

DAFTAR PUSTAKA

- Al-Whaibi, M.H., 2011. Plant Heat-Shock Protein: A Mini Review. *J King Saud Univ Sci.* 23 (2): 139-150.
- Anitasari, S.D., Dwi N.R.S., Ida A.A., dan Made R.D., 2018. *Dasar Teknik Kultur Jaringan Tanaman*. Yogyakarta: Deepublish Budi Utama.
- Asra, R., Ririn A.S., dan Mariana S., 2020. *Hormon Tumbuhan*. Jakarta: UKI Press.
- Badan Pusat Statistik (BPS). 2018. *Statistik Tanaman Hias Indonesia*. Jakarta: BPS-Statistic Indonesia.
- Cardoso, J.C., Cesar A.Z., dan Jen-Tsung C., 2020. An Overview of Orchid Protocorm-Like Bodies: Mass Propagation, Biotechnology, Molecular Aspects, and Breeding. *International Journal of Molecular Sciences.* 21 (985): 1-32.
- Chaudhary, A., Kashif A., Neha F., dan Nosheen M., 2019. Optimazation of Tissue Culture Protocol for Regeneration and Direct Multiplication of *Moringa oleifera* by Seed Germination. *International Journal of Advanced Research (IJAR).* 7 (4): 547-555.
- Chen, J., Bo Y., Yanjing T., Yongmei X., Yang L., Dongyu Z., dan Shinxing G., 2020. Symbiotic and Asymbiotic Germination of *Dendrobium officinale* (Orchidaceae) Respond Differently to Exogenous Gibberellins. *International Journal of Molecular Sciences.* 21: 1-23.
- Djufri, Hasanuddin dan Fauzi. 2015. Orchidaceae Pulau Rubiah Kota Madya Sabang Provinsi Aceh. *Jurnal Biotik.* 3 (1). 1-8.
- Dwiyani, R., 2014. *Anggrek Vanda tricolor Lindley var. Suavis*. Bali: Universitas Udayana Press.
- Fandani, H.S., Sri N.M., dan I NengahKorja. 2018. Keanekaragaman Jenis Anggrek pada Beberapa Penangkaran di Desa Ampera dan Desa Karunia Kecamatan Palolo Kabupaten Sigi. *Jurnal Warta Rimba.* 6 (3): 14-20.
- Harahap, F., Arisah H., Harifah I., Nikmatul K.H., Mitra D.P., Syahmi E., Herbert S., dan Ramlan S., 2019. *Kultur Jaringan Nanas*. Surabaya: Media Sahabat Cendekia.

- Hardjo, P. H., dan Wina D.S., 2017. Somatic Enbryo from Basal Leaf Segments of *Vanda tricolor* Lindl. var. *Pallida*. *International Conference on Natural Resources and Life Science*: 173-179.
- Hartati, S., Agus B., dan Ongko C., 2016. Pengaruh NAA dan BAP Terhadap Pertumbuhan Subkultur Anggrek Hasil Persilangan *Dendrobium biggibum* x *Dendrobium liniale*. *Journal of Sustainable Agriculture*. 31 (1): 33-37.
- Hayanti, I.P., Retna B.A., dan Praswanto. 2012. Pengaruh Pupuk Organik Cair dan Ekstrak Rumpun Mutiara Terhadap Pertumbuhan Tunas Pegagan (*Centella asiatica*) secara *in-vitro*. *Biofarmasi*. 10 (2): 54-60.
- Kidus, T., dan Zenebe T., 2020. Isolation, Characterization and Identification of Contaminant Bacteria from Sugarcane (*Saccharum officinarum* L.) *in vitro* Culture in Tigrary Biotechnology Center, Mekelle, Ethiopia. *Journal of Bacteriology & Parasitology*. 11: 1-13.
- Konopkova, J., Dominika K., dan Peter F., 2020. Genotype-Specific Requirements for *In Vitro* Culture Initiation and Multiplication of *Magnolia* taxa. *Folia Oecologica*. 47 (1): 34-44.
- Lee, Z.H., Takeshi H., Nobutoshi Y., dan Toshiro I., 2019. The Roles of Plant Hormones and Their Interactions with Regulatory Genes in Determining Meristem Activity. *International Journal of Molecular Sciences*. 20: 1-19.
- Madusari, S., 2019. Processing of Fibre and Its Application as Liquid Organic Fertilizer in Oil Palm (*Elaeis quineensis* Jacq.) Seedling for Sustainable Agriculture. *Journal of Applied Science and Advanced Technologi*. 1 (3): 81-90.
- Meilani, S.N., Septarini D.A., dan Fatimatuz Z., 2017. Efektifitas Penambahan Media Organik Ekstrak Ubi Jalar (*Ipomoea batatas* L.) pada Pertumbuhan Subkultur Anggrek *Cattleya* sp., *Jurnal Florea*. 4 (1): 5-11.
- Melisa, A.O., 2019. Efek Pupuk Organik Cair Terhadap Pertumbuhan dan Perkembangan Daun Planlet Anggrek (*Vanda limbata* x *Vanda tricolor*) *In Vitro*. *Journal of Biology Education*. 2 (1): 92-101.
- Mendrofa, F.N.E., Nurcahyo W.S., dan Lutfi A., 2021. Introduction Shoots From Callus of Cucumber Apple (*Cucumis* sp.) Using a Combination of Benzyl Amino Purine and Naphthalene Acetic Acid Concentrations In Vitro. *Jurnal Mangifera Edu*. 5 (2): 103-120.

