,442	0,062	0,051	0,024	0
0,418	0,038	0,027	0	
0,391	0,011	0		
0,380	0			
	1	2	3	4
	a	b	c	d

Ranking perlakuan umur tanaman :

	0,260	0,308	0,458	0,605
0,605	0,345	0,297	0,147	0
0,458	0,198	0,150	0	
0,308	0,048	0		
0,260	0			
	I	IV	III	II
	p	q	r	s

Rangking interaksi umur dan kultivar :

	0.252	0.255	0.263	0.269	0.283	0.288	0.32	0.343	0.408	0.437	0.483	0.506	0.577	0.585	0.607	0.65
0.65	0.398	0.395	0.387	0.381	0.367	0.362	0.33	0.307	0.242	0.213	0.167	0.144	0.073	0.065	0.043	0
0.607	0.355	0.352	0.344	0.338	0.324	0.319	0.287	0.264	0.199	0.17	0.124	0.101	0.03	0.022	0	
0.585	0.333	0.33	0.322	0.316	0.302	0.297	0.265	0.242	0.177	0.148	0.102	0.079	0.008	0		
0.577	0.325	0.322	0.314	0.308	0.294	0.289	0.257	0.234	0.169	0.14	0.094	0.071	0			
0.506	0.254	0.251	0.243	0.237	0.223	0.218	0.186	0.163	0.098	0.069	0.023	0				
0.483	0.231	0.228	0.22	0.214	0.2	0.195	0.163	0.14	0.075	0.046	0					
0.437	0.185	0.182	0.174	0.168	0.154	0.149	0.117	0.094	0.029	0						
0.408	0.156	0.153	0.145	0.139	0.125	0.12	0.088	0.065	0							
0.343	0.091	0.088	0.08	0.074	0.06	0.055	0.023	0								
0.32	0.068	0.065	0.057	0.051	0.037	0.032	0									
0.288	0.036	0.033	0.025	0.019	0.005	0										
0.283	0.031	0.028	0.02	0.014	0											
0.269	0.017	0.014	0.006	0												
0.263	0.011	0.008	0													
0.255	0.003*	0														
0.252	0															



Lampiran 7. Kandungan protein daun (mg protein / gr daun) bibit padi kultivar Cisadane, IR-64, Cilosari dan Memberamo

Umur (Minggu)	Kelompok	Kultivar				Totaal	Rata-rata
		Cisadane	IR-64	Cilosari	Memberamo		
I	1.	96,105	102,387	104,899	109,925	2050,878	102,544
	2.	94,849	99,874	106,156	108,040		
	3.	96,734	101,131	106,156	107,412		
	4.	93,593	102,387	104,271	108,040		
	5.	92,337	100,502	106,784	109,296		
Subtotal Rata-rata		473,618 94,724	506,281 101,256	528,266 105,653	542,713 108,543		
II	1.	122,487	126,256	131,909	137,563	2592,964	129,648
	2.	119,347	128,769	133,166	138,191		
	3.	124,372	127,513	132,538	136,306		
	4.	121,231	128,141	131,909	138,819		
	5.	118,090	125,628	133,794	136,935		
Subtotal Rata-rata		605,527 121,105	636,307 127,261	663,316 132,663	687,814 137,563		
III	1.	101,131	109,925	118,090	118,719	2266,881	113,493
	2.	105,528	112,437	116,834	119,975		
	3.	106,784	111,181	116,206	120,603		
	4.	103,643	110,553	116,834	121,859		
	5.	108,040	112,347	114,950	121,231		
Subtotal Rata-rata		525,126 105,025	556,454 111,291	582,914 116,583	602,387 120,477		
IV	1.	79,146	89,196	92,965	97,362	1826,621	91,331
	2.	84,799	91,080	94,221	98,618		
	3.	81,030	89,824	93,593	99,246		
	4.	86,055	92,337	92,965	97,990		
	5.	84,171	89,824	96,105	96,105		
Subtotal Rata-rata		415,201 83,040	452,261 90,452	469,838 93,968	489,321 97,864		
Total		2019,472	2151,303	2244,345	2322,235	8737,344	
Rata-rata		100,973	107,714	112,217	116,112		109,254
Kelompok Total	1	2	3	4	5		
	1738,065	1751,884	1750,629	1750,627	1746,139		

