

**EFFECTS OF BENZYLADENINE, WATERING FREQUENCY
AND DURATION OF SHADING ON GROWTH AND QUALITY OF
DRACAENA SANDERIANA AND *CODIAEUM VARIEGATUM***

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**MASTER OF SCIENCE
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DEDICATION

To my parents,

My late father: Mustanir Alwi and my mother: Rosmaini

For their inspiration;

To my beloved wife,

Desmulyanti, D. S.E

Your constant love, support and patience sustained me through, thank you

and,

My sister: Sartini. M. BA, my sister: Yurlinis. AMd,

my brother: Albodri, my brother: Wazri, my sister: Dini Fitri,

my brother -in- law: Drs. Adri. K., my brother -in-law: Syafril

my brother- in-law: Khairi S.T., my sister- in-law: Farida Hanum,

my sister- in-law: Yenni

Abstract of thesis presented to the Senate of Universiti Putra Malaysia
in fulfillment of the requirement for the degree of Master of Science

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DRACAENA SANDERIANA AND *CODIAEUM VARIEGATUM***

By

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This study was carried out with the main objective of looking at the effects of benzyladenine (BA), frequency of watering and duration of shading with various acclimatization techniques on growth and quality retention of *Dracaena sanderiana* and *Codiaeum variegatum* during subsequent shipping conditions. This study comprised three experiments. The first experiment was designed to evaluate the effect of BA as foliar application on *Dracaena sanderiana* and *Codiaeum variegatum*. Concentrations of BA applied were 0 (control), 75, 150, 225 and 300 mgL⁻¹. The second experiment was designed to evaluate the effect of different concentrations of BA at 0 (control), 75, 150, 225 and 300 mgL⁻¹ and frequency of watering daily, every 4, 7 and 10 days on *Dracaena sanderiana* and *Codiaeum variegatum*. A third experiment was conducted to evaluate the effect of the selected BA concentrations (control and 225 mgL⁻¹ for *Dracaena sanderiana* and 150 mgL⁻¹ for *Codiaeum variegatum*) and in combination with duration of shading (2, 4 and 6 weeks) subsequent shipping condition.

For *Dracaena sanderiana* and *Codiaeum variegatum*, growth and plant quality in terms of photosynthesis rate, stomatal conductance, chlorophyll content, plant height and plant grade were significantly ($p < 0.05$) affected by BA. For *Dracaena sanderiana*, the photosynthesis rate ($6.74 \mu\text{molm}^{-2}\text{s}^{-1}$) and chlorophyll content were the highest when sprayed with 300 mgL^{-1} BA, while ($5.40 \mu\text{molm}^{-2}\text{s}^{-1}$) for *Codiaeum variegatum* at 150 mgL^{-1} BA. As expected, photosynthesis rate increased with the chlorophyll content. The photosynthesis rate is more than double with this treatment compared to other treatments. Stomatal conductance, leaf fresh weight and plant grade were also significantly ($p < 0.05$) affected with different concentrations of BA. Similar to the photosynthesis and chlorophyll content of *Dracaena sanderiana*, plants sprayed with 300 mgL^{-1} BA gave a better growth response, and the requirement of *Codiaeum variegatum* needs lower concentrations (150 mgL^{-1} BA). In order to obtain a good plant grade in term of leaf freshness, *Dracaena sanderiana* and *Codiaeum variegatum* required BA concentration of 300 mgL^{-1} (4.50 = excellent quality) and 150 mgL^{-1} (4.17 = excellent quality), respectively. A good quality plant seems to be closely related to photosynthesis rate of the leaf.

Interaction between BA concentration and frequency of watering gave satisfactory results. This interaction resulted in the highest chlorophyll content at BA 225 mgL^{-1} and frequency of watering every 4 days for *Dracaena sanderiana*. The same interaction also produced high grade of *Dracaena sanderiana* and *Codiaeum variegatum* plant. No significant interaction between BA concentrations and frequency of watering was observed on photosynthesis rates, stomatal conductance, specific leaf area, fresh and dry weight parameters. For *Dracaena sanderiana*, the optimum photosynthesis rate ($5.87 \mu\text{molm}^{-2}\text{s}^{-1}$)

occurred with BA concentration of 187.50 mgL⁻¹ and photosynthesis rate decreased with an increased frequency of watering. For *Codiaeum variegatum*, the optimum photosynthesis rate was found at 3.81 μmolm⁻²s⁻¹ with BA concentration of 183.33 mgL⁻¹ and was not significant with frequency of watering. The highest stomatal conductance (1.39 mmolm⁻²s⁻¹) of *Dracaena sanderiana* was obtained with BA concentration of 225 mgL⁻¹, stomatal conductance parameter independently was found with BA concentration of 225 mgL⁻¹. The frequency of watering every four days gave the best photosynthesis rate and plant height for *Dracaena sanderiana*, but no significant response for *Codiaeum variegatum*.

