Sys Rev Pharm 2020;11(2):786-794
A multifaceted review journal in the field of pharmacy

Study of the Damage of Green Open Space Plants Due to Parasitized by Parasite in Surabaya City

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ABSTRACT

The beauty and benefit values of the green open space plants are often disrupted by the existence of parasites. A parasite attached to a branch or twig (dries) or dies. Plants that have a lot of parasites will look miserable, green leaves that look not plant leaves but parasitic leaves. Plants with lots of parasites will dry out so that easy to collapse at any time in the wind. This study aims to (1) Conduct a study of the abundance of parasites in green open spaces in Surabaya; (2) Conduct an assessment of the level of damage to plants due to parasitized by parasites; and (3) Determine the degree of compatibility of host plants to parasitic plants. The study uses exploratory methods, with five sample points namely Central, North, East, South and West Surabaya. Observation variables were plant type, parasitic level, damage intensity and compatibility degree between parasites and host plants. The results showed that green open space plants in Surabaya which were potentially parasitized by parasites recorded 72 plant species, 42 species were parasitized, and 30 plants were not parasitized. Plants that parasitized by parasites were dominated by the plant of angsana Pterocarpus indicus, tamarind/trembesi Samanea saman, mango/mangga Mangifera indica, and sengon Albizia chinensis namely, plants that have a large of number and have high habitus and wide canopy, however the level of parasitation and intensity of damage are not affected by the level of abundance or size of plant habitus. From 42 species of plants that parasitized, there are 11 species whose associations with parasites are significant, meaning that there is a correlation between the abundance of parasites with the species of its host plant.

Keywords: green open space, host plant, parasites

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INTRODUCTION

Industrial activities and the number of motor vehicle in Surabaya which continues to increase resulting in an increase in air pollution due to the exhaust emissions produced. Exhaust emission contains chemical substances such as CO and CO_2 which will increase the average temperature and endanger human lungs. In order to build a healthy air environment needed a balancer in the form of plants which exist in the city as a pollutant gas absorber. The presence of plants, especially large trees, is very much needed in the Surabaya city area in an effort to reduce air pollution from industry and city traffic. The Surabaya City Government seeks to balance the environment with the provision of Green Open Space / Ruang Terbuka Hijau (RTH) in order to reduce temperatures (Arifah, and Susetyo, 2018). The increase in the area of green open space in Surabaya is carried out through various policies supported by various programs among others the program of one soul one tree, green and clean and mangrove forest conservation (Iswari, A.N, 2014). This is because when plants carry out photosynthesis they will absorb CO_2 and CO gas in the air and will produce oxygen. A decrease in CO_2 and CO gas will reduce pollutants in the air, and the presence of additional oxygen in the air causes the air become clean and comfortable for life Ancheta, A.A., et al (2017). The total number of city green open spaces in Surabaya covering an area of 6.330 ha (19.42% of Surabaya city area) needs to be maximized its function in order to be able to provide comfort for significant communities and in respond to global warming. (Yuswarini, E., 2010; sukmawati, et al, 2015). The function of Taman Flora Surabaya is very complex, covering the functions of education, health functions, economic functions and interaction functions (Rosawatiningsih, N. 2018)

The idea of greening in the city actually has emerged a long time ago, based on awareness as well as concern about the more reduced in the open space, parks, forests and various types of trees. In fact, at every stage of human life, from birth, children, adolescents, adults to the elderly, green open space is always needed in various scales and variations. Without the presence of green open spaces that are affordable and enjoyed by all levels of society, cities in Indonesia will feel cramped, hot and arid. The next following effect, humans become more violent, easily ignited emotions and easily explosive its behavior (Sundari, E.S., 2005).

Green open spaces in Surabaya have pollution levels that are different from the lowest, medium and highest pollution levels. In the area of green open space are found *Polyalthea longifolia, Pterocarpus indicus*, and *Cebera manghas* plants as the most dominating plants (sukmawati, et al, 2015). One of the problems affecting the quality of urban forest plants is the damage by parasites. Identification of affected plant species, causes and patterns of the attacks, can help in the control planning of attacks and efficient planting policies (Silva, F.P. and Fadini, 2017). The distribution of parasites in the green open space in the city of Surabaya tends to group in accordance with the pattern of distribution of host plants. There are three types of parasites that parasitize green open space plants in the city of Surabaya, namely Dendrophtoe pentandra (L.) (very dominant), Macrosolen cochinchinensis (Lour.) van Tiegh, and Henslowia frutescens.Champ (Haryanta & Susilo, A. 2018).