- Metusala, D., 2011. Keragaman *Vanda* spp. (Orchidaceae) di Kepulauan Sunda Kecil-Indonesia. *Berk.Penel.Hayati*. 5A (29-33).
- Ningrum, E.F.C., Ikhsanudin N.R., Rizka R.P., dan Endang S., 2017. Perkembangan Awal *Protokorm* Anggrek *Phalaenopsis amabilis* Secara *In Vitro* Setelah Penambahan Zat Pengatur Tumbuh α -Naphthaleneacetic Acid dan Thidiazuron. *Biosfera*. 34 (1): 9-14.
- Nirmala, R., dan Ratna S., 2019. Pertumbuhan dan Ketahanan Penyakit Kepok “Kuning” Pisang Paska Aklimatisasi Bibit di Pembibitan dengan Pupuk Organik Nasa Cair dan Trichoderma. *Jurnal Agroteknologi Tropika Lembab*. 1 (2): 77-87.
- Novak, S.D., Lila J.L., dan Roshan N.G., 2014. Role of Auxin in Orchid Development. *Plant Signaling & Behavior*. 9 (10): 10-8.
- Oratmangun, K.M., Dingse P., dan Febby E.K., 2017. Deskripsi Jenis-Jenis Kontaminan Dari Kultur Kalus *Catharanthus roseus* (L.) G. Don. *Jurnal Mipa Unsrat Online*. 6 (1): 47-52.
- Oseni, O.M., Veena P., dan Tapan K.N., 2018. A Review on Plant Tissue Culture, A Technique for Propagation and Conservaton of Endangered Plant Species. *Int.J.Curr.Microbiol.App.Sci*. 7 (7): 3778-3786.
- Purwanto, A.W., 2016. *Anggrek Budi Daya dan Perbanyakkan*. Yogyakarta: LPPM UPN Veteran Yogyakarta Press.
- Puspasari, R.R., Ikhsanudin N.R., Eka F.C.N., dan Endang S., 2018. Pengaruh Pepton Terhadap Pertumbuhan Embrio Anggrek *Vanda tricolor* Lindley var. *Suavis* Asal Merapi Secara *In Vitro*. *Scripta Biologica*. 5 (1): 47-50.
- Razaq, M., Peng Z., Hai-long S., dan Salahuddin. 2017. Influence of Nitrogen and Phosphorus on The Growth and Root Morphology of *Acer mono*. *Plos One*. 12 (2): 1-13.
- Rineksane, I.A., dan Masrukhan S., 2015. Regenerasi Anggrek *Vanda tricolor* Pasca Erupsi Merapi Melalui Kultur *In Vitro*. *Seminar Nasional Universitas PGRI Yogyakarta*. 378-384.
- Sadili, A., dan Siti S., 2017. Keanekaragaman, Sebaran, dan Pemanfaatan Jenis-Jenis Anggrek (*Orchidaceae*) di Hutan Bodogol, Taman Nasional Gede Pangrango, Jawa Barat. *Widyariset*. 3 (2): 95-106.

