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Production of coloured callus in *Orthosiphon stamineus* Benth and antioxidant properties of the extracted pigments

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PIGMENT & RESIN TECHNOLOGY

Volume: 47 Issue: 3 Pages: 196-207

DOI: 10.1108/PRT-01-2017-0009

Published: 2018

Document Type: Article

[View Journal Impact](#)

Abstract

Purpose The purpose of the present study is to understand the role of auxin and cytokinin in stimulating the production of pigmented callus in *Orthosiphon stamineus* and to gain correlation between the callus colours with their antioxidant capacity and bioactive constituents.

Design/methodology/approach In this study, plant tissue culture was used to induce production of callus of various colours from leaf explants of *O. stamineus*, via manipulation of plant hormones (0-2.0 mg L⁻¹ indole-3-acetic acid [IAA] and Kinetin [Kin]). The coloured callus was subjected to solvent extraction and used for quantification of its carotenoid, chlorophyll, anthocyanin and phenolic contents. The 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activity of the extracts was also evaluated, before and after four weeks of storage at -20 degrees C.

Findings The highest mean (per cent) explants that produced roots (93.33 0.05 per cent) were observed when the cultures were supplemented with 2.0 mg L⁻¹ IAA. The colour of the callus changed with time, from green to cream to brown after two and four months of culture, respectively. Optimum production of green callus was achieved with addition of 2.0 mg L⁻¹ Kin plus 1.0-2.0 mg L⁻¹ IAA to the media, while cream callus in 0.5 mg L⁻¹ Kin plus 2.0 mg L⁻¹ IAA and brown callus in 0.5 mg L⁻¹ Kin plus 1.5 mg L⁻¹ IAA. Green callus was found to contain the highest amount of chlorophylls, carotenoid and anthocyanin, while cream callus contained the highest amount of phenolic compounds. The amount of pigments and secondary metabolites in the callus extracts decreased after four weeks of storage, except anthocyanin. The antioxidant potential of the extracts also increased after storage.

Research limitations/implications The major compounds identified in the methanolic extracts of *O. stamineus*-coloured callus are chlorophylls, carotenoids, flavonoids and phenolic acids. Future research work should include improvements in the extraction and identification methods which may lead to detection of other compounds that could attribute to the antioxidant capacity, to complement the findings of the current study.

Practical implications This analysis provides valuable information on the application of IAA and Kinetin (Kin) to manipulate the content of major pigments with medicinal benefits in *O. stamineus* by using the plant tissue culture system.

Originality/value A comparative study on antioxidant capacity and bioactive constituents of pigmented callus from *O. stamineus* leaves is original. To the best of the authors' knowledge, this is the first attempt of comparative evaluation on antioxidant potential of *O. stamineus*-coloured callus produced using IAA and Kin.

Keywords

Author Keywords: [Pigments](#); [Coloured callus](#); [Indole-acetic acid](#); [Kinetin](#); [Orthosiphon stamineus](#)

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KeyWords Plus: RADICAL SCAVENGING ACTIVITY; SECONDARY METABOLITES; TISSUE CULTURES; PLANTS; ANTHOCYANINS; STORAGE; GROWTH

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Funding

Funding Agency	Grant Number
University of Malaya, Malaysia	RG297-14AFR PG156-2014B

[View funding text](#)

Publisher

EMERALD GROUP PUBLISHING LTD, HOWARD HOUSE, WAGON LANE, BINGLEY BD16 1WA, W YORKSHIRE, ENGLAND

Journal Information

Impact Factor: [Journal Citation Reports](#)

Categories / Classification

Research Areas: Chemistry; Engineering; Materials Science

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- Thin-layer densitometry as an alternative tool in the quantitative evaluation of the free radical scavenging activity of natural antioxidants** **Times Cited: 4**

By: Abourashed, EA
ZEITSCHRIFT FUR NATURFORSCHUNG SECTION B-A JOURNAL OF CHEMICAL SCIENCES Volume: 60 Issue: 11 Pages: 1212-1218 Published: NOV 2005
- Sinensetin, eupatorin, 3'-hydroxy-5,6,7,4'-tetramethoxyflavone and rosmarinic acid contents and antioxidative effect of Orthosiphon stamineus from Malaysia** **Times Cited: 57**

By: Akowuah, GA; Zhari, I; Norhayati, I; et al.
FOOD CHEMISTRY Volume: 87 Issue: 4 Pages: 559-566 Published: OCT 2004
- THE CHEMICAL PIGMENTS OF PLANTS** **Times Cited: 18**

