



SENSIENT

Accomplishment Report

5 Years Research Collaboration

UNPAD - SENSIENT

2018 - 2023





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Company Profile

Sensient Colors

Sensient Colors Group, a unit of Sensient Technologies Corporation, is the leading global manufacturer and supplier of natural and synthetic color solutions for the food and beverage, cosmetic, pharmaceutical, and industrial markets.



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Company Profile

Universitas Padjadjaran

UNPAD aims to be globally competitive while preserving local wisdom. It focuses on interdisciplinary research, industry collaboration, and partnerships at local and international levels. Its research excellence is evident through publications and centers addressing global challenges in health, agriculture, and the environment.



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The Accomplishments

27

Involved
Students

42

Publications

11

Superior
Genotypes



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The Involved Students (Ph.D)



Dr. Debby Ustari



Dr. Hari Hariadi



Dr. Hanny Hidayati Nafi'ah



Dr. Murgayanti



Dr. Nurhasanah Jusuf



Dr. Try Zulchi Prasetyo Hadi



Dr. Raden Rhazista Noviardi



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The Involved Students (M.Sc.)



Trixie Almira Ulimaz, M.Sc.



Amalia Murnihati Noerrizki, M.Sc.



Tresna Kusuma Putri, M.Sc.



Yosua Liberty Filio, M.Sc.



Arif Affan Wicaksono, M.Sc.



Reviana Aulia, M.Sc.



Nurul Amelia Shafira, M.Sc.



Farisa Qisthi Shafira, M.Sc.



Nasrul Hakim, M.Sc. (Candidate)



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The Involved Students (B.Sc.)



Azka Algina, B.Sc.



Harlino Nandha P., B.Sc.



Putri Ardhya Anindita, B.Sc.



Virda Aziza, B.Sc.



Kintan Widya Pangestika, B.Sc.



Rumaisha Thifa, B.Sc.



Saskia Pratiwi, B.Sc.



Desy Ira Sihombing, B.Sc.



Mulyati Binti Mustapa, B.Sc.



Lauren Thalita, B.Sc.



Fiona Margaretha, B.Sc.



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The Published Articles

1. • Agung Karuniawan, Trixie Almira Ulimaz, Debby Ustari, Virda Aziza, Nurhasanah, Haris Maulana, Vergel Concibido and Tarkus Suganda. 2018. **Diversity of Butterfly Pea and Opportunities for Development of PostHarvest Processing**. Maluku Corner National Seminar, Universitas Khairun 17th December 2018.
2. • Hari Hariadi, Marleen Sunyoto, Bambang Nurhadi and Agung Karuniawan. 2018. **Comparison of phytochemical characteristics pigmen extract (Antosianin) sweet purple potatoes powder (Ipomoea batatas L) and clitoria flower (Clitoria ternatea) as natural dye powder**. Journal of Pharmacognosy and Phytochemistry, 7 (4): 3420-3429.
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5. • Yohanis Amos Mustamu, Koko Tjintokohadi, Wolfgang J Grüneberg, Agung Karuniawan, Dedi Ruswandi. 2018. **Selection of superior genotype of sweet-potato in Indonesia based on stability and adaptability**. Chilean journal of agricultural research, 78 (4): 461-469. <http://dx.doi.org/10.4067/S0718-58392018000400461>.
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9. • Murgayanti Murgayanti, Anne Nuraini, Megianti Agtari, Agung Karuniawan. 2019. **Respons klon ubi jalar (*Ipomoea batatas* L.) var. Awachy-1 dan var. Biang terhadap aplikasi paclobutrazol**. Kultivasi, 18 (3): 958-961.
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11. • Agung Karuniawan, Trixie Almira Ulimaz, Debby Ustari, Tarkus Suganda, and Vergel Concibido. 2020. **Characterization of Butterfly Pea As a Model of Underutilized Crop Management in Indonesia**. In Boosting The Big Data of Plant With Digital Identifiers, First Edition, IAARD Press, pages: 67-81.
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13. • Tresna Kusuma Putri, Putri Ardhya Anindita, Nolahdi Wicaksana, Tarkus Suganda, Vergel Concibido, Agung Karuniawan. 2020. **Genetic Diverity of 64 Turmeric Accessions from Indonesia Based on P450-Based Analogue (PBA) Marker**. Buletin Penelitian Tanaman Rempah dan Obat, 31 (2): 123-134.
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15. • Amalia Murnihati Noerrizki, Agung Karuniawan, Tarkus Suganda, Yuli Andriani, Vergel Concibido, and Jutti Levita. 2020. **Sweet Potato (*Ipomoea batatas*[L.] Lam) – A Review on Its Bioprospecting**. IOSR Journal Of Pharmacy And Biological Sciences (IOSR-JPBS). Volume 15, Issue 3 Ser. I (May –June 2020), PP01-07.