- Semiarti, E., 2018. Orchid Biotechnology for Indonesian Orchids Conservation and Industry. *AIP Conference Proceedings*. 2002 (1).
- Semiarti, E., dan Rozikin. 2015. Karakterisasi Gen Ketahanan Terhadap Suhu Tinggi *HSP70* pada Anggrek *Vanda tricolor* var. *Suavis* Forma Merapi. *Pros Sem Nas Masy Biodiv Indon*. 1 (3): 404-408.
- Sen, M.K., Abu H.M.J., dan Shamima N., 2013. Sterilization Factors Affect Seed Germination and Proliferation of *Achyranthes aspera* Cultured In Vitro. *Environmental and Experimental Biology*. 11: 119-123.
- Setiari, N., Aziz P., Sukarti M., dan Endang S., 2016. Peptone and Tomato Extract Induced Early Stage of Embryo Development of *Dendrobium Phalaenopsis* Orchid. *Journal of Tropical Biodiversity and Biotechnology*. 1 (2): 77-84.
- Singh, P., dan Patel R.M., 2016 Factors Affecting *In Vitro* Degree of Browning and Culture Establishment of Pomegranate. *African Journal of Plant Science*. 10 (2): 43-49.
- Solihah, S.M., 2015. Koleksi, Status dan Potensi Anggrek Di Kebun Raya Liwa. *Warta Kebun Raya*. 13 (1): 15-23.
- Taghizadeh, M., dan Mahboubeh G.D., 2021. Inhibition of Browning Problem During the Callogenesis of *Spartium junceum* L. *Ornamental Horticulture*. 27 (1): 68-77.
- Tjitrosoepomo, G., 2013. *Taksonomi Tumbuhan Tinggi (Spermatophyta)*. Yogyakarta: UGM Press.
- Utami, E.S.W., Sucipto H., dan Yosephine S.W.M., 2017. *In Vitro* Propagation of the Endangered Medicinal Orchid, *Dendrobium lasianthera* J.J.Sm Through Mature Seed Culture. *Asian Pac J. Trop Biomed*. 7 (5): 406-410.
- Utami, E.S.W., dan Sucipto H., 2019. *In Vitro* Seed Germination and Seedling Development of a Rare Indonesian Native Orchid *Phalaenopsis amboinensis* J.J.Sm. *Hindawi*. 2019: 1-7.
- Wati, R.K., dan Sofi M., 2015. *Orcidaceae Catalogue of Bogor Botanic Gardens*. Jakarta: LIPI Press.
- Widiastoety, D., Nina S., dan Muchdar S., 2010. Potensi Anggrek *Dendrobium* dalam Meningkatkan Variasi dan Kualitas Anggrek Bunga Potong. *Jurnal Litbang Pertanian*. 29 (3): 101-106.

- Widodo, E., dan Hastuti. 2019. Riwayat Aktivitas Gunung Merapi: Potensi dan Ancamannya Bagi Sektor Pariwisata. *Geomedia*. 17 (1): 21-34.
- Winarto, B., Dewanti M., dan Pramanik D., 2013. Studi Embriogenesis Klon-Klon *Vanda* Hasil Persilangan *Vanda tricolor* x [(*Vanda* Patao x *Vanda* Jenny Hashimoto) x *Ascocenda* Peggy Foo] secara *In Vitro*. *J. Hort*. 23 (2): 114-128.
- Yeung, E.C., 2017. A Perspective on Orchid Seed and Protocorm Development. *Botanical Studies*. 58 (1): 1-14.
- Yusuf, Y., dan Ari I., 2017. Pengaruh Medium Pupuk Organik Cair (POC) Terhadap Karakter Morfologi dan Jumlah Tunas Protokorm Anggrek *Vanda limbata* Blume x *Vanda tricolor* Lindl. *Jurnal Bionature*. 17 (1): 14-23.
- Zulkaidhah, Sri N.M., dan Ferdiansah. 2018. Keanekaragaman Jenis Anggrek Alam di Desa Lembantongoa Kecamatan Palolo Kabupaten Sigi. *Jurnal Forest Sains*. 15 (2): 58-66.