By: ALKEMA, J; SEAGER, SL
JOURNAL OF CHEMICAL EDUCATION Volume: 59 Issue: 3 Pages: 183-186 Published: 1982

4. **Preliminary morphological and anatomical study of Orthosiphonstamineus** Times Cited: 5
By: Almatar, M; Rahmat, Z; Salleh, FM.
Indian Journal of Pharmaceutical and Biological Research Volume: 1 Issue: 4 Pages: 1-6 Published: 2013
5. **Determination of total phenolics and anthocyanin contents in the pericarp of hot chilli pepper (*Capsicum annuum* L.).** Times Cited: 19
By: Arnnok, P.; Ruangviriyachai, C.; Mahachai, R.; et al.
International Food Research Journal Volume: 19 Issue: 1 Pages: 235-243 Published: 2012
6. **Antihypertensive effect of Orthosiphon stamineus extracts in spontaneous hypertensive rats: a preliminary study** Times Cited: 1
By: Azizan, N.A.; Ahmad, R.; Asmawi, Z.; et al.
African Journal of Pharmacy and Pharmacology Volume: 6 Issue: 6 Published: 2012
[\[Show additional data\]](#)
7. **Medicinal potentials of Orthosiphon stamineus Benth** Times Cited: 3
By: Basheer, MA; Abdul Majid, AM.
Webmedcentral Volume: 1 Pages: 12 Published: 2010
8. **Haploid production** Times Cited: 2
By: Bhojwani, S.S.; Razdan, M.K.
Plant Tissue Culture: Theory and Practice Pages: 167-213 Published: 1996
Publisher: Elsevier Science, Amsterdam, The Netherlands
9. **Establishment of callus and cell suspension cultures of Nigella sativa L. For thymol production** Times Cited: 2
By: Chaudhry, H.; Fatima, N.; Ahmad, I. Z.
International Journal of Pharmacy and Pharmaceutical Sciences Volume: 6 Issue: 1 Pages: 788-794 Published: 2014
10. **Anthocyanins: from plant to health** Times Cited: 146
By: de Pascual-Teresa, Sonia; Sanchez-Ballesta, Maria Teresa
Phytochemistry Reviews Volume: 7 Issue: 2 Pages: 281-299 Published: 2008
11. **Effect of plant growth regulators on seed germination and seedling vigour in *Asparagus sprengeri* Regelin.** Times Cited: 4
By: Dhoran, V. S.; Gudadhe, S. P.
International Research Journal of Biological Sciences Volume: 1 Issue: 7 Pages: 6-10 Published: 2012
12. **Storage of olives (*Olea europaea*) under CO2 atmosphere: Effect on anthocyanins, phenolics, sensory attributes and in vitro antioxidant properties** Times Cited: 18
By: Dourtoglou, VG; Marnalos, A; Makris, DP
FOOD CHEMISTRY Volume: 99 Issue: 2 Pages: 342-349 Published: 2006
13. **ANTIOXIDANT ACTIVITY AND PHENOLIC CONTENT OF DIFFERENT PARTS OF ORTHOSIPHON STAMINEUS GROWN UNDER DIFFERENT LIGHT INTENSITIES** Times Cited: 5
By: Farhan, M.; Razak, S. Abdul; Pin, K. Y.; et al.
JOURNAL OF TROPICAL FOREST SCIENCE Volume: 24 Issue: 2 Pages: 173-177 Published: APR 2012
14. **DPPH RADICAL SCAVENGING ACTIVITY AND PHENOLIC COMPOUND CONTENT IN DIFFERENT LEAF EXTRACTS FROM SELECTED BLACKBERRY SPECIES** Times Cited: 9
By: Gawron-Gzella, Anna; Dudek-Makuch, Marlena; Matlawska, Irena
ACTA BIOLOGICA CRACOVIENSIA SERIES BOTANICA Volume: 54 Issue: 2 Pages: 32-38 Published: 2012
15. **Characterization and measurement of anthocyanins by UV-Vis spectroscopy** Times Cited: 243
By: Giusti, MM; Wrolstad, RE.
Current Protocols in Food Analytical Chemistry Published: 2001
Publisher: John Wiley & Sons Inc, New York, USA
16. **Toxicity study of Orthosiphon stamineus Benth (Misai Kucing) on Sprague Dawley rats** Times Cited: 25
By: Han, Chin Jin; Hussin, Abas Hj; Ismail, Sabariah