Lampiran 7.1. Protein daun (mg protein / gr daun)

Minggu	Kultivar				Rata-rata
	Cisadane	IR-64	Cilosari	Memberamo	
I	94,724	101,256	105,653	108,543	102,544 ^a
II	121,105	127,261	132,663	137,563	129,648 ^s
III	105,025	111,291	116,583	120,477	113,493 ^f
IV	83,040	90,452	93,968	97,864	91,331 ^p
Rata-rata	100,973 ^a	107,714 ^b	112,217 ^c	116,112 ^d	

Angka yang diikuti huruf berbeda, menunjukkan beda nyata ($\square = 5\%$)

$$FK = \frac{(8737,344)^2}{5 \times 4 \times 4}$$

$$= 954264,752$$

$$JKT = (96,105)^2 + (94,849)^2 + \dots + (97,990)^2 + (96,105)^2 - 954264,752$$

$$= 18723,715$$

$$JKP = \frac{(473,816)^2 + (506,281)^2 + \dots + (469,849)^2 + (489,321)^2}{5} - 954264,752$$

$$= 18542,139$$

$$JKK = \frac{(1738,065)^2 + (1751,884)^2 + \dots + (1746,139)^2}{4 \times 4} - 954264,752$$

$$= 8,103$$

$$JKG = 18723,715 - 18542,139 - 8,103$$

$$= 173,473$$

$$\text{db perlakuan} = (4)(4) - 1 = 15$$

$$\text{db kelompok} = (5 - 1) = 4$$

$$\text{db galat} = (5 - 1)(16 - 1) = 60$$

$$\text{db total} = (5)(4)(4) - 1 = 79$$

$$JK(A) = \frac{(2019,472)^2 + \dots + (2322,235)^2}{5 \times 4} - 954264,752$$

$$= 2544,361$$

$$JK(B) = \frac{(2050,878)^2 + \dots + (1826,632)^2}{5 \times 4} - 954264,752$$

$$= 15978,079$$

$$\begin{aligned} \text{JK (AB)} &= 18542,139 - 2544,361 - 15978,079 \\ &= 19,699 \end{aligned}$$

$$\text{db faktor A} = 4 - 1 = 3$$

$$\text{db faktor B} = 4 - 1 = 3$$

$$\text{db interaksi} = 3 \times 3 = 9$$

Tabel 8. Rekapitulasi ANAVA Protein daun (mg protein / gr daun)

Sumber variasi	Db	JK	KT	F hitung	F tabel
Kelompok	4	8,103			
Perlakuan	15	18542,139			
A	3	2544,361	848,1203	293,3454*	2,76
B	3	15978,079	5326,0263	1842,1508*	2,76
AB	9	19,699	2,1888	0,757 ^{tn}	2,04
Galat	60	173,473	2,8912		
Total	79	18723,715			

Keterangan : tanda * = beda nyata

Uji DMRT :

$$\begin{aligned} S\Box &= \left(\frac{\text{KTG}}{r} \right)^{1/2} \\ &= \left(\frac{2,8912}{5} \right)^{1/2} \\ &= 0,5782 \end{aligned}$$

$$\begin{aligned} R_p &= (2) 2,88 \times 0,5782 = 1,665 \\ &= (3) 2,98 \times 0,5782 = 1,723 \\ &= (4) 3,04 \times 0,5782 = 1,758 \end{aligned}$$

Ranking perlakuan kultivar :

	100,973	107,714	112,217	116,112
116,112	15,139	8,398	3,895	0
112,217	11,244	4,503	0	
107,714	6,741	0		
100,973	0			
	1 a	2 b	3 c	4 d

Ranking perlakuan umur tanaman :

