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HEALTH OF TREES IN TITIWANGSA RECREATIONAL PARK, KUALA LUMPUR, MALAYSIA

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Abstract: Trees are very important element in the construction of garden and landscape area. The health status of trees in urban park has not been studied compared to roadside trees. This research was conducted to access the health of trees in Titiwangsa Recreational Park in Kuala Lumpur, Malaysia. A random sample selection of trees assessed in Titiwangsa Recreational Park for health status using Tree Health form as the primary instrument. The results showed that trees in Titiwangsa Recreational Park were in fair (63.1%) to good (30.4%) health status. Only less than 6.6% with poor (6.3%) and dead tree (0.2%) indicates that most of the trees in study area suffered from many structural and mechanical damage, poor crown health and have poor vigor.

KEYWORDS: Tree health, Titiwangsa Recreational Park, Kuala Lumpur, Malaysia, urban trees.

Introduction

Living in urban areas can be demanding with routines such as juggling schedules, work, and meeting daily needs and commuting. Surprisingly, the urban open spaces and parks can provide welcome relief of these pressures. Regardless of time, the nature in the cities can help us to calm and cope, and recharge our ability to carry on with our life daily (Wolf, 1998). Trees can be considered as valuable assets in the urban park. Mass of leaves can provide a convenient place to shelter from the heat by producing the cooling effect from the shade (Scott *et.al.,* 1999) and act as wind breaks to reduce wind velocity (Heisler, 1977). As recreational park mostly surrounded by pavement, the existence of trees which sheltered the pavement decreased the heat waves coming off the pavement (Scott et.al., 1999). While from the aesthetic value perspective, trees role as improving the natural appearance of park and blending the natural environment with the developed facilities in the park (Tyznik, 1981).

Trees in urban park always suffered from several ill health and these problems can be caused by abiotic and biotic factor and more than one factor can affect the health of trees at a time (Roberts, 1977). Ware (1994) stated that 80% of urban tree problems begin with soil. Compacted soil creates poorer soil moisture relationships (Cregg and Dix, 2001) and causing poor aeration which will limit the root growth and nutrient absorption (Day and Bassuk, 1994). Most trees planted in recreational park were selected based on aesthetic value of the tree without taking into account the urban tree tolerance to stresses (Ware, 1994). Exotic species especially have less resistance toward sites where they do not naturally occur and are unable to adapt to the environment and ultimately predispose them to pests and diseases (Scroeder, 1994).

There are a lot of research been published related to tree risk and hazard assessment. Tree risk and hazard assessment focused on trees with structural defect that already predisposes it to failure. It must be remembered that hazardous situation will occur when a tree is in poor health. So, it is important to look out for the health of trees before the trees become hazardous.This research aims to identify the health status of the trees at Titiwangsa Recreational Park. Lack of studies about health of trees in the park is some of the factors that contributed to the study being conducted.

Methodology

Study site

This research was conducted in Titiwangsa Recreational Park. This park was chosen because it is one of the most popular parks in Kuala Lumpur located in the city centre. There are 1739 total of trees in Titiwangsa Recreational Park not included palm trees and shrubs and they are divided into 10 zones (Figure 1).

Method

To access the health status of trees in Titiwangsa recreational park, the data were obtained by conducting tree assessment using Tree health form through visual observation. The tree health was evaluated based on adapted rating systems established by the 'Council of Tree and Landscape Appraisers' by International Society of Arboriculture (ISA), 2000 as in Table 1. Besides that, other information collected in the assessment were diameter of trees (dbh) and name of the tree species.

The data were analysed using SPSS version 17.0. The tree sample was determined by referring to the table for determining sample size by Krejcie and Morgan (1970). Through the calculation of tree populations at Titiwangsa recreational park, the total population of the trees was 1739. Based on the table by Krejcie and

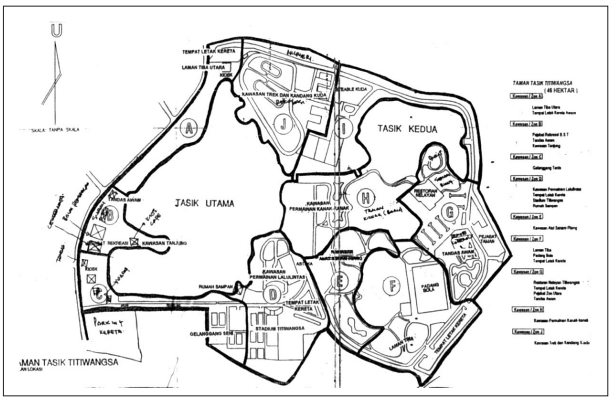

Figure 1: Map of Titiwangsa Recreational Park, Malaysia which is divided into 10 zones.

Table 1: Tree Health Rating.