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16. • Trixie Almira Ulimaz, Debby Ustari, Virda Aziza, Tarkus Suganda, Vergel Concibido, Jutti Levita, Agung Karuniawan. 2020. **Genetic Diversity of Butterfly Pea (*Clitoria ternatea*) from Indonesia Based on Yield Trait in Two Environments.** Jurnal AgroBiogen, 16 (1):1-6.
17. • 1.Virda Aziza, Trixie Almira Ulimaz, Debby Ustari, Tarkus Suganda, Vergel Concibido, Budi Irawan, Agung Karuniawan. 2021. **Genetic Diversity of Double Petal Butterfly Pea (*Clitoria ternatea* L.) Germplasm Based on Flower Morphology Traits.** Al-Kauniyah Jurnal Biologi, 14 (1): 78-89.
18. • Hanny Hidayati Nafi'ah, Reginawati Hindersah, Syariful Mubarak, Haris Maulana, Tarkus Suganda, Vergel Concibido, Agung Karuniawan. 2021. **Growth rate and yield response of several sweet potato clones to reduced inorganic fertilizer and biofertilizer.** Biodiversitas, 22 (4): 1775-1782.
19. • Sitaresmi Dewayani, Haris Maulana, Noladhi Wicaksana, Tarkus Suganda, Vergel Concibido, Agung Karuniawan. 2021. **Distribution and prevalence of Scurf (*Monilochaetes infucans*) on sweet potato (*Ipomoea batatas* (L.) Lam.) in West Java, Indonesia.** Biodiversitas, 22 (5): 2876-2883.
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27. • Yoshua Liberty Filio, Haris Maulana, Reviana Aulia, Tarkus Suganda, Trixie Almira Ulimaz, Virda Aziza, Vergel Concibido and Agung Karuniawan. 2023. **Evaluation of Indonesian Butterfly Pea (*Clitoria ternatea* L.) Using Stability Analysis and Sustainability Index.** Sustainability. 15(3), 2459.
28. • Amalia Murnihati Noerrizki, Harlino Nandha Prayudha, Debby Ustari, Tarkus Suganda, Vergel Concibido, Agung Karuniawan. 2022. **Daya Hasil dan Kandungan Antosianin Genotip Ubi Jalar Ungu (Purple-Fleshed Sweet Potato) di Jatinangor, Jawa Barat.** Berita Biologi. 21 (3).
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32. • Try Zulchi, Ali Husni, Dwinita W Utami, Reflinur Reflinur, Mia Kosmiatin, Haris Maulana, Tarkus Suganda, Vergel Concibido, Agung Karuniawan. 2024. **Evaluation of performance, diversity, and trait relationships of butterfly pea (*Clitoria ternatea*) genotypes M4 generations.** Biodiversitas Journal of Biological Diversity. 25 (8).