	91,331	102,544	113,493	129,648
129,648	38,317	27,104	16,155	0
113,493	22,162	10,949	0	
102,544	11,213	0		
91,331	0			
	IV p	I q	III r	II s

Lampiran 9. Berat kering total (mg / tanaman) bibit padi kultivar Cisadane, IR-64, Cilosari dan Memberamo

Umur (Minggu)	Kelompok	Kultivar				Total	Rata-rata
		Cisadane	IR-64	Cilosari	Memberamo		
I	1.	18,720	19,360	20,360	20,920	401,680	20,084
	2.	19,000	19,680	20,240	21,160		
	3.	18,880	19,840	20,440	21,480		
	4.	18,800	19,720	20,320	21,600		
	5.	19,120	19,920	20,600	21,520		
Subtotal		94,520	98,520	101,960	106,680		
Rata-rata		18,904	19,704	20,392	21,336		
IV	1.	119,640	120,520	121,160	122,000	2418,920	120,946
	2.	119,360	120,120	121,240	122,160		
	3.	119,720	120,520	121,440	122,480		
	4.	119,600	120,720	121,720	122,520		
	5.	119,840	120,080	121,640	122,440		
Subtotal		598,160	601,960	607,200	611,600		
Rata-rata		119,632	120,392	121,440	122,320		
Total		692,680	700,480	709,160	718,280	2820,600	
Rata-rata		69,268	70,048	70,916	71,828		70,515
Kelompok Total	1	2	3	4	5		
	562,680	562,960	564,800	565,000	565,160		

Lampiran 9.1. Berat kering total (mg / tanaman)

Minggu	Kultivar				Rata-rata
	Cisadane	IR-64	Cilosari	Memberamo	
I	18,904	19,704	20,392	21,336	20,084 ^p
IV	119,632	120,392	121,440	122,320	120,946 ^q
Rata-rata	69,268 ^a	70,048 ^a	70,916 ^a	71,828 ^a	

Angka yang diikuti huruf berbeda, menunjukkan beda nyata ($\alpha = 5\%$)

$$FK = \frac{(2820,600)^2}{5 \times 4 \times 2}$$

$$= 198894,609$$

$$JKT = (18,720)^2 + (19,000)^2 + \dots + (122,520)^2 + (122,440)^2 - 198894,609$$

$$= 102010,985$$

$$\text{JKP} = \frac{(94,520)^2 + (98,520)^2 + \dots + (607,200)^2 + (611,600)^2}{5} - 198894,609$$

$$= 101768,253$$

$$\text{JKK} = \frac{(562,68)^2 + (562,96)^2 + (564,80)^2 + (565,0)^2 + (565,16)^2}{2 \times 4} - 198894,609$$

$$= 0,7172$$

$$\text{JKG} = 102010,985 - 101768,253 - 0,7172$$

$$= 242,015$$

$$\text{db perlakuan} = (4) (2) - 1 = 7$$

$$\text{db kelompok} = (5 - 1) = 4$$

$$\text{db galat} = (5 - 1) (8 - 1) = 28$$

$$\text{db total} = (5) (4) (2) - 1 = 39$$

$$\text{JK (A)} = \frac{(692,68)^2 + (700,48)^2 + (709,16)^2 + (718,28)^2}{5 \times 2} - 198894,609$$

$$= 36,579$$

$$\text{JK (B)} = \frac{(401,680)^2 + (2418,920)^2}{5 \times 4} - 198894,609$$

$$= 101731,430$$

$$\text{JK (AB)} = 101768,253 - 36,579 - 101731,430$$

$$= 0,244$$

$$\text{db faktor A} = 4 - 1 = 3$$

$$\text{db faktor B} = 2 - 1 = 1$$

$$\text{db interaksi} = 3 \times 1 = 3$$

Tabel 10. Rekapitulasi ANAVA berat kering total (mg / tanaman)