The beauty and benefit values of the green open space plants are often disrupted by the existence of parasites. A parasite attached to a branch or twig (dries) or dies. Plants that have a lot of parasites will look miserable, green leaves that look not plant leaves but parasitic leaves. Plants with lots of parasites will dry out so that easy to collapse at any time in the wind (Sunaryo, et al.,

2006; Sunaryo, et al., 2007). The presence of parasites can directly damage the host plant and encourage the emergence of pests and diseases (Kavosi, M.R. *et al*, 2012) The existence of parasites is widely known by the public, but has never received attention in plant maintenance.

Parasite is an invasive plant that is parasitic to the host plant. The presence of parasites in large quantities will interfere with the growth of a plan, but often parasites are ignored by managers in agriculture and forestry. The existence of plant disturber in the form of pests, diseases including parasites have not received serious attention. The presence of parasites in green open space is potentially harmful because it interferes with plant growth and development. On the other hand the presence of parasites in green open space has great potential because it can be used as a biopesticide and as a cure for various diseases in humans (Muttaqin, Z., et al. 2016; Fikriani, et al, 2017). Cai-Feng Yan, et al. (2016) states the presence of parasites in a host can increase the amount of N available and the binding of C, which causes an increase in the level of host growth. In the future, we need a lot of information about parasites in order to be able to manage so that could provide the optimal use value.

This study aims to (1) Conduct a study of the abundance of parasites in green open spaces in Surabaya; (2) Conduct an assessment of the level of damage to plants due to parasitized by parasites; and (3) Determine the degree of compatibility of host plants to parasitic plants;

MATERIAL AND METHOD

A. Research Methods

The study was conducted in the city of Surabaya which is at the position of 7^0 9 ' – 7^0 21' SL and 112^0 36' -112^0 54'EL, a height of 3-6 m above sea level, the average rainfall of 183,2 mm. The study was conducted in green open space / ruang terbuka hijau (RTH) especially in the form of urban forest. The object of observation is limited to plants which allow it to become a parasite host namely woody and cambium trees.

This study uses an exploration method (Rugayah, et al 2004), namely exploring locations that are determined to be the area/scope of research namely green open space in the form of urban forest/city park in the city of Surabaya. Observations conducted at five sample points, and to make it easier following the division of administrative regions that have been commonly used, namely the Central Surabaya region, North Surabaya region, East Surabaya region, South Surabaya region, and West Surabaya region. An illustration of sample points is as follows:

1. Central Surabaya namely the urban forest in Apsari Park, Bungkul Park, roadside plants of Kombes Pol. M. Duriyat street, Kedungdoro street, and Jais Nasution street
2. North Surabaya is a roadside plant along Perak street towards the harbor
3. East Surabaya is the campus complex of the Institut Sepuluh November Surabaya (ITS) in the form of urban forest around the campus building;
4. South Surabaya is in the Al-Akbar mosque complex in Surabaya in the form of a city park in the courtyard around the mosque and a roadside plant of the housing of Gayung Sari, Wisma Pagesangan, Wisma Menanggal, and Menanggal Indah;
5. West Surabaya is a Ciputra housing complex in the form of roadside plants and a residential park.