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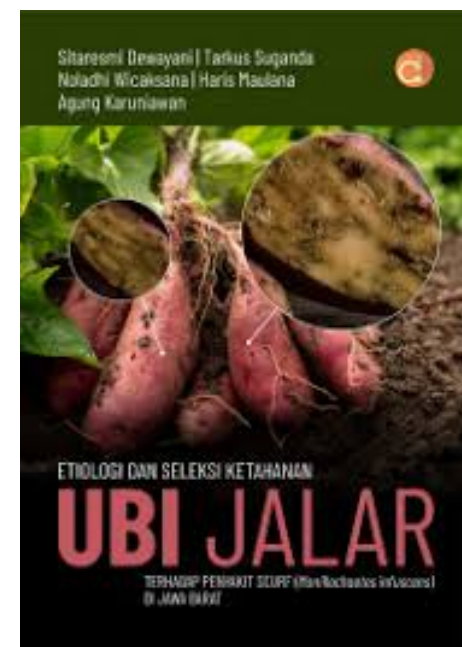
33. • Hari Hariadi, Suseno Amien, Sandi Darniadi, Achmat Sarifudin, Haris Maulana, Doddy Andy Darmajana, Pramono Nugroho, Ridwan Rahmat, Sunarmani Sunarmani, Sri Widowati, Agung Karuniawan, Yusep Ikrawan. 2023. **Activity antioxidant and sensory profile of jelly candy with addition of butterfly pea (*Clitoria ternatea* L.) extract powder**. Food Science and Technology. 43.
34. • Hari Hariadi, Suseno Amien, Agung Karuniawan, Sandi Darniadi, Dian Histifarina, Ashri Indriati, Suwarni Tri Rahayu, Adnan Adnan, Yani Alvi, Hidayat Hidayat, Laela Nuraini, Ali Asgar, Christina Litaay, Kasma Iswari, Agus Nurawan, Diana Atma Budiman, Rudy Tjahjoutomo, Nyoman Ngurah Arya, Mita Ramadiyanti. 2024. **The Effect of three drying methods on physicochemical properties of powdered butterfly pea flower extract (*Clitoria ternatea* L.)**. Food Science and Technology. 44.
35. • Nurhasanah, Reginawanti Hindersah, Tarkus Suganda, Vergel Concibido, Sundari, Agung Karuniawan. 2023. **The First Report on the Application of ISSR Markers in Genetic Variance Detection among Butterfly Pea (*Clitoria ternatea* L.) Accession in North Maluku Province, Indonesia**. Horticulturae. 9 (9).
36. • Azka Algina, Debby Ustari, Mulyati Binti Mustapa, Virda Aziza, Arif Affan Wicaksono, Binastya Anggara Sekti, Azis Natawijaya, Tarkus Suganda, Vergel Concibido, Agung Karuniawan. 2024. **Assessing Fresh Flower Weight Stability of Butterfly Pea (*Clitoria ternatea*) Through Multi-Year Genotype-Environment Analysis**. Submitted to Plant-Environment Interactions.
37. • Azka Algina, Debby Ustari, Mulyati Binti Mustapa, Virda Aziza, Arif Affan Wicaksono, Tarkus Suganda, Vergel Concibido, Agung Karuniawan. 2024. **Genetic Variability in 12 Butterfly Pea (*Clitoria ternatea* L.) Accessions: A Dual Approach With Cluster And Principal Component Analysis**. Submitted to Jurnal Agro.
38. • Agung Karuniawan, Debby Ustari, Arif Affan Wicaksono, Azka Algina, Ernah, Tarkus Suganda, and Vergel Concibido. (2024). **Economic Valuation of Butterfly Pea (*Clitoria ternatea* L.) in Java Indonesia**. Submitted to Jurnal Hayati.