Sumber variasi	db	JK	KT	F hitung	F tabel
Kelompok	4	0,7172			
Perlakuan	7	101768,253			
A	3	36,579	12,193	1,41067 ^{tn}	2,95
B	1	101731,430	101731,430	11769,849*	4,20
AB	3	0,244	0,08133	0,0094 ^{tn}	2,95
Galat	28	242,015	8,643393		
Total	39	102010,985			

Keterangan : tanda * = beda nyata

Uji DMRT :

$$S_{\square} = \left(\frac{KTG}{r} \right)^{1/2}$$

$$= \left(\frac{8,643393}{5} \right)^{1/2}$$

$$= 1,3148$$

$$R_p = (2) 2,90 \times 1,3148 = 3,8129$$

$$= (3) 3,04 \times 1,3148 = 3,9969$$

$$= (4) 3,13 \times 1,3148 = 4,1153$$

Ranking perlakuan umur tanaman :

	20,084	120,946
120,946	100,862	0
20,084	0	
	I	IV
	p	q

ABSORBANSI STANDAR PROTEIN
METODE LOWRY

Konsentrasi (mg/ml)	Absorbansi V1, 1	Absorbansi V1, 2	Absorbansi \bar{x}
0,05	0,124	0,128	0,126
0,10	0,199	0,195	0,197
0,15	0,272	0,268	0,270
0,20	0,312	0,318	0,315
0,25	0,397	0,399	0,398
0,30	0,46	0,468	0,464
0,35	0,515	0,509	0,512
0,40	0,587	0,581	0,584

PERSAMAAN REGRESI

xi	yi	xi , yi	xi ²	yi ²
0,126	0,05	0,0063	0,015876	0,0025
0,197	0,10	0,0197	0,038809	0,0100
0,270	0,15	0,0405	0,072900	0,0225
0,315	0,20	0,0630	0,099225	0,0400
0,398	0,25	0,0995	0,158404	0,0625
0,464	0,30	0,1392	0,215296	0,0900
0,512	0,35	0,1792	0,262144	0,1225
0,584	0,40	0,2336	0,341056	0,1600
2,866	1,800	0,781	1,20371	0,510

$$\begin{aligned}
 a &= \frac{(\sum yi)(\sum xi^2) - (\sum xi)(\sum xi \cdot yi)}{n \sum xi^2 - (\sum xi)^2} \\
 &= \frac{(1,8)(1,20372) - (2,866)(0,781)}{8(1,20371) - (2,866)^2} \\
 &= \frac{2,166678 - 2,238346}{9,62968 - 8,213956} \\
 &= \frac{-0,071668}{1,415724} \\
 &= -0,05062286 \\
 a &= -0,0506
 \end{aligned}$$

$$\begin{aligned}
 b &= \frac{n \sum x_i y_i - (\sum x_i)(\sum y_i)}{n \sum x_i^2 - (\sum x_i)^2} \\
 &= \frac{8(0,781) - (2,866)(1,80)}{8(1,20371) - (2,866)^2} \\
 &= \frac{6,248 - 5,1588}{9,62968 - 8,213956} \\
 &= \frac{1,0892}{1,415724} \\
 &= 0,769358999 \\
 &= 0,7694
 \end{aligned}$$