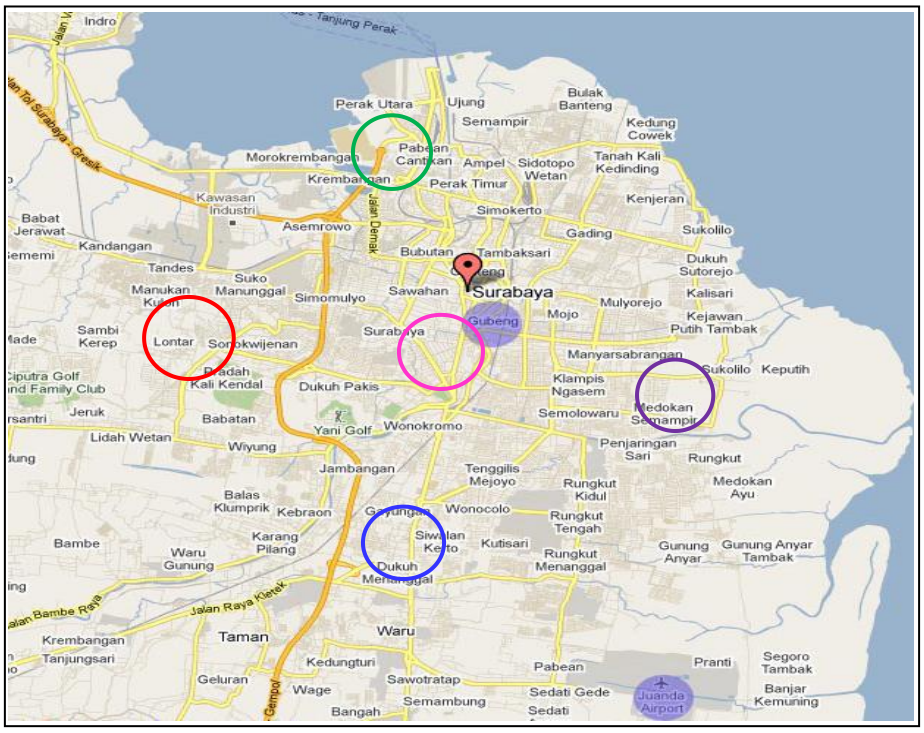

Figure of Study Location Plan

Source: Google Map

Information

West Surabaya Point North Surabaya Point

South Surabaya Point
Central Surabaya Point
East Surabaya Point

Each region is assigned five points of the sample unit in a diagonal pattern, which is one point approximately in the center (middle) and 4 for the other points taken towards the four corners. Each point is an urban forest area, which can be in the form of parks, road shades, house yards, or in other forms. In one point there are at least 500 plant trees which allow it to become a parasite host.

B. Research Variables

In this study several variables and their methods of measurement were noted as follows:

1. Frequency of the presence/existence of parasites in urban forest plants
   At each point of the sample unit (consisting of at least 500 plants which are possible to become parasitic hosts), conducted observations and identification by recording the names of plants and the presence of parasites on the intended plant.
2. The intensity of parasite parasitation
   The method of measurement is as follows:
   a. From each type of plant that showing the existence of parasitation by parasites, taken samples equal to 10-25% from the total number of plants, or at least 10 plants and a maximum of 25 plants. Procedure for sampling is done by simple random method or systematic random based on the layout of plants on site.
   b. From each sample plant conducted the scoring, with the following references:
      Score 0 : if in plants there is no parasite at all
      Score 1 : if the ratio of parasitic twigs and leaves with the twigs and leaves of plants is up to 20% (1:5)
      Score 2 : if the ratio of parasitic twigs and leaves with the twigs and leaves of plants is up to 20-40% (2:5)
      Score 3 : if the ratio of parasitic twigs and leaves with the twigs and leaves of plants is up to 40-60% (3:5)
      Score 4 : if the ratio of parasitic twigs and leaves with the twigs and leaves of plants is up to 60-80% (4:5)
      Score 5 : if the ratio of parasitic twigs and leaves with the twigs and leaves of plants is up to 80-100% (1:1)

C. Data Analysis

Data analysis was adjusted to the type of data, types of variables and research objectives. The types of analysis carried out are as follows:

1. The level of plant parasitation by parasites
   The level of parasite parasitation to a plant species is calculated based on the formula :

$$TP = \frac{a}{a+b} x\ 100\%$$

   TP : the level of parasite parasitation / tingkat parasitasi benalu
   a : number of trees that overgrown / parasitized by a type of parasite
   b : number of trees that not overgrown / parasitized by a type of parasite

2. The intensity of Parasite Parasitation
   The level of damage to plants can be calculated by the following formula :

$$TK = \frac{\sum n.Xi}{N.5} x\ 100\%$$

   Information :
   TK : The level of damage to plants because it is parasitized by the parasite
   n : the number of plants with a certain score
   Xi : score from plants
   N : the number of samples of a species of plant
   5 : the highest score used in scoring

3. Analysis of the Association of Parasite with Host Plants
   From the frequency data of the presence/existence of parasites in urban forest plants, then the data is compiled and created the contingency table (Soejono and Arisoesilaningsih, 1999) as follows :

	Parasite Exist	No Parasite	Total
A species of plant	a	b	e = a+b
Other Species of Plant	c	d	f = c+d
Total	g = a+c	h = b+d	g+h = e+f

The level of parasite association with host is measured from the value of C (coefficient of association) calculated using the following formula:

$$C = \frac{(ad - bc)}{[(a+b)(c+d)(a+c)(b+d)]}$$

The significance level of parasite-host associations determined by the test of X^2 *(chi-square)*

RESEARCH RESULT

A. Parasitation of Parasites on Green Open Space Plants in the City of Surabaya

Most of the urban forest plants and city parks of Surabaya have been planted in the last 30 years. Variations and composition of plant species have been planned according to the purpose of the making of urban forests and city parks in each location. Observation results in five sample points obtained data of green open space plants in Surabaya which has the potential to become a parasite host amounted to 72 species of plants consisting of 16.809 plant. The research data shows that there are thirty species of plants, consisting of 4.151 stems that not parasitized and 42 species consisting of 12.658 plant stems that parasitized with a parasitization rate/level of 16,70%.