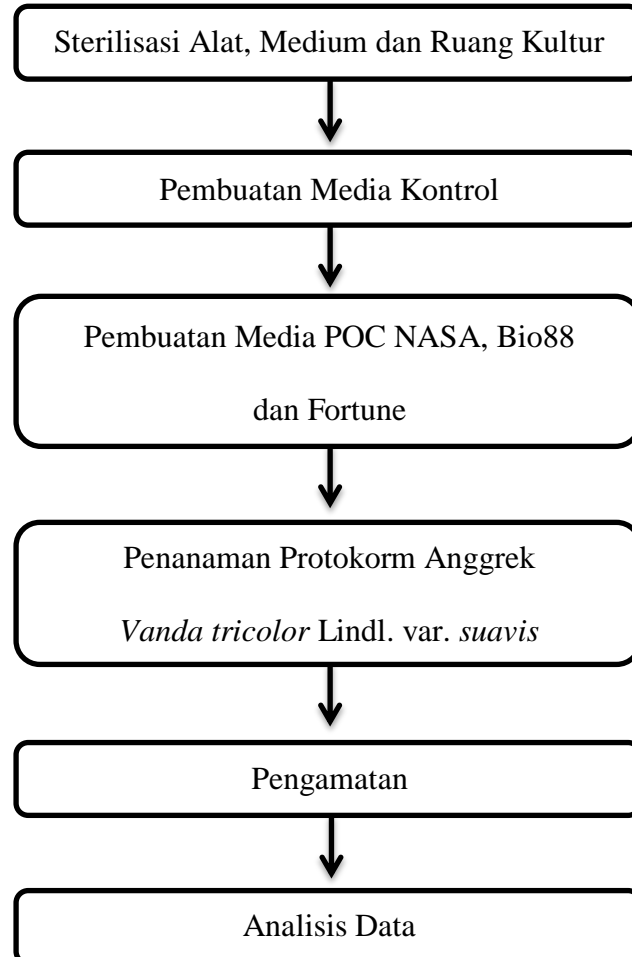
Lampiran 1. Komposisi Pupuk Organik Cair (POC)

No.	Jenis Unsur	Pupuk Organik Cair		
		Fortune	NASA	Bio88
1.	Nitrogen (N)	3.26%	4.15%	3.47%
2.	P ₂ O ₅	4.11%	4.45%	4.10%
3.	K ₂ O	3.45%	5.66%	3.53%
4.	Fe	6.03 ppm	505.5 ppm	575 ppm
5.	Mn	255.11 ppm	1931.1%	1187 ppm
6.	Cu	276.47 ppm	1179.8%	1026 ppm
7.	Zn	253.02 ppm	1986.1%	752 ppm
8.	B	127.11 ppm	806.6%	-
9.	Co	5.16 ppm	8.4 ppm	-
10.	Mo	3.48 ppm	2.3 ppm	-
11.	C Organic	-	9.69%	9.87%
12.	pH	-	5.61	6.24
13.	Pb	-	4.7 ppm	2 ppm
14.	Cd	-	0.1 ppm	Tt ppm
15.	Hg	-	0.03 ppm	Tt ppm
16.	Zat Pengatur Tumbuh (ZPT)	-	Giberalin, Sitokinin dan Auksin	-

Lampiran 2. Komposisi Media Murashige and Skoog (MS)

No.	Komponen	Komposisi (mg/l)
1.	NH ₄ NO ₃	1650
2.	KNO ₃	1900
3.	CaCl ₂ .2H ₂ O	440
4.	MgSO ₄ .7H ₂ O	370
5.	KH ₂ PO ₄	170
6.	FeSO ₄ .7H ₂ O	27
7.	NaEDTA	37.3
8.	MnSO ₄ .4H ₂ O	22.3
9.	ZnSO ₄ .7H ₂ O	8.6
10.	H ₃ BO ₃	6.2
11.	KI	0.83
12.	Na ₂ .MoO ₄ .2H ₂ O	0.25
13.	CuSO ₄ .5H ₂ O	0.025
14.	CoCl ₂ .6H ₂ O	0.025
15.	Myoinositol	100
16.	Niasin	0.5
17.	Piridoksin-HCl	0.5
18.	Tiamin-HCl	0.1
19.	Glisin	2

Lampiran 3. Skema Kerja Pertumbuhan Protokorm Anggrek *Vanda tricolor* Lindl. var. *suavis* Melalui Penambahan Pupuk Organik Cair (POC) Secara *In Vitro*



Lampiran 4. Proses Pembuatan Media Pupuk Organik Cair (POC)