$$\hat{y} = a + bx$$

$$\hat{y} = -0,0506 + 0,7694x$$

$$x = 0,100$$

$$y = 0,02634$$

$$x = 0,200$$

$$y = 0,10328$$

$$x = 0,300$$

$$y = 0,18022$$

$$x = 0,400$$

$$y = 0,25716$$

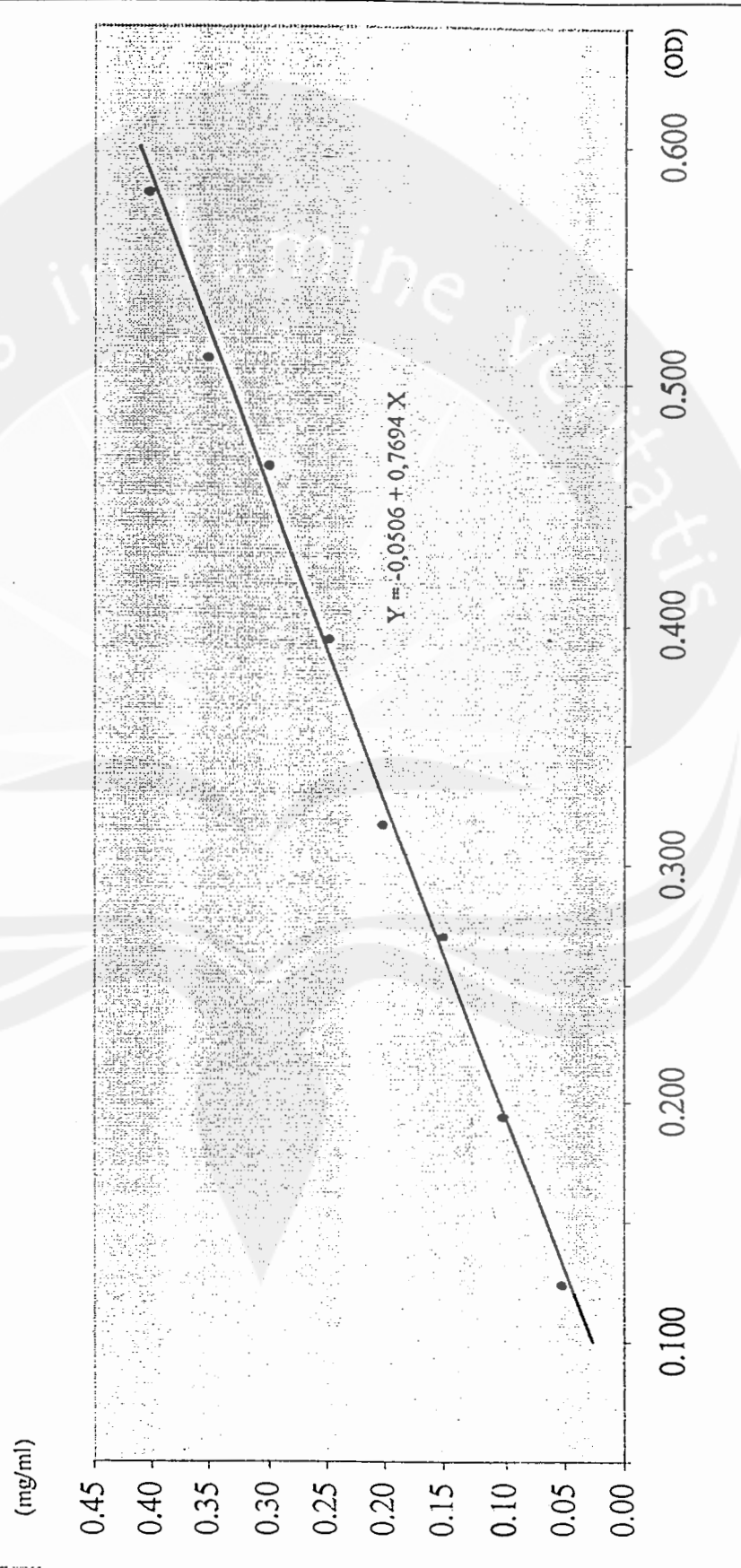
$$x = 0,500$$

$$y = 0,3341$$

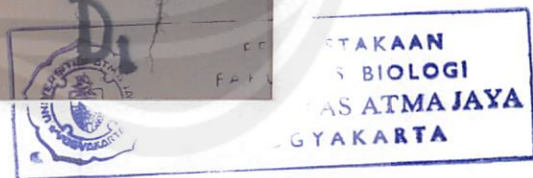
$$x = 0,600$$

$$y = 0,41104$$

GRAFIK PROTEIN STANDAR
(METODE LOWRY)



LAMPIRAN FOTO TANAMAN



Gambar 8. Bibit padi varietas Memberamo (A), Cilosari (B), IR-64 (C) dan Cisadane (D) umur 1 minggu