Data on thirty species of plants that are not parasitized by parasites are presented in Table 1. Plants that not parasitized are dominated by the plant of bintaro, *Cerbera manghas* (8,41%), tanjung, *Mimosops elengi* (5,77%), and the plant of glodokan *Polyalthia fragrans* (3,92%). Plants that are not parasitized amounted to 26,12% of all plants that are potentially parasitized by parasites.

Table 1 Species of Green Open Space Plants in Surabaya which are not parasitized by the parasite

No	Plants Species		Number of plants sampled	Total percentage
	Common Name	Scientific Name		
1	Flamboyan	*Delonix regia*	216	1,29
2	Glodokan	*Polyalthia fragrans*	623	3,71
3	Glodokan Tiang	*Polyalthia longifolia*	270	1,61
4	Bintaro	*Cerbera manghas*	1337	7,95
5	Sepatu Dea	*Spathodea campanulata*	335	1,99
6	Tanjung	*Mimosops elengi*	917	5,46
7	Kiara Payung	*Filicium decipiens*	35	0,21
8	Kedondong	*Spondias dulcis*	10	0,06
9	Kepoh	*Sterculia foetida*	52	0,31
10	Pohon Palembang	*Etrameles nudiflora*	62	0,37
11	Apokat / Avocado	*Persea Americana*	1	0,01
12	Jeruk / Orange	*Citrus sp.*	17	0,10
13	Akasia / Acacia	*Acacia mangium*	17	0,10
14	Mojo	*Aegle marmelos*	15	0,09
15	Belimbing Wuluh	*Averhoa bilimbi L*	79	0,47
16	Kelengkeng / Longan	*Dimocarpus longan*	6	0,04
17	Cempaka	*Elmerrillia ovalis*	17	0,10
18	Belinjo	*Gnetun gnemon*	17	0,10
19	Sirsat / Soursop	*Annona muricata*	26	0,15
20	Sukun	*Artocarpus communis*	22	0,13
21	Mimba	*Azadirachta indica*	23	0,14
22	Kelor	*Moringa oleifera*	1	0,01
23	Kamboja	*Plumeria acuminate*	9	0,05
24	Pucuk Merah	*Syzygium oleana*	8	0,05
25	Bakau / Mangrove	*Bruguiera conyugata.*	17	0,10
26	Bougenvile	*Bougainvillea spectabilis*	5	0,03
27	Makuto Dewa	*Phaleria macrocarpa*	2	0,01
28	Kayu Putih	*Melalueca leucadendra*	3	0,02
29	Pecah Piring	*Gardenia augusta*	2	0,01
30	Waru Merah	*Hibisci tiliaceus*	7	0,04
	Total		**4.151**	**24,70**

Data on forty-two species of green open space plants that parasitized are presented in Table 2. Plants that parasitized by parasites are dominated by angsana, *Pterocarpus indicus porsi,* the number of plants amounted to 18,37% with a parasitation level of 39,10%, trembesi *Samanea saman*, the number of plants amounted to 9,66% with a parasitation level of 14,33%, mango *Mangifera indica*, the number of plants amounted to 5,19% with a parasitation level of 46,20%, sengon *Albizia chinensis*, the number of plants amounted to 4,90% with a parasitation level of 35,70%, and kupu-kupu *Bauhinia tomentosa*, the number of plants amounted to 2,17% with a parasitation level of 31,3%.

Table 2. List of Species of Green Open Space Plants in Surabaya which are parasitized by the Parasite

No	Plants Species		Number of plants sampled	Total percentage	Parasitation level (%)
	Common Name	Scientific Name			
1	Beringin / Banyan	*Ficus Benjamina*	55	0,33	7,3
2	Mangga / Mango	*Mangifera indica*	873	5,19	46,2
3	Trembesi	*Samanea saman*	1623	9,66	14,3
4	Angsana	*Pterocarpus indicus*	3087	18,37	39,1
5	Nyamplong	*Calophyllum inophyllum*	44	0,26	2,3
6	Mahoni / Mahogany	*Swietenia mahogany*	988	5,88	5,9
7	Pace	*Morinda citrifolia*	71	0,42	5,6
8	Tanjung	*Mimosops elengi*	917	5,46	0,1
9	Sawo Kecik	*Manikara kaoka*	216	1,29	7,4
10	Tabebuya	*Tabebuia* chrysotricha	733	4,36	3,9
11	Johar	*Cassia siamea*	203	1,21	2,0
12	Ketapang	*Terminalia catappa*	548	3,26	15,5
13	Srikaya	*Annona squamosa)*	35	0,21	17,1
14	Dadap Merah	*Erythrina crista-galli*	525	3,12	0,2
15	Waru	*Hibiscus tiliaceus*	66	0,39	9,1
16	Nangka / Jackfruit	*Artocarpus heterophyllus*	168	1,00	0,6
17	Sikat Botol	*Allistemon viminalis*	17	0,10	23,5
18	Bungur	*Lagerstroemia speciosa*	88	0,52	29,5
19	Jambu Air	*Syzygium aqueum*	113	0,67	31,0
20	Cemara Laut	*Casuarina equisetifolia*	65	0,39	16,9