Penimbangan dan pencampuran semua bahan, lalu dihomogenkan



Pengukuran pH



Penuangan media ke dalam botol kultur



Sterilisasi media

Lampiran 5. Proses Penanaman Protokorm dan Pengamatan Fase Protokorm



Proses penanaman protokorm pada media perlakuan



Proses pengamatan fase pertumbuhan protokorm angrek *Vanda tricolor*

Lampiran 6. Hasil Data Jumlah Tunas dan Jumlah Daun

A. Data Jumlah Tunas

Jenis POC	Perlakuan	Ulangan				
		1	2	3	4	5
NASA	NA ₁	12	10	31	5	11
	NA ₂	21	17	4	21	12
	NA ₃	5	7	5	7	12
	NA ₄	8	4	6	18	5
	NA ₅	6	1	2	0	0
BIO88	BIO ₁	0	0	0	0	0
	BIO ₂	0	0	0	0	0
	BIO ₃	0	0	0	0	0
	BIO ₄	5	0	3	1	0
	BIO ₅	2	2	1	0	0
FORTUNE	F ₁	15	3	6	14	6
	F ₂	3	12	6	2	2
	F ₃	2	1	1	0	5
	F ₄	0	9	0	0	0
	F ₅	0	2	0	0	1
KONTROL	MS ₁	0	40	6	27	28
	MS ₂	9	4	11	10	20
	MS ₃	15	0	0	8	22
	MS ₄	4	14	71	3	1
	MS ₅	26	16	15	28	5

B. Data Jumlah Daun

Jenis POC	Perlakuan	Ulangan				
		1	2	3	4	5
NASA	NA ₁	3	0	0	5	0
	NA ₂	30	10	0	25	13
	NA ₃	3	0	3	6	0
	NA ₄	7	3	0	5	0
	NA ₅	0	0	0	0	0
BIO88	BIO ₁	0	0	0	0	0
	BIO ₂	0	0	0	0	0
	BIO ₃	0	0	0	0	0
	BIO ₄	0	0	0	0	0
	BIO ₅	0	0	0	0	0

Lampiran 7. Lanjutan

FORTUNE	F ₁	0	0	0	0	0
	F ₂	2	0	0	4	1
	F ₃	1	0	0	0	4
	F ₄	0	0	0	0	0
	F ₅	0	0	0	0	0
KONTROL	MS ₁	0	5	0	10	5
	MS ₂	2	1	3	0	11
	MS ₃	17	0	0	3	7
	MS ₄	0	6	18	0	0
	MS ₅	10	5	8	9	0

Lampiran 8. Hasil Uji Normalitas Kolmogorov-Smirnov Jumlah Tunas dan Jumlah Daun

A. Uji Normalitas Jumlah Tunas

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		100
Normal Parameters ^{a,b}	Mean	.0000000
	Std. Deviation	10.39125295
Most Extreme Differences	Absolute	.175
	Positive	.171
	Negative	-.175
Test Statistic		.175
Asymp. Sig. (2-tailed)		.000 ^c

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

B. Uji Normalitas Jumlah Daun

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		100
Normal Parameters ^{a,b}	Mean	.0000000
	Std. Deviation	5.18790606
Most Extreme Differences	Absolute	.346
	Positive	.346
	Negative	-.313
Test Statistic		.346
Asymp. Sig. (2-tailed)		.000 ^c

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

Lampiran 9. Hasil Uji *Kruskal-Wallis* Jumlah Tunas dan Jumlah Daun untuk Pemberian Pupuk Organik Cair (POC)

Ranks

	Perlakuan	N	Mean Rank
Jumlah_Daun	1	5	12.80
	2	5	5.00
	3	5	7.20
	4	5	17.00
	Total	20	
Jumlah_Tunas	1	5	12.70
	2	5	3.70
	3	5	8.40
	4	5	17.20
	Total	20	

Test Statistics^{a,b}

	Jumlah_Daun	Jumlah_Tunas
Chi-Square	13.925	14.493
df	3	3
Asymp. Sig.	.003	.002

a. Kruskal Wallis Test

b. Grouping Variable: Perlakuan

Lampiran 10. Hasil Uji Lanjut *Mann-Whitney* Jumlah Tunas

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Jumlah_Tunas is the same across categories of Perlakuan.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
Bio88-Fortune	-4700	3722	-1263	0.207	1000
Bio88-NASA	9000	3722	2418	0.016	0.094
Bio88-Kontrol	13500	3722	-3627	0.000	0.002
Fortune-NASA	4300	3722	1155	0.248	1000
Fortune-Kontrol	-8800	3722	-2364	0.018	0.108
NASA-Kontrol	-4500	3722	-1209	0.227	1000

Lampiran 11. Hasil Uji Lanjut *Mann-Whitney* Jumlah Daun

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Jumlah_Daun is the same across categories of Perlakuan.	Independent-Samples Kruskal-Wallis Test	.001	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
Bio88-Fortune	-2200	3569	-0.616	0.538	1000
Bio88-NASA	7800	3569	2186	0.029	0.173
Bio88-Kontrol	-12000	3569	-3362	0.001	0.005
Fortune-NASA	5600	3569	1569	0.117	0.700
Fortune-Kontrol	-9800	3569	-2746	0.006	0.036
NASA-Kontrol	-4200	3569	-1177	0.239	1000