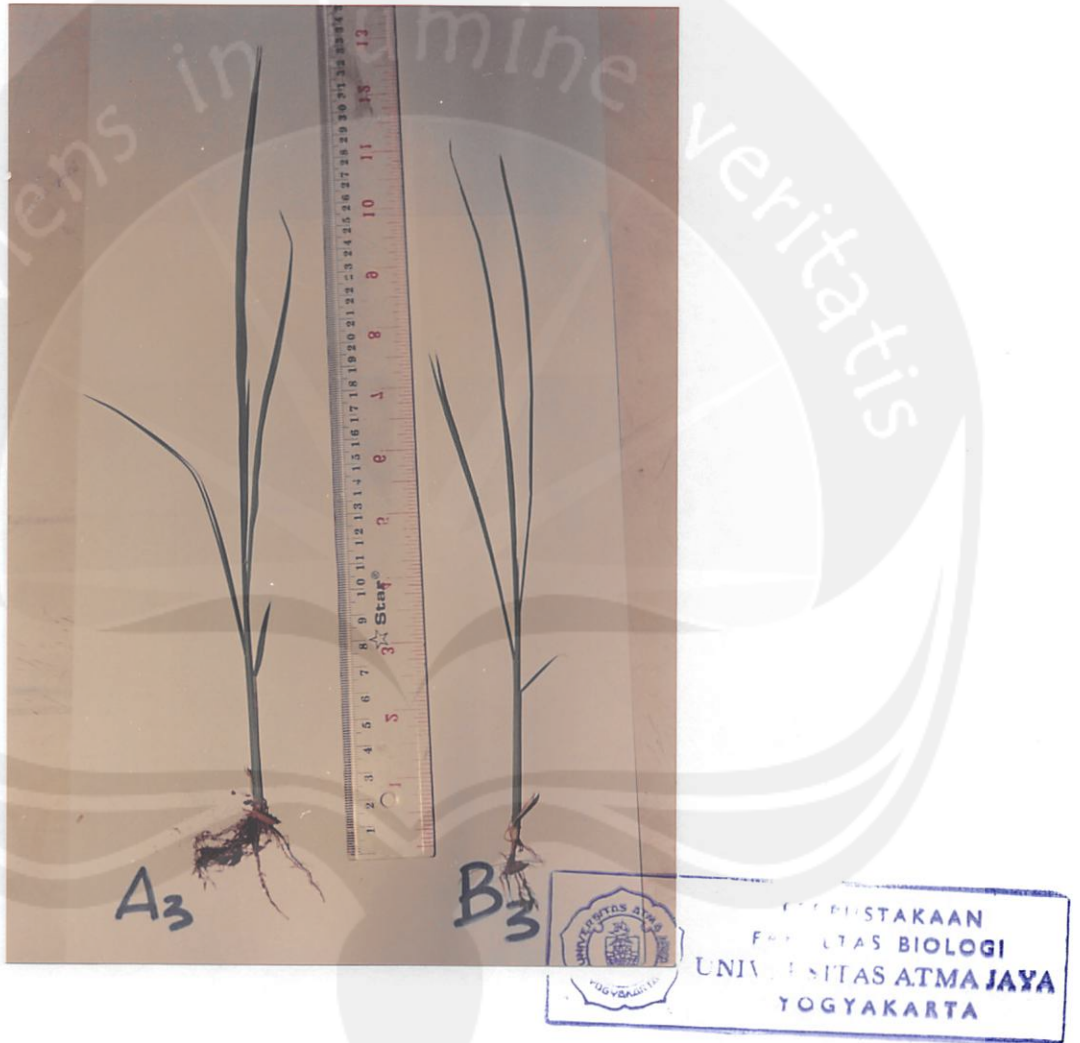
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Gambar 10. Bibit padi varietas Memberamo (A) dan Cilosari (B) umur 2 minggu