21	Sengon	*Albizia chinensis*	824	4,90	35,7
22	Keres	*Muntingia calabura L*	172	1,02	0,6
23	Lamtoro	*Leucaena glauca*	98	0,58	3,1
24	Jambu Biji	*Psidium guajava*	65	0,39	12,3
25	Kasambi	*Schleichera oleosa)*	6	0,04	16,7
26	Kupu-Kupu	*Bauhinia tomentosa*	364	2,17	31,3
27	Asem	*Tamarindus indica*	106	0,63	0,9
28	Juwet	*Syzygium cumini*	68	0,40	2,9
29	Sapu tangan	*Maniltoa grandiflora*	46	0,27	2,2
30	Kenitu	*Chrysophyllum cainito L*	58	0,35	3,4
31	Jati / Teak	*Tectona grandis*	50	0,30	50,0
32	Belimbing / Star fruit	*Averhoa Carambola*	84	0,50	26,2
33	Randu	*Ceiba petandra*	31	0,18	9,7
34	Ketapang Kencana	*Terminalia mantaly)*	14	0,08	14,3
35	Andalas/Arbei	*Fragaria vesca*	13	0,08	23,0
36	Pete	*Parkia speciosa*	27	0,16	3,7
37	Jabon	*Anthocephalus cadamba*	130	0,77	13,1
38	Cerme	*Phyllanthus acidus*	9	0,05	11,1
39	Terompet / Trumpet	*Mandevilla sanderi*	20	0,12	25,0
40	Sawo	*Manilkara zapota*	13	0,08	7,7
41	Salam	*Syzygium polyanthum*	19	0,11	36,8
42	Turi	*Sesbandia grandiflora*	6	0,04	66,7
		Total	**12658**	**75,30**	**16,7**

The intensity of parasitation is measured against the types of plants where parasite attacks occur throughout Surabaya (north, east, south, west, and central Surabaya), so that the final calculation results are a combination of each sampling area. The intensity of parasite parasitation on forest plants in the city of Surabaya as presented in Table 3.

Table 3 Parasitation level and intensity of damage to Green Open Space Plants in Surabaya due to attacked by Parasite

No	Plants Species		Percentage of Parasitation (%)	Damage Intensity (%)
	Common Name	Scientific Name		
1	Mangga / Mango	*Mangifera indica*	46,2	28,0
2	Trembesi	*Samanea saman*	14,3	32,0
3	Angsana	*Pterocarpus indicus*	39,1	30,7
4	Mahoni / Mahogany	*Swietenia mahogany*	5,9	27,7
5	Sawo Kecik	*Manikara kaoka*	7,4	20,0
6	Ketapang	*Terminalia catappa*	15,5	24,0
7	Sikat Botol	*Allistemon viminalis*	23,5	22,7
8	Cemara Laut	*Casuarina equisetifolia*	16,9	24,0
9	Sengon	*Albizia chinensis*	35,7	28,0
10	Kupu-Kupu	*Bauhinia tomentosa*	31,3	33,0
11	Belimbing / Star fruit	*Averhoa Carambola*	26,2	22,0
12	Jabon	*Anthocephalus cadamba*	13,1	20,0

B. Association Level (closeness relationship) between the parasite with Green Open Space Plants as Host

The level of closeness of the relationship between host plants and parasites can be seen from the magnitude of the contingency coefficient (C) value and the results of the **χ2** test. From the forty-two species of plants that are parasitized by parasites, obtained ten species of plants with a significant contingency coefficient (C). Data on the ten types/species of plants with significant contingency coefficient (C) values are presented in Table 4.