There was a significant interaction between BA concentration and duration of shading on chlorophyll content, plant height increment and plant grade of *Dracaena sanderiana*. *Dracaena sanderiana* duration of shaded in the glass house adaptation for six weeks showed the best quality. It is indicated by the highest plant grade (4.50 = excellent quality), the lowest leaf drop and moderate plant height increment, while *Codiaeum variegatum* occurred with adaptation period for 4 weeks under subsequently simulated shipping condition.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

**BENZILADENIN, KEKERAPAN PEMBERIAN AIR DAN JANGKA MASA
TEDUHAN MEMPENGARUHI PERTUMBUHAN TANAMAN DAN KUALITI *DRACAENA
SANDERIANA* DAN *CODIAEUM VARIEGATUM***

Oleh

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Kajian ini telah dijalankan dengan objektif untuk mengkaji kesan berbagai teknik penyesuaian terhadap kualiti *Dracaena sanderiana* dan *Codiaeum variegatum* semasa keadaan simulasi pengangkutan melalui laut. Eksperimen pertama mengkaji kesan pengawalatur tumbesaran iaitu BA menggunakan kaedah semburan ke atas daun pokok *Dracaena sanderiana* dan *Codiaeum variegatum*. Kepekatan BA yang digunakan ialah 0 (kawalan), 75, 150, 225, dan 300 mg/L. Eksperimen kedua pula, mengkaji kesan perbezaan kepekatan BA (0, 75, 150, 225, dan 300 mg/L) dan perbezaan kekerapan pemberian air pada kadar setiap hari sekali, sekali dalam 4 hari, sekali dalam 7 hari dan sekali dalam 10 hari ke atas pokok *Dracaena sanderiana* dan *Codiaeum variegatum*. Eksperimen ketiga dijalankan untuk mengkaji kesan kombinasi pengawalatur tumbesaran (kawalan dan 225 mg/L untuk *Dracaena sanderiana* dan 150 mg/L untuk *Codiaeum variegatum*, dan penggabungan dengan jangka masa teduhan (2, 4 dan 6 minggu).

Hasil kajian menunjukkan bahawa kualiti *Dracaena sanderiana* dan *Codiaeum variegatum* di dalam parameter seperti kadar fotosintesis, stomata konduktan, kandungan klorofil, tinggi tanaman dan gred tanaman dipengaruhi oleh benzyladenine (BA). Pada *Dracaena sanderiana* kadar fotosintesis ($6.74 \mu\text{molm}^{-2}\text{s}^{-1}$) dan kandungan klorofil tertinggi dicapai pada kepekatan 300 mg/L, manakala pada *Codiaeum variegatum* tertinggi ($5.40 \mu\text{molm}^{-2}\text{s}^{-1}$) pada kepekatan 150 mg/L. Kadar fotosintesis meningkat dengan meningkatnya kandungan klorofil. Kadar fotosintesis pada rawatan ini dua kali ganda bila dibandingkan dengan rawatan lain. Stomata konduktan, berat segar daun dan gred tanaman juga dipengaruhi oleh kepekatan BA. Kadar fotosintesis dan kandungan klorofil pada *Dracaena sanderiana* dimana tanaman yang diberi rawatan 300 mg/L BA menunjukkan bahawa tindakbalas tanaman lebih baik dan permintaan *Codiaeum variegatum* memerlukan kepekatan yang lebih rendah (150 mg/L BA). Gred tanaman yang lebih baik adalah seperti warna daun hijau gelap dan segar. *Dracaena sanderiana* dan *Codiaeum variegatum* masing-masing menghendaki kepekatan BA 300 mg/L (4.50 = kualiti sangat baik) dan 150 mg/L (4.17 = kualiti sangat baik).

interaksi antara kepekatan BA dengan kekerapan pemberian air menunjukkan perbezaan yang bererti. Manakala interaksi kedua rawatan ini menunjukkan kandungan klorofil yang tinggi iaitu BA pada kepekatan 225mg/L dan kekerapan pemberian air 4 hari sekali pada *Dracaena sanderiana*. Interaksi kedua rawatan juga mampu menghasilkan gred tanaman yang baik pada *Dracaena sanderiana* dan *Codiaeum variegatum*. Tiada wujud interaksi yang bererti di antara kepekatan BA dan kekerapan pemberian air diperolehi dari parameter kadar fotosintesis, stomata konduktan, luas daun, berat basah dan kering. Bagi *Dracaena sanderiana*, parameter kadar fotosintesis yang optimum ($5.87 \mu\text{molm}^{-2}\text{s}^{-1}$)

dengan kepekatan BA 187.50 mg/L dan kadar fotosintesis rendah dengan meningkatnya kekerapan pemberian air. Bagi *Codiaeum variegatum*, kadar fotosintesis yang optimum diperolehi ($3.81 \mu\text{molm}^{-2}\text{s}^{-1}$) dengan kepekatan BA 183.33 mg/L dan tiada perbezaan kekerapan pemberian air, tinggi tanaman yang sederhana (27.56 cm) dan stomata konduktan ($1.39 \text{mmolm}^{-2}\text{s}^{-1}$) yang diperolehi pada kepekatan 225 mg/L. Kekerapan pemberian air 4 hari sekali menunjukkan kadar fotosintesis dan tinggi tanaman yang terbaik pada *Dracaena sanderiana* dan tidak ada tindakbalas pada *Codiaeum variegatum*.

Wujudnya interaksi yang bererti di antara kepekatan BA dan jangkamasa naungan dalam kandungan klorofil, tambahan tinggi tanaman dan gred tanaman pada *Dracaena sanderiana*. *Dracaena sanderiana* yang dinaungi di rumah teduhan dengan masa adaptasi 6 minggu menunjukkan kualiti paling baik. Ini dapat ditunjukkan dengan gred tanaman tertinggi (4.50 = kualiti sangat baik), jumlah daun gugur yang paling sedikit dan perbezaan tambahan tinggi tanaman yang sederhana. Manakala *Codiaeum variegatum* terjadi pada jangkamasa penyesuaian selama 4 minggu di bawah simulasi pengangkutan laut pada keadaan bilik gelap selama 1 bulan.

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I certify that an Examination Committee met on 30 June 2004 to conduct the final examination of Misril Fuadi on his Master of Science thesis entitled “Effects Benzyladenine, Watering Frequency and Duration of Shading on Plant Growth and Quality of *Dracaena sanderiana* and *Codiaeum variegatum*” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis based on my original work expect for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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