Tree health rating	Tree health description
Good	The tree has no major structural problems; no significant damage due to diseases or pests; no significant mechanical damage; a full, balanced crown and normal twig condition and vigor for the species.
Fair	The tree may exhibit the following characteristics: minor structural problems and/or mechanical damage; significant damage from non-fatal or disfiguring diseases; minor crown imbalance or thin crown; minor structural imbalance or stunted growth compared to adjacent trees. This condition also includes trees that have been topped, but show reasonable vitality and show no obvious signs of decay.
Poor	The tree appears unhealthy and may have structural defects. Trees in this category may also have severe mechanical damage, decay, and severe crown dieback or poor vigor.
Dead	This category refers only to dead trees.

Table 2: Table to Determining Sample Size by Krejcie and Morgan (1970).

TABLE FOR DETERMINING SAMPLE SIZE FROM A GIVEN POPULATION

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: "N" is population size
"S" is sample size.

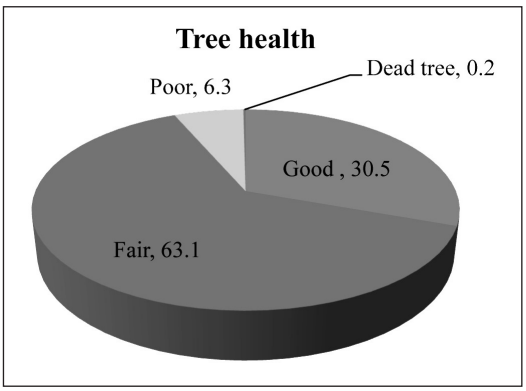

Figure 2: Tree Health Status.

Morgan (1970) (Table 2), the amount of sample required was 317 for 1800 population of tree. However, the number of samples in this study was increased to 654 trees in order to increase the accuracy of the data.

In this procedure, each zone acts as a cluster and the sample was taken for all zones. The number of samples taken for each zone/cluster was 65 trees. For the zone that had the number of trees less than 65 trees, all the trees in the zone were assessed. Then the samples were chosen at random for tree health assessment.

Results and Discussions

Tree Health Status

Based on Figure 2, majority of the trees in Titiwangsa recreational park were in fair (63.1%) health which means that the trees have minor structural problems and mechanical damage, significant damage from non-fatal or disfiguring diseases, minor crown and structural imbalance. While 30.4% of them were in good health. Only 0.2% of trees show dead tree and 6.3% in poor health condition. From the assessment, most of the structural problems, crown imbalance and mechanical damage are caused by improper and lack of pruning works by the maintenance workers.

Tree Health Status Based on Species

As seen in Table 3, the species with the most trees with good health were *Araucaria columnaris* (100%), *Callistemon lanceolatus* (88.9%), *Swietenia macrophylla* (81.3%) and *Garcinia spp* (81.0%). *Ficus benjamina* was the only species with dead tree (2.6%), while *Tamarindus indica* shows the highest percentage of trees with poor health (50%) followed by *Plumeria obtusa* (40%) and *Pterocarpus indicus* (30%).

Tamarindus indica with poor average health status (Table 3) comes from exotic species. However *Araucaria columnaris*, *Callistemon lanceolatus* and *Swietenia macrophylla* with good average health status were also from the exotic species. This denies that exotic species had low tolerant of urban stresses as stated by Elias *et al.,* (1976) and Dewers (1981). Tree health status was also not affected by tree species distribution as trees with both good health and poor health has a low frequency distribution of

Table 3: Tree Health Status by Species.