There are 42 species of plants found parasitized by parasites. Contingency coefficient values of 42 plants species that parasitized vary greatly, the smallest in the keres plant with a value of C = $-4{,}6.10^{-8}$, the number of healthy plants equal to 171 trees, the number of plants that parasitized 1 tree, percentage of parasitation 0,6%, total plants as many as 172 trees, it is 1,02% of the total sample plant. The largest C value in sengon plant, *Albizia chinensis* with a value of C = $5{,}5.10^{-8}$, the number of healthy plants equal to 530 trees, , the number of plants that parasitized 294 tress, percentage of parasitation 35,7%, total plants as many as 824 trees, it is 4,90% of the total sample plant (16.809 tress). From 42 species of plants that parasitized, there are 11 species whose associations with parasites are significant, namely the plant of mango, *Mangifera indica* , angsana, *Pterocarpus indicus,* bungur, *Lagerstroemia speciosa* jambu air, *Syzygium aqueum* sengon, *Albizia chinensis,* kupu-kupu plant, *Bauhinia tomentosa,* teak, *Tectona grandis,* star fruit, *Averhoa Carambola,* salam, *Syzygium polyanthum,* jati ambon (jabon), *Anthocephalus cadamba* and turi, *Sesbandia grandiflora*. The value of contingency coefficient and the result of **χ2** test for each plant that parasitized by parasite presented in Table 4.

Table 4 Data on the species of green open space plants in Surabaya which associated with parasites.

No	Plants Species		C Value	Value of $\chi 2_{\text{calculate}}$	Information
	Common Name	Scientific Name			
1	Beringin / Banyan	*Ficus Benjamina*	$-0{,}27.10^{-8}$	3,52	
2	Mangga / Mango	*Mangifera indica*	$0{,}89.10^{-8}$	576,82	significant
3	Trembesi	*Samanea saman*	$-0{,}08.10^{-8}$	7,48	
4	Angsana	*Pterocarpus indicus*	$0{,}79.10^{-8}$	1386,96	significant
5	Nyamplong	*Calophyllum inophyllum*	$-0{,}41.10^{-8}$	6,60	
6	Mahoni/Mahogany	*Swietenia mahogany*	$-0{,}33.10^{-8}$	88,74	
7	Pace	*Morinda citrifolia*	$-0{,}32.10^{-8}$	6,27	
8	Tanjung	*Mimosops elengi*	$-0{,}50.10^{-8}$	192,31	
9	Sawo Kecik	*Manikara kaoka*	$0{,}05.10^{-8}$	0,50	
10	Johar	*Cassia siamea*	$-0{,}42.10^{-8}$	32,05	
11	Tabebuya	*Tabebuia* chrysotricha	$0{,}16.10^{-8}$	0,29	
12	Ketapang	*Terminalia catappa*	$-0{,}04.10^{-8}$	0,57	
13	Srikaya	*Annona squamosa)*	$0{,}01.10^{-8}$	0,01	
14	Dadap Merah	*Erythrina crista-galli*	$-0{,}49.10^{-8}$	106,33	
15	Waru	*Hibiscus tiliaceus*	$-0{,}22.10^{-8}$	2,75	
16	Nangka/Jackfruit	*Artocarpus heterophyllus*	$-0{,}46.10^{-8}$	31,64	
17	Sikat Botol	*Allistemon viminalis*	$0{,}20.10^{-8}$	0,57	
18	Bungur	*Lagerstroemia speciosa*	$0{,}37.10^{-8}$	10,51	significant
19	Jambu air	*Syzygium aqueum*	$0{,}53.10^{-8}$	28,37	significant
20	Cemara laut	*Casuarina equisetifolia*	$0{,}01.10^{-8}$	0,003	
21	Sengon	*Albizia chinensis*	$5{,}50.10^{-8}$	2164,59	significant
22	Keres	*Muntingia calabura L*	$-4{,}60.10^{-8}$	32,46	
23	Lamtoro	*Leucaena glauca*	$-0{,}39.10^{-8}$	13,18	
24	Jambu Biji	*Psidium guajava*	$-0{,}13.10^{-8}$	0,90	
25	Kesambi	*Schleichera oleosa)*	$-0{,}001.10^{-8}$	$0{,}32.10^{-5}$	
26	Kupu-kupu	*Bauhinia tomentosa*	$0{,}43.10^{-8}$	57,29	significant
27	Asem	*Tamarindus indica*	$-0{,}45.10^{-8}$	19,03	
28	Juwet	*Syzygium cumini*	$-0{,}39.10^{-8}$	9,29	
29	Sapu Tangan	*Maniltoa grandiflora*	$-0{,}28.10^{-8}$	4,74	
30	Kenitu	*Chrysophyllum cainito L*	$-0{,}38.10^{-8}$	7,34	
31	Jati / Teak	*Tectona grandis*	$0{,}95.10^{-8}$	40,00	significant
32	Belimbing/Starfruit	*Averhoa Carambola*	$0{,}27.10^{-8}$	5,48	significant
33	Randu	*Ceiba petandra*	$-0{,}20.10^{-8}$	1,10	
34	Ketapang Kencana	*Terminalia mantaly*	$-0{,}07.10^{-8}$	0,06	
35	Arbei	*Fragaria vesca*	$0{,}18.10^{-8}$	0,38	
36	Pete	*Parkia speciosa*	$-0{,}37.10^{-8}$	3,28	
37	Jabon	*Anthocephalus cadamba*	$-0{,}10.10^{-8}$	1,23	
38	Cerme	*Phyllanthus acidus*	$-0{,}16.10^{-8}$	0,20	
39	Terompet/Trumpet	*Mandevilla sanderi*	$0{,}24.10^{-8}$	0,99	
40	Sawo	*Manilkara zapota*	$-0{,}26.10^{-8}$	0,76	
41	Salam	*Syzygium polyanthum*	$1{,}20.10^{-8}$	11,70	signifikan
42	Turi	*Sesbandia grandiflora*	$1{,}40.10^{-8}$	10,78	signifikan