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The Published Books

- Sitaresmi Dewayani, Tarkus Suganda, Noladhi Wicaksana, Haris Maulana, Agung Karuniawan. 2022. **Etiologi dan Seleksi Ketahanan Ubi Jalar terhadap Penyakit Scurf (*Monillochaetes infuscans*) di Jawa Barat [Etiology and Selection of Sweet Potato Resistance to Scurf Disease (*Monillochaetes infuscans*) in West Java]**. Deepublish Publisher: Yogyakarta, pp. 66.
- Yohanis Amos Mustamu, Dedi Ruswandi, Hersanti, Agung Karuniawan. 2022. **Seleksi Varietas Unggul Ubi Jalar Berdasarkan Keragaman Genetik, Aksi Gen, dan Stabilitas Hasil [Selection of Superior Sweet Potato Varieties Based on Genetic Diversity, Gene Action, and Yield Stability]**. Deepublish Publisher: Yogyakarta, pp. 159.
- Yoshua Liberty Filio, Tarkus Suganda, Agung Karuniawan. **Inovasi Ragam, Stabilitas, dan Sifat Kembang Telang [Discovery of Variety, Stability, and Nature of Butterfly Pea]**. 2022. Deepublish Publisher: Yogyakarta.
- Reviana Aulia, Tarkus Suganda, Agung Karuniawan. **Mengenal Lebih Dalam Tanaman Kunyit Lokal [Explore to the Local Turmeric Varieties]**. 2022. Deepublish Publisher: Yogyakarta.





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The Superior Genotypes

Purple-Fleshed Sweet Potato - “Biang”

- Purple-fleshed sweet potato “BIANG” has a deep purple color, making it suitable for starches and natural dyes.
- Yield: 28-35 tonnes/ha.
- Storability: up to $\pm$ 45-60 days





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The Superior Genotypes

Butterfly Pea - “CT 8.3”

Flower Length (cm)	: 5.86	Number of Total Pods	: 1256.67
Flower Width (cm)	: 4.23	Weight total pods (gram)	: 562.23
Calix Length (cm)	: 1.88	Seed Length (mm)	: 5.49
Flowering Age (wan)	: 55.78	Seed Width (mm)	: 3.84
Weight of 1 Fresh Flower (gram)	: 0.54	Seed Diameter (mm)	: 2.10
Weight of Fresh Flower per Plant (gram)	: 101.90	Number of seed per pod	: 8.47
Weight of Total Fresh Flower (gram)	: 667.45	Weight of seed per plant (gram)	: 71.64
Flower Color	: RHS 93A	Weight of 100 seed (gram)	: 3.77
Petal Number	: Double Petal	Weight of total seed (gram)	: 240.01
Leaf Shape	: Elliptic	Seed Germination (%)	: 52.00
Growth Habit	: Determinate		
Pod Length (cm)	: 8.44		
Pod Width (mm)	: 8.96		
Number Of Pod per Plant	: 280.94		
Weight of pods per plant (gram)	: 120.85		





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The Superior Genotypes

Butterfly Pea - “CT 12.2”

Plant Height (cm)	: 191.22	Number of Total Pods	: 1150.33
Leaf Length (cm)	: 4.38	Weight total pods (gram)	: 813.57
Leaf Width (cm)	: 2.79	Seed Length (mm)	: 6.12
Flower Length (cm)	: 5.51	Seed Width (mm)	: 3.94
Flower Width (cm)	: 4.14	Seed Diameter (mm)	: 2.29
Calix Length (cm)	: 1.92	Number of seed per pod	: 8.32
Flowering Age (wan)	: 52.89	Weight of seed per plant (gram)	: 108.93
Weight of 1 Fresh Flower (gram)	: 0.61	Weight of 100 seed (gram)	: 4.75
Weight of Fresh Flower per Plant (gram)	: 81.77	Weight of total seed (gram)	: 412.04
Weight of Total Fresh Flower (gram)	: 360.49	Seed Germination (%)	: 64.50
Flower Color	: RHS N89A		
Petal Number	: Double Petal		
Leaf Shape	: Elliptic		
Growth Habit	: Determinate		
Pod Length (cm)	: 8.92		
Pod Width (mm)	: 8.86		
Number of Pod per Plant	: 319.72		
Weight of pods per plant (gram)	: 180.25		





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The Superior Genotypes

Butterfly Pea - “CT 12.3”