Species	Tree Health					
	Good	Fair	Poor	Dead tree	Average health status	Tree frequency
Samanea saman	0	85.7	14.3	0	Fair	14
Casuarina equisetifolia	29.2	66.7	4.2	0	Fair	24
Arfeuillea arborescens	25	68.8	6.3	0	Fair	16
Mesua ferrea	33.3	66.7	0	0	Fair	6
Cassia biflora	21.4	78.6	0	0	Fair	32
Cassia fistula	78.1	21.9	0	0	Good	14
Hopea odorata	22.2	75.6	2.2	0	Fair	45
Syzygium jambos	27.3	63.6	9.1	0	Fair	11
Melaleuca cajuputi	25	75	0	0	Fair	12
Lagerstromia speciosa	40	60	0	0	Fair	5
Fillicium decipiens	42.9	57.1	0	0	Fair	7
Swietenia macrophylla	81.3	18.8	0	0	Good	16
Ficus benjamina	25.6	66.7	5.1	2.6	Fair	39
Cerbera odollam	12.5	87.5	0	0	Fair	8
Peltophorum pterocarpum	0	84.6	15.4	0	Fair	13
Erythrina fusca	47.1	41.2	11.8	0	Good	17
Dryobalanop saromatica	0	100	0	0	Fair	3
Azadirachta excelsa	50	50	0	0	Good/Fair	6
Tamarindus indica	0	50	50	0	Fair/Poor	4
Callistemon lanceolatus	88.9	0	11.1	0	Good	9
Pithecellobium dulce	0	100	0	0	Fair	4
Callerya atropurpurea	12.5	87.5	0	0	Fair	16
Pterocarpus indicus	0	70	30	0	Fair	10
Adenanthera pavonina	33.3	66.7	0	0	Fair	3
Mimusops elengi	7.4	85.2	7.4	0	Fair	27
Saracat haipingensis	10.5	63.2	26.3	0	Fair	19
Cinnamomum iners	11.1	88.9	0	0	Fair	18
Pongamia pinnata	0	92.9	7.1	0	Fair	14
Delonixr egia	0	81.8	18.2	0	Fair	11
Andira inermis	25	75	0	0	Fair	4
Dyera costulata	64.3	28.6	7.1	0	Good	14
Tabebuia pentaphylla	23.1	76.9	0	0	Fair	13
Pometia pinnata	44.4	44.4	11.1	0	Good/Fair	18
Plumeria obtusa	0	60	40	0	Fair	10
Araucaria columnaris	100	0	0	0	Good	3
Dillenia indica	46.2	53.8	0	0	Fair	13
Juniperus chineensis	36.8	52.6	10.5	0	Fair	19
Garcinia spp	81	19	0	0	Good	21
Acasia mangium	0	100	0	0	Fair	10
Polyalthia longifolia	18.9	81.1	0	0	Fair	37
Syzygium grandis	0	81.8	18.2	0	Fair	11
Shorea spp	0	80	20	0	Fair	5
Dracaena maingayi	25	62.5	12.5	0	Fair	8
Xanthostemon chrysanthus	73.3	26.7	0	0	Good	30
Tectona grandis	0	100	0	0	Fair	6
Calophyllum inophyllum	0	100	0	0	Fair	5
Casuarina nobilis	0	100	0	0	Fair	4

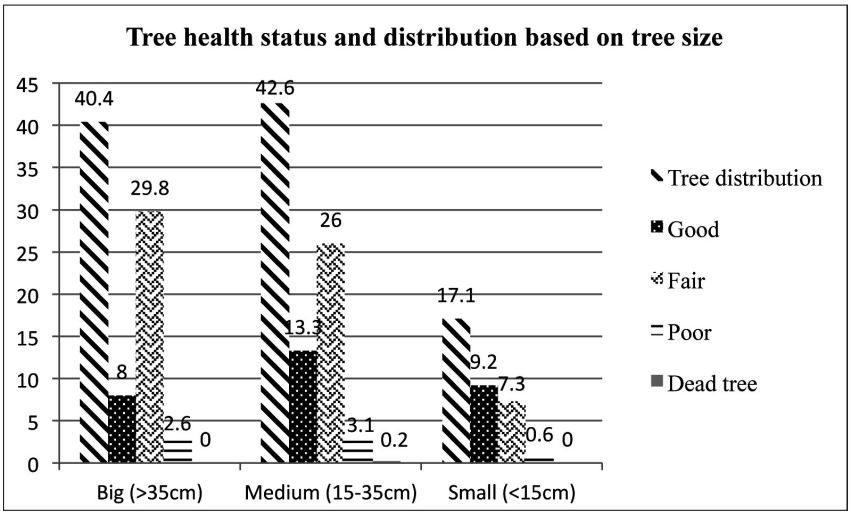

Figure 3: Tree Health Status and Distribution Based on Tree Size.

trees (Table 3). Based on studies that have been conducted, the maintenance practices play an important role which contributes to the health of trees in urban park.

Tree Health Status Based on Tree Size (Diameter)

Figure 3 shows tree health status according to the size of the tree. Majority of the trees from big (29.8%) and medium (26%) were in fair health condition. Most of the trees from small size were in good health (9.2%). Less than 50% of the tree size distribution for each tree that shows the status of good health trees. Only medium size shows dead tree but the percentage is 0.2% of trees only. It can be concluded that the level of tree health is deteriorating as the tree size increases. It seems that lack of care given to large-sized tree causing the tree inclined towards unhealthy condition. More care should also be given to large trees as they are very sensitive to their surrounding environment compared to young trees. Besides, they are more susceptible to disease if damaged or left with large pruning wounds.

Conclusion

The findings revealed that majority of the trees in Titiwangsa Recreational Park was in fair health condition (63.1%). Another 36.9% of the trees were found to have good (30.4%), poor (6.3%) and dead tree (0.2%). Trees with fair health status means that the trees have minor structural problems and mechanical damage, minor crown and structural imbalance, and obvious signs of decay or disease problem. From the results, it also concluded that the level of tree health is deteriorating as increasing of tree size. The tree species frequency distribution and tree origin do not influence the health of the trees.

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