Positive or negative sign of the contingency coefficient (C) value is determined by the level of plant parasitation. In ketapang plants with a parasitization rate/level of 15,5% the value of C = $-0{,}04.10^{-8}$ (negative) with the number of plants 548 trees (3,26%), while in srikaya plants with a parasitization rate of 17,1% the value of C = $0{,}01.10^{-8}$ (positive) even though the number of plants was only 35 trees (0,21%). The significance of the C value is also determined by the level of plant parasitation. In starfruit plants with a parasitization rate/level of 26,2% the value of C was significant with the value of $\chi 2_{\text{calculate}}$ = 5,48, while in terompet/trumpet plants the level of parasitation of 25,0% the value of C was not significant with the value of $\chi 2_{\text{calculate}}$ = 0,99. The level of association or the closeness of the relationship between parasites and host can be interpreted as the level of opportunity (possibility) of a species of plant parasitized by the parasite from the many types/species and numbers of plants in an area of green open space.

DISCUSSION

The results of observations in five sample points obtained data of green open space plants in Surabaya which have the potential to be parasitized by parasites there were 72 species of plants, consisting of 42 species that are parasitized and 30 species that are not parasitized. Matula, R. et al. (2015) states the presence of parasites on a tree is mostly influenced by the size of the tree, ie competition directly affects the presence of parasites on the abundance of parasites. Nisa, and Nasrullah, (2017) concluded the results of observations in a sample region only found one species of parasite namely Dendrophthoe pentandra L. The total number of trees at the study site was 557 trees consisting of 19 species, but only four species were attacked by parasites, with varying degrees of parasitation and intensity of damage.. Díaz-Limón et al. (2016) states the most abundant plant, broad leaf canopy, heavily infected by parasites. Low plant diversity and the many numbers of exotic plants cause high attacks by parasites. The use of native plants in the making of urban forests will reduce parasitic attack and plant mortality level. Zaroug et al. (2014) conveys information on the existence of parasitic endemic attacks on plants along the

Neil river, but there are no quantitative data that indicate production decline and losses caused by parasites. Rahmad, et al. (2014) expressed parasite abundance was significantly affected by canopy diameter, height and shape of the canopy. The parasite is not randomly distributed, but the parasite is more closely related to certain hosts. Griebel et al (2017) states parasites have positive and negative effects on plant physiology, soil nutrient cycling, and tree health. Tree death due to parasitized by parasites influences the succession of ecosystems and biodiversity. Fadini Cintra (2015) already parasitized.

The plants that parasitized by parasites are dominated by the plant of angsana, *Pterocarpus indicus* trembesi *Samanea saman*, mango *Mangifera indica*, sengon *Albizia chinensis* namely plants that have more number and have high habitus and wide canopy. In accordance with the statement of Hilton G. T. Ndagurwa, et al. (2012) which states the intensity of the parasite attack is related to the size of the tree. Other factors that affect on the suitability of parasites with their host are related to the presence of seed dispersing birds and the development of parasitic seed sprouts (Messias, et al., 2014; L. Roxburgh & Nicolson, 2005) states parasite seed dispersing birds rarely visit trees that are not attacked, and only like certain trees. Caraballo-Ortiz, et al, (2017) shows that the presence of parasites is influenced by the quality and abundance of the host and the phenotype pattern of the plant which directly influences the probability of the arrival of parasitic seeds which are spread by birds. According to Queijeiro-Bolaños, et al. (2013) the prevalence of parasites on a host plant is influenced by the physical environment, anthropogenic disorders and interactions among the types of parasites. According to Arce-Acosta,I., et al (2016). Diversity and composition of plant species (host) positively correlated to the presence of parasites.