Plant Height (cm)	: 210.11	Number of Pod per Plant	: 128.50
Leaf Length (cm)	: 4.63	Weight of pods per plant (gram)	: 74.98
Leaf Width (cm)	: 3.07	Number of Total Pods	: 311.00
Flower Length (cm)	: 5.49	Weight total pods (gram)	: 197.77
Flower Width (cm)	: 4.32	Seed Length (mm)	: 6.19
Calix Length (cm)	: 2.10	Seed Width (mm)	: 4.18
Flowering Age (wap)	: 53.89	Seed Diameter (mm)	: 2.30
Weight of 1 Fresh Flower (gram)	: 1.02	Number of seed per pod	: 8.61
Weight of Fresh Flower per Plant (gram)	: 202.95	Weight of seed per plant (gram)	: 39.10
Weight of Total Fresh Flower (gram)	: 475.22	Weight of 100 seed (gram)	: 4.91
Flower Color	: RHS 93A	Weight of total seed (gram)	: 89.29
Petal Number	: Double Pet	Seed Germination (%)	: 54.00
Leaf Shape	: Oval		
Growth Habit	: Determina		
Pod Length (cm)	: 9.57		
Pod Width (mm)	: 9.81		
Number of Pod per Plant	: 128.50		





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The Superior Genotypes

Butterfly Pea - “CT 12.3B”

Plant Height (cm)	: 207.56	Number Of Pod per Plant	: 89.50
Leaf Length (cm)	: 4.41	Weight of pods per plant (gram)	: 67.20
Leaf Width (cm)	: 2.89	Number of Total Pods	: 307.00
Flower Length (cm)	: 5.62	Weight total pods (gram)	: 240.14
Flower Width (cm)	: 4.78	Seed Length (mm)	: 5.88
Calix Length (cm)	: 2.26	Seed Width (mm)	: 4.16
Flowering Age (wap)	: 53.22	Seed Diameter (mm)	: 2.18
Weight of 1 Fresh Flower (gram)	: 1.29	Number of seed per pod	: 7.52
Weight of Fresh Flower per Plant (gram)	: 207.80	Weight of seed per plant (gram)	: 24.37
Weight of Total Fresh Flower (gram)	: 786.52	Weight of 100 seed (gram)	: 5.03
Flower Color	: RHS 93A	Weight of total seed (gram)	: 86.23
Petal Number	: Double Petal	Seed Germination (%)	: 49.50
Leaf Shape	: Acute		
Growth Habit	: Determinate		
Pod Length (cm)	: 8.88		
Pod Width (mm)	: 9.50		
Number Of Pod per Plant	: 89.50		





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The Superior Genotypes

Butterfly Pea - “CT 12.5”

Plant Height (cm)	: 199.89	Weight of pods per plant (gram)	: 190.81
Leaf Length (cm)	: 4.28	Number of Total Pods	: 1382.67
Leaf Width (cm)	: 2.96	Weight total pods (gram)	: 1035.22
Flower Length (cm)	: 5.29	Seed Length (mm)	: 5.78
Flower Width (cm)	: 4.32	Seed Width (mm)	: 4.12
Calix Length	: 1.91	Seed Diameter (mm)	: 2.09
Flowering Age (wap)	: 48.78	Number of seed per pod	: 8.14
Weight of 1 Fresh Flower (gram)	: 0.85	Weight of seed per plant (gram)	: 125.78
Weight of Fresh Flower per Plant (gram)	: 160.84	Weight of 100 seed (gram)	: 4.27
Weight of Total Fresh Flower (gram)	: 635.75	Weight of total seed (gram)	: 313.16
Flower Color	: RHS N89B	Seed Germination (%)	: 59.00
Petal Number	: Double Petal		
Leaf Shape	: Elliptic		
Growth Habit	: Indeterminate		
Pod Length (cm)	: 9.20		
Pod Width (mm)	: 9.68		
Number of Pod per Plant	: 366.78		





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The Superior Genotypes

Butterfly Pea - “CT 12.7B”