TROPICAL BIOMEDICINE Volume: 25 Issue: 1 Pages: 9-16 Published: APR 2008

17. **In vitro antibacterial and antioxidant activities of Orthosiphon stamineus Benth. extracts against food-borne bacteria** Times Cited: 36
By: Ho, Chun-Hoong; Noryati, Ismail; Sulaiman, Shaida-Fariza; et al.
FOOD CHEMISTRY Volume: 122 Issue: 4 Pages: 1168-1172 Published: OCT 15 2010
18. **Isolation and characterisation of flavonoids from the leaves of medicinal plant Orthosiphon stamineus** Times Cited: 11
By: Hossain, M. Amzad; Rahman, S. M. Mizanur
ARABIAN JOURNAL OF CHEMISTRY Volume: 8 Issue: 2 Pages: 218-221 Published: MAR 2015
19. **Chemical composition and anti-fungal properties of the essential oils and crude extracts of Orthosiphon stamineus Benth** Times Cited: 33
By: Hossain, M. Amzad; Ismail, Zhari; Rahman, Atiqur; et al.
INDUSTRIAL CROPS AND PRODUCTS Volume: 27 Issue: 3 Pages: 328-334 Published: MAY 2008
20. **Biophotovoltaics: Natural pigments in dye-sensitized solar cells** Times Cited: 81
By: Hug, Hubert; Bader, Michael; Mair, Peter; et al.
APPLIED ENERGY Volume: 115 Pages: 216-225 Published: FEB 15 2014
21. **Current approaches toward production of secondary plant metabolites** Times Cited: 77
By: Hussain, Md. Sarfaraj; Fareed, Sheeba; Ansari, Saba; et al.
JOURNAL OF PHARMACY AND BIOALLIED SCIENCES Volume: 4 Issue: 1 Pages: 10-20 Published: JAN-MAR 2012
22. **Plant growth regulator effect on adventitious roots induction of Labisia Pumila** Times Cited: 1
By: Hussein, S.; Ibrahim, R.
Malaysian Journal of Fundamental and Applied Sciences Volume: 10 Issue: 1 Published: 2014
23. **Abscisic Acid Induced Changes in Production of Primary and Secondary Metabolites, Photosynthetic Capacity, Antioxidant Capability, Antioxidant Enzymes and Lipoyxygenase Inhibitory Activity of Orthosiphon stamineus Benth** Times Cited: 18
By: Ibrahim, Mohd Hafiz; Jaafar, Hawa Z. E.
MOLECULES Volume: 18 Issue: 7 Pages: 7957-7976 Published: JUL 2013
24. **A review on trends in production of secondary metabolites from higher plants by in vitro tissue, organ and cell cultures** Times Cited: 102
By: Karuppusamy, S.
JOURNAL OF MEDICINAL PLANTS RESEARCH Volume: 3 Issue: 13 Pages: 1222-1239 Published: DEC 2009
25. **Antioxidant activity of some common plants** Times Cited: 1
By: Khalaf, N.A.; Shakya, A.K.; Al-Othman, A.; et al.
Turk J Biol Volume: 32 Issue: 11 Published: 2008
[\[Show additional data\]](#)
26. **Antioxidant activity and phenolic content of Orthosiphon Stamineus Benth from different geographical origin** Times Cited: 9
By: Khamsah, S.M.; Akowah, G.; Zhari, I.
J. Sustain. Sci. Manag. Volume: 1 Pages: 14-20 Published: 2006
27. **Physiological responses of Orthosiphons tamineus plantles to gamma irradiation** Times Cited: 32
By: Kiong, A. L. P.; Lai, G. A.; Hassan, S.; et al.
American-Eurasian J. of Sust. Agri. Volume: 2 Issue: 2 Pages: 135-149 Published: 2008
[\[Show additional data\]](#)
28. **Establishment of Orthosiphon stamineus cell suspension culture for cell growth** Times Cited: 10
By: Lee, WL; Chan, LK
PLANT CELL TISSUE AND ORGAN CULTURE Volume: 78 Issue: 2 Pages: 101-106 Published: AUG 2004
29. **PHOTOSYNTHETIC ACTIVITY CHLOROPLAST ULTRASTRUCTURE AND LEAF CHARACTERISTICS OF HIGH** Times Cited: 336

LIGHT AND LOW LIGHT PLANTS AND OF SUN AND SHADE LEAVES

By: LICHTENTHALER H K; BUSCHMANN C; DOELL M; et al.

Photosynthesis Research Volume: 2 Issue: 2 Pages: 115-141 Published: 1981

30. **Chlorophylls and carotenoids: Measurement and characterization by UV-VIS spectroscopy**

Times Cited: 149

By: Lichtenthaler, H. K; Buschmann, C.

Current protocols in food analytical chemistry Published: 2001

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