The level of parasitation and intensity of damage are not affected by the level of abundance or size of plant habitus. The plant of turi, *Sesbandia grandiflora,* terompet/ trumpet, *Mandevilla sanderi* and andalas/arbei, *Fragaria vesca* the level of abundance is low, the habitus is relatively small but the level of parasitation and intensity of the attack is high. Amico et al (2019) states a generalist parasite (which has many hosts) has a smaller geographical range than a specific parasite. Kavanagh, P.H. *et al*. (2012) states the presence of parasites in fertile areas the scope of the host tends to be broader (general), and vice versa in arid regions the scope of the host is more specific. M. A. Caraballo-Ortiz, et al. (2017) shows that parasites parasitize certain types of plants that are suitable and available in their environment. Szmidla, H, et al, (2019) states parasites contribute to the reduction of trees on the roadside and in the urban forest. Gairolaa, et al, (2013) states that tree plants with a height of ≥200cm are more vulnerable to parasitic attack, meaning that the size of the stem determines the host's persistence against parasitic attacks.

The level of association or the closeness of the relationship between parasites and host can be interpreted as the level of opportunity (possibility) of a species of plant parasitized by the parasite from the many types/species and numbers of plants in an area of green open space. From the 42 species of plants that parasitized, there are 11 species whose associations with the parasite are significant, namely the plant of mango, *Mangifera indica* , angsana, *Pterocarpus indicus,* bungur, *Lagerstroemia speciosa* jambu air, *Syzygium aqueum* sengon, *Albizia chinensis,* the plant of kupu-kupu, *Bauhinia tomentosa* teak, *Tectona grandis,* star fruit, *Averhoa Carambola,* salam, *Syzygium polyanthum,* jati ambon (jabon), *Anthocephalus cadamba* and turi, *Sesbandia grandiflora*. This shows the suitability between parasites and their host. In line with the research results by Okubamichael et al., (2016) which states that the specificity of parasites host is influenced by the flow of genes during plant pollination, seed dispersal vectors (birds), host abundance, the genetical, morphological, physiological, and chemical content suitability. The research results of Dlama, T.T., et al., (2016) states there is almost no host specificity on parasites. According to Arce-Acosta,I., et al (2016) diversity and composition of plant species (hosts) are positively correlated with the presence of parasites. The parasite of Psittacanthus calyculatus (Loranthaceae) has a strong relationship with plants from the family of Leguminosae, among others, with Acacia plantsa. Meanwhile Queijeiro-Bolaños et al. (2013) stated the prevalence of parasites in the study area was regulated by the physical environment and anthropogenic disorders. According to M.A.Caraballo-Ortiz, et al, (2017) the main factor determining the presence of tropical parasites (*Dendropemon caribaeus, Loranthaceae*) in Puerto Rico is the compatibility between the parasite and the plant species that exist in the community. Aruda et al, (2006) concluded that many parasites were significantly affected by the type of bark, but not by the bark of the branches and in general plants with rough skin were more susceptible to parasites parasitation.

CONCLUSION

Based on data from observation results of the species of green open space plants in Surabaya which were potentially parasitized by parasites recorded 72 plant species, 42 species were parasitized, and 30 plants were not parasitized. Plants that parasitized by parasites were dominated by the plant of angsana *Pterocarpus indicus,* tamarind/trembesi *Samanea saman*, mango/mangga *Mangifera indica*, and sengon *Albizia chinensis* namely, plants that have a large of number and have high habitus and wide canopy, however the level of parasitation and intensity of damage are not affected by the level of abundance or size of plant habitus. From 42 species of plants that parasitized, there are 11 species whose associations with parasites are significant, meaning that there is a correlation between the abundance of parasites with the species of its host plant. The research findings can be used as a reference in the construction of green open spaces, specifically related to the selection of plant species and their management in order to avoid parasites parasitation.

ACKNOWLEDGMENTS

The manuscript material is part of the institution's internal research scheme. On this occasion, we would like to thank the Rector and Chairman of the Institute for Research and Community Services of University of Wijaya Kusuma Surabaya which has provided funding for the implementation of the research and gives an opportunity to take part in manuscript writing training for international journals.

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