Plant Height (cm)	: 202.44	Weight of pods per plant (gram)	: 70.80
Leaf Length (cm)	: 3.84	Number of Total Pods	: 496.67
Leaf Width (cm)	: 2.72	Weight total pods (gram)	: 304.96
Flower Length (cm)	: 5.29	Seed Length (mm)	: 6.05
Flower Width (cm)	: 3.98	Seed Width (mm)	: 3.75
Calix Length	: 1.91	Seed Diameter (mm)	: 2.19
Flowering Age (wap)	: 50.67	Number of seed per pod	: 7.55
Weight of 1 Fresh Flower (gram)	: 0.71	Weight of seed per plant (gram)	: 38.56
Weight of Fresh Flower per Plant (gram)	: 80.85	Weight of 100 seed (gram)	: 4.14
Weight of Total Fresh Flower (gram)	: 234.68	Weight of total seed (gram)	: 127.60
Flower Color	: RHS N89B	Seed Germination (%)	: 44.50
Petal Number	: Double Petal		
Leaf Shape	: Oval		
Growth Habit	: Indeterminate		
Pod Length (cm)	: 8.96		
Pod Width (mm)	: 9.00		
Number of Pod per Plant	: 151.44		





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The Superior Genotypes

Butterfly Pea - “CT 24.1”

Plant Height (cm)	: 193.22	Weight of pods per plant (gram)	: 32.95
Leaf Length (cm)	: 4.83	Number Of Total Pods	: 143.67
Leaf Width (cm)	: 3.03	Weight total pods (gram)	: 79.51
Flower Length (cm)	: 5.18	Seed Length (mm)	: 5.95
Flower Width (cm)	: 4.02	Seed Width (mm)	: 4.03
Calix Length (cm)	: 2.04	Seed Diameter (mm)	: 2.18
Flowering Age (wap)	: 54.89	Number of seed per pod	: 8.06
Weight of 1 Fresh Flower (gram)	: 1.32	Weight of seed per plant (gram)	: 16.02
Weight of Fresh Flower per Plant (gram)	: 196.09	Weight of 100 seed (gram)	: 4.27
Weight of Total Fresh Flower (gram)	: 458.33	Weight of total seed (gram)	: 38.41
Flower Color	: RHS 93A	Seed Germination (%)	: 44.50
Petal Number	: Double Petal		
Leaf Shape	: Acute		
Growth Habit	: Determinate		
Pod Length (cm)	: 8.77		
Pod Width (mm)	: 9.26		
Number Of Pod per Plant	: 60.06		





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Butterfly Pea - “CT 4.3”

Plant Height (cm)	: 170.44	Weight of pods per plant (gram)	: 221.07
Leaf Length (cm)	: 4.14	Number of Total Pods	: 1783.33
Leaf Width (cm)	: 2.74	Weight total pods (gram)	: 954.84
Flower Length (cm)	: 6.28	Seed Length (mm)	: 5.65
Flower Width (cm)	: 3.67	Seed Width (mm)	: 4.04
Calix Length (cm)	: 1.95	Seed Diameter (mm)	: 2.23
Flowering Age (wap)	: 47.67	Number of seed per pod	: 7.96
Weight of 1 Fresh Flower (gram)	: 0.58	Weight of seed per plant (gram)	: 187.13
Weight of Fresh Flower per Plant (gram)	: 84.21	Weight of 100 seed (gram)	: 4.39
Weight of Total Fresh Flower (gram)	: 25.42	Weight of total seed (gram)	: 626.33
Flower Color	: RHS 93A	Seed Germination (%)	: 66.70
Petal Number	: Single Petal		
Leaf Shape	: Acute		
Growth Habit	: Determinate		
Pod Length (cm)	: 9.01		
Pod Width (mm)	: 9.03		
Number of Pod per Plant	: 473.67		



