UNIVERSITI PUTRA MALAYSIA

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By

NUR DINA SHAZANI BINTI MOHD AZAM

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, In Fulfillment of the Requirements for the Degree of Master of Science

March 2013

DEDICATED TO

My lovely late father Allahyarham Mohd Azam Bin Mahmud (November 6, 1954 to April 7, 2012), my precious mother Normorsidah Binti Mohd Labib and family members.

Abstract of the 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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Chairman: Assoc. Prof. Ahmad Ainuddin Bin Nuruddin, PhD

Faculty: Forestry

Urban vegetation plays an important role in amelioration of city environment. Urban vegetation entraps air pollutants on the surface of the leaves. This could reduce long-term threat to human health, microclimate and ecosystems as well. However, this benefit is not fully explored in Malaysia and the studies are very scarce. The objectives of this study were to estimate the amount of airborne pollutants deposited onto the leaves of two selected urban plants and identify the elements present according to the response-relationship of several factors. Samples of particulates were collected on the leaves surfaces of *Acalypha siamensis* at the Country Heights Kajang and *Ficus microcarpa* at the Jalan Hang Tuah, Kuala Lumpur by using Cyclopore Track Etched Membrane Filter. Samples were obtained at two levels of plants' canopy for three different periods of exposure (24, 48 and 72 hours). Samples were then screened using SEM-EDX and EDXRF Spectroscopy. The deposited particulates were mostly in an agglomeration form and 26 elements of airborne pollutants were detected

using the EDXRF. PM (235469.317±22536.715), Al (3171.923±906.808) and Si (308.948±64.776) were found to be the highest percentage in Jalan Hang Tuah, Kuala Lumpur whereas PM (159461.704±13523.958), Al (2794.384±633.483) and Mg (242.701±8.728) were the highest quantities found in Country Heights Kajang. However, most of the elements' concentration was not greatly influenced by the increasing or decreasing of the hour of exposure. The results showed Na, Mg, Si, Zn, As, W and Al were highly significant at Country Heights Kajang for 24, 48 and 72 hours, whereas at Jalan Hang Tuah, Na, Mg, Si, K, Co, Ba and particulate matter were highly significant indicating that concentration varied with times. The findings showed that the elements' concentration was greatly influenced by the meteorological parameters. Ca increases with the increased of wind speed at Jalan Hang Tuah, whereas at Country Heights Kajang, Mg was correlated to mean temperature and rainfall; K, Cu, Th and PM were correlated to wind speed; Rb and W were correlated to minimum temperature while Mn, W and PM were highly correlated to relative humidity. However, the elements' concentration on the upper and lower parts of the canopy was not statistically different at both sites. The results also showed the elements with their possible sources; Country Heights Kajang: K and Ca (7.898%) were originated from construction while Sc, Ni, Cr, Ti and S (17.592%) were mainly emitted from sediments or road dust along Jalan Hang Tuah. The results showed 17 elements were highly enriched at Country Heights Kajang whereas 12 elements were significant to extremely enriched at Jalan Hang Tuah. However, further investigations need to carry out holistically by considering other possible factors which may influence the dispersion of airborne pollutants.

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

PENGANGGARAN PEMENDAPAN PARTIKULAT UDARA PADA DUA SPESIES TUMBUHAN BANDAR

Oleh

NUR DINA SHAZANI BINTI MOHD AZAM

Mac 2013

Pengerusi: Prof. Madya Ahmad Ainuddin bin Nuruddin, PhD

Fakulti : Perhutanan

Tumbuhan Bandar memainkan peranan penting dalam memperbaiki persekitaran bandar. Tumbuhan Bandar memerangkap pencemar udara di atas permukaan daun. Ia dapat mengurangkan kesan jangka panjang terhadap kesihatan manusia, mikroiklim dan ekosistem. Walau bagaimanapun, manfaat ini tidak diterokai secara meluas di Malaysia dan kajiannya adalah terhad. Objektif kajian ini ialah untuk menganggar kuantiti pencemar udara yang termendap di atas daun tumbuhan terpilih serta mengenalpasti unsur-unsur yang hadir yang berhubungkait dengan beberapa faktor tindakbalas. Sampel zarah udara dikumpul di atas permukaan daun *Acalypha siamensis* di Country Heights Kajang dan *Ficus microcarpa* di Jalan Hang Tuah, Kuala Lumpur menggunakan *Cyclopore Track Etched Membrane Filter*. Sampel diambil di dua peringkat kanopi untuk tiga tempoh pendedahan yang berlainan (24, 48 dan 72 jam). Sampel kemudiannya dianalisa menggunakan SEM-EDX dan EDXRF *Spectroscopy*. Zarah termendap kebanyakannya dalam bentuk gumpalan dan sebanyak

26 unsur-unsur pencemar udara dikesan menggunakan EDXRF. PM (235469.317±22536.715), Al (3171.923±906.808) dan Si (308.948±64.776) mencatat peratus tertinggi di Jalan Hang Tuah manakala PM (159461.704±13523.958), Al (2794.384±633.483) dan Mg (242.701±8.728) adalah kuantiti tertinggi dijumpai di Country Heights Kajang. Walau bagaimanapun, sebahagian besar kepekatan unsur-unsur tersebut tidak dipengaruhi oleh kenaikan atau penurunan tempoh pendedahan. Keputusan menunjukkan Na, Mg, Si, Zn, As, W dan Al signifikan di Country Heights Kajang untuk 24, 48 dan 72 jam, manakala Na, Mg, Si, K, Co, Ba dan PM adalah signifikan yang menunjukkan kepekatan berlainan mengikut masa. Penemuan menunjukkan kepekatan unsur-unsur sangat dipengaruhi oleh parameter meteorologi. Ca meningkat dengan peningkatan kelajuan angin di Jalan Hang Tuah, manakala di Country Heights Kajang, Mg berhubungkait dengan purata suhu dan taburan hujan; K, Cu, Th dan PM berhubungkait dengan kelajuan angin; Rb dan W berhubungkait dengan suhu minimum sementara Mn, W dan PM berhubungkait dengan kelembapan relatif. Walau bagaimanapun, keputusan bagi kepekatan unsur-unsur pada bahagian atas dan bawah kanopi menunujukkan tiada perbezaan di kedua-dua lokasi. Keputusan juga menunjukkan unsur-unsur beserta sumbernya; Country Heights Kajang: K dan Ca (7.898%) berpunca daripada pembinaan sementara Sc, Ni, Cr, Ti dan S (17.592%) berpunca daripada habuk jalan dan ampaian sepanjang Jalan Hang Tuah. Keputusan menunjukkan 17 unsur-unsur diperkaya tinggi di Country Heights Kajang manakala 12 unsur-unsur yang signifikan kepada diperkaya tinggi di Jalan Hang Tuah. Walau bagaimanapun, penyiasatan meluas perlu dilakukan dengan mengambil kira faktor yang berkemungkinan mempengaruhi penyebaran pencemar udara.

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