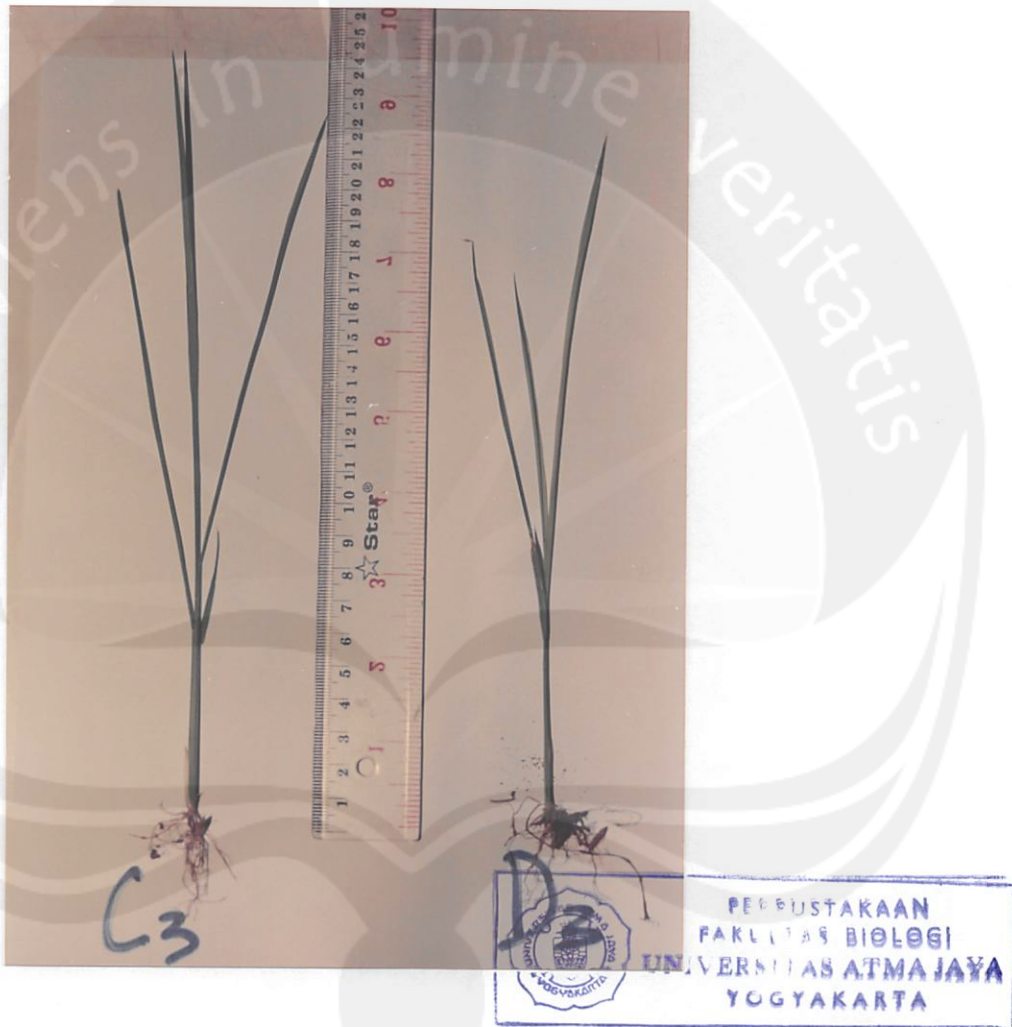


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Gambar 11. Bibit padi Varietas IR-64 (C) dan Cisadane (D) umur 2 minggu



Gambar 12. Bibit padi varietas Memberamo (A) dan Cilosari (B) umur 3 minggu



Gambar 13. Bibit padi varietas IR-64 © dan Cisadane (D) umur 3 minggu



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Gambar 14. Bibit padi varietas Memberamo (A) dan Cilosari (B) umur 4 minggu



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Gambar 15. Bibit padi varietas IR-64 (C) dan Cisadane (D) umur 4 minggu



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