Lampiran 12. Hasil Uji *Kruskal-Wallis* untuk pengaruh konsentrasi

Ranks

	Konsentrasi	N	Mean Rank
Jumlah_Daun	1	4	9.50
	2	4	12.75
	3	4	11.50
	4	4	10.25
	5	4	8.50
	Total	20	
Jumlah_Tunas	1	4	12.75
	2	4	11.00
	3	4	8.63
	4	4	11.50
	5	4	8.63
	Total	20	

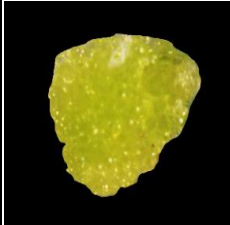

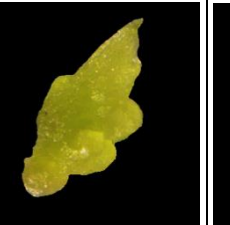

Test Statistics^{a,b}


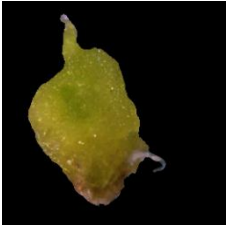
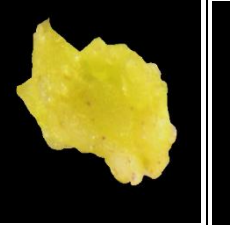




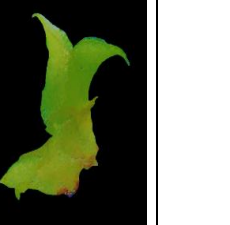


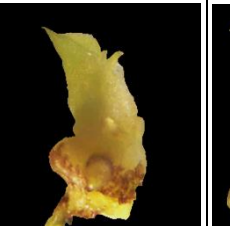





	Jumlah_Daun	Jumlah_Tunas
Chi-Square	1.398	1.541
df	4	4
Asymp. Sig.	.845	.819

a. Kruskal Wallis Test



b. Grouping Variable: Konsentrasi

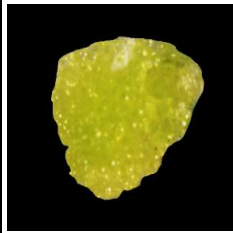
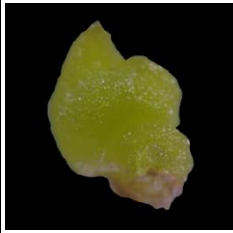


Lampiran 13. Protokorm Angrek *Vanda tricolor* Lindl. var. *suavis*

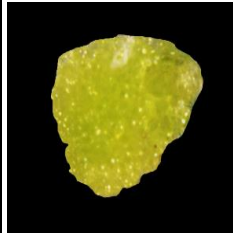
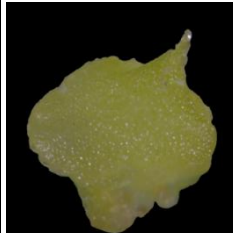
Kontrol				
Perlakuan	Sebelum tanam	Fase I	Fase II	Fase III
1 ml				
	0 MST	6 MST	7 MST	8 MST

POC NASA				
Perlakuan	Sebelum tanam	Fase I	Fase II	Fase III
1 ml				
	0 MST	5 MST	7 MST	10 MST
1.5 ml				
	0 MST	5 MST	7 MST	8 MST
2 ml				
	0 MST	5 MST	7 MST	9 MST
2.5 ml				
	0 MST	5 MST	7 MST	9 MST











Lampiran 14. Lanjutan

3 ml				
	0 MST	5 MST		

POC Bio88				
Perlakuan	Sebelum tanam	Fase I	Fase II	Fase III
1 ml		-	-	-
1.5 ml		-	-	-
2 ml		-	-	-
2.5 ml				
	0 MST	3 MST		
3 ml				
	0 MST	3 MST		

POC Fortune				
Perlakuan	Sebelum tanam	Fase I	Fase II	Fase III
1 ml				
	0 MST	3 MST		

Lampiran 15. Lanjutan

1.5 ml	 0 MST	 3 MST	 6 MST	 11 MST
2 ml	 0 MST	 3 MST	 6 MST	 11 MST
2.5 ml	 0 MST	 3 MST		