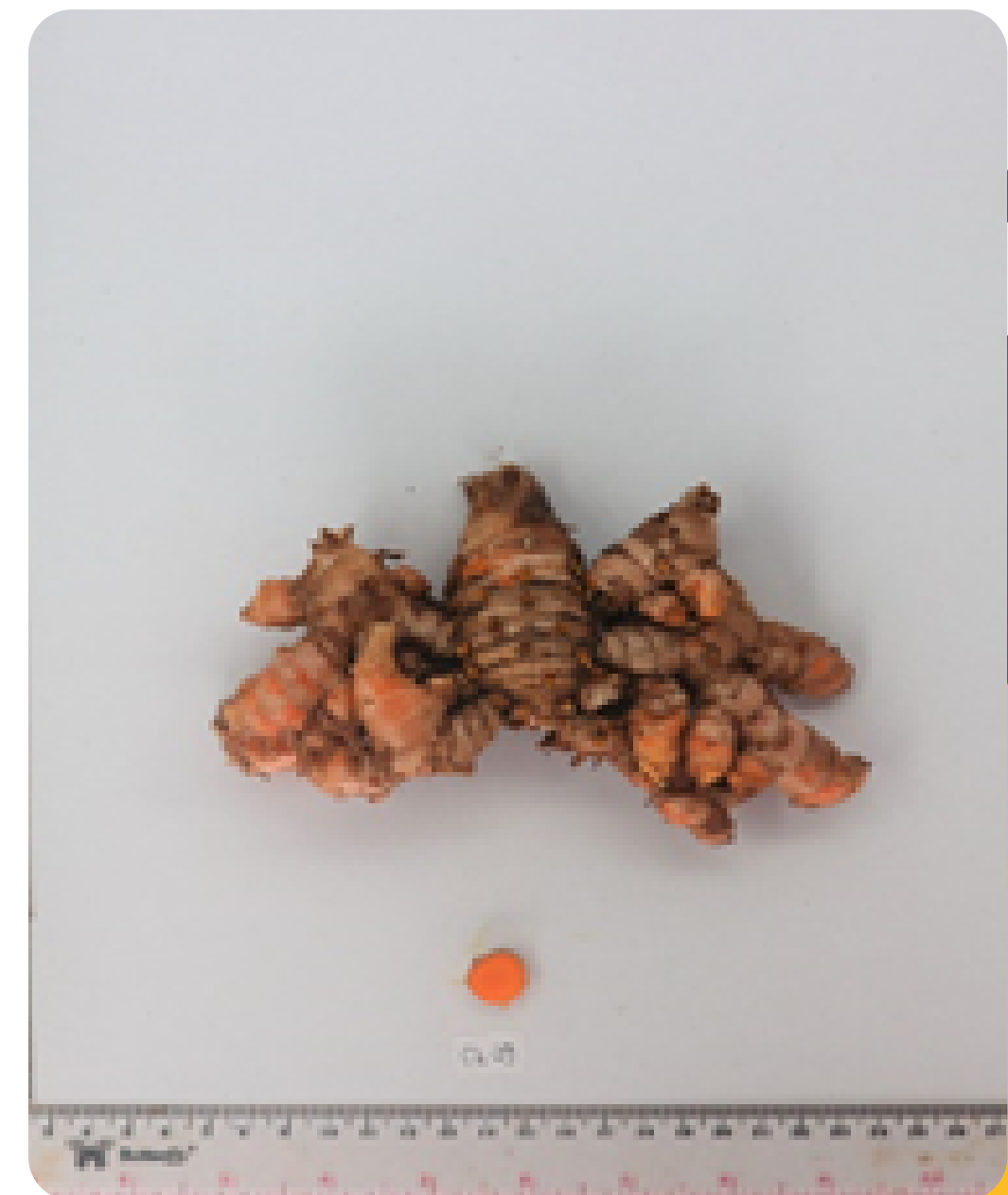


SENSIENT

The Superior Genotypes

Turmeric - “CL-SSL-02”

- Color of Rhizomes : Orange
- Number of Tillers : 1
- Number of main rhizomes : 1
- Weight of rhizome per grove : 0.135 ± 0.04 kg
- Potential yield : 5.49 tons/ha
- Curcumin levels : $5.687 \pm 0.015\%$





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The Superior Genotypes

Turmeric - “CL-LMP-03”

- Color of Rhizomes : Orange
- Number of Tillers : 6.4 ± 2.97
- Number of main rhizomes : 2.6 ± 0.89
- Weight of rhizome per grove : 1.365 ± 0.9 kg
- Potential yield : 18.81 tons/ha
- Curcumin levels : $5.633 \pm 0.046\%$





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Thank You!



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