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FUNCTION OF KANA (CANNA.SP) AS LANDSCAPE PLANTS OF CITY PARK SURABAYA

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ABSTRACT

The city park is a park located in an urban environment on a large scale and can anticipate the impacts caused by the development of the city and can be enjoyed by all citizens. The beauty of the city park was decorated by many plants such as various varieties of kana plant (Canna sp).

This study aimed (1) to determine the grouping of Canna sp. species in the garden city of Surabaya (2) the role of Canna sp. Species as landscape plants in the garden city of Surabaya. Kana plant samples used in this study consisted of 39 Kana plants characters and the data were analyzed descriptively. In addition, the analysis was also performed using SPSS 16.0, which resulted in a dendrogram. The results showed that the seven samples of kana plants can be grouped into two main groups, namely group I (C. indica, C. 'Warscewiczii', C. glauca) and group II (C. 'King Humbert', C. 'Cleopatra', C. 'Bengal Tiger', C. 'Orange Punch'). The main group I formed two small groups, i.e. groups III and IV (C. glauca), and next, the group III formed two more groups, namely, group V (C. indica) and group VI (C. 'Warsewiczii'). The main group II also formed two small groups, namely group VII (C. 'King Humbert', C. 'Cleopatra') and group VIII (C. 'Bengal Tiger', C. 'Orange Punch'). The next group VII formed two groups namely group IX (C. 'King Humbert') and the group X (C 'Cleopatra'). The group VIII also formed two groups back, the group XI (C. 'Orange Punch') and group XII (C. 'Bengal Tiger').

The role of Canna sp as garden plants (landscape plants) in the city of Surabaya as protection from damage caused by UV radiation and as an antioxidant. In addition, the bulbs can be used for the manufacture of flour, because of the rhizomes of the sweet and also the plant can be used as a conditioning, fever reliever, laxative urine, and sedative.

Keywords: *Canna* sp.; Diversity; Morphological characters; the role of landscape plants

1. INTRODUCTION

City park is a park located in an urban environment on a large scale and can anticipate the impacts caused by the development of the city and can be enjoyed by all citizens. Garden city is often specified by the square.

The square is an open field and a grassy area surrounded by roads and can be used for various community activities. According to Lestari, G. and I. P. Kencana (2008), basically the square was the front yard of the house, but in a larger size. The rulers could mean the king, regents, district officer, and sub-district, even village heads that have the most spacious courtyard in front of the palace or pavilion residence, which is used as a community center daily in military government, trade, crafts and education.

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A city park should be an important point in planning a city in order to maintain the quality of the activity of a dense urban environment. Besides, the city park can be a place to socialize for the urban community. A good garden is a reflection of the city with good humans (public). Man (society) is an important aspect in a city, so the quality of the human (people) will affect the quality of a city. In the city park, diverse species of plants are planted to make a beautiful garden. One of the plants used are plants flower beads (*Canna* sp).

Canna sp. has an attractive flower color and diverse ranging color from deep red, pink, yellow, orange, and a combination of these colors. Because of its beauty, most people only know him as a mere ornamental plant (Santoso, 2008). *Canna indica L*. or also known as *Canna edulis Ker*. is one kana plant species found in Indonesia. The local communities (especially in Java) are familiar with this species as canna is utilized for food crops because of the high nutrient content of the rhizome. Data from the MOH Nutrition Directorate mentions that the nutritional content per 100 grams of rhizomes of *Canna indica L*. consisted of: 95.00 cal calories; 1.00 g protein; 0.11 g fat; 22.60 g carbohydrates; 0.021 g of calcium; phosphorus 0.07 g; 0.0019 g of iron; vitamin B1 0.0001 g; Vitamin C 0.01 g; 75.00 g water (Soenardi and Wulan, 2009).

Besides *Canna indica* L. species is useful as crops and ornamental plants, it has also a great potential as a medicinal plant. However, only a few people know about it usefulness. Rhizome is the part that is also commonly used for the treatment because it contains compounds such as phenols, terpenes, koumarin, and special alkaloid. With these ingredients, rhizome of kana has a medicinal effect as an antipyretic and diuretic, as well as useful to treat acne, sores, fever, cough, diarrhea, heartburn, hypertension to acute hepatitis (Anonymous, 2010; Santoso, 2008).

Actually, besides *Canna indica L*. there are some species or even other varieties of kana which are found in Indonesia. Mostly, other kana plant species were not use optimally. Generally, the kana plant species other than *Canna indica* L. is still used merely as an ornamental plant in the garden or in the streets. Therefore, the research on crop diversity of kana and the relationships of the species and varieties are indispensable. In addition, the research in this area is important in providing the information about different types of the existing kana plants, as well as in maximizing the potential of plant species in addition to *Canna indica* L. kana as an alternative source of food and medicines (Anonymous, 2010). Thus, in the future other species of kana plants may also be used for food and medicine as a replacement of *Canna indica* L. If it is not found within a certain time or location.

Some of the researchers who conducted the study of the phenotics relationship of kana plant as practiced by Ashary (2010) are limited only to the diversity of *Canna indica L*., which is based on morphological and isozyme banding patterns in each different area of the overgrown species. Other studies on the kinship between species of kana plants were also conducted by Prince (2010) which used molecular approaches to analyze the phylogenetic relationship among species in the family of Cannaceae. Researches on kana species that have been conducted by the two previous researchers are already using molecular approaches. The phenotics research on the relationship between organisms through morphological approach as evidence of taxonomy is still needed. That is because the morphological characters are more easily seen when compared to other sources of evidence of taxonomies such as anatomy, physiology, biochemistry or molecular, so it is more quick and easy to obtain the data and the cost is low as well. In addition, the results of the grouping or closeness of kinship analysis of an organism

based on the equation of morphological characters do not differ much when compared to the results of the grouping through the analysis of molecular data.
The objectives of the study were (1) to determine the grouping of *Canna* sp. species in Surabaya city park. (2) the role of *Canna* sp. species as a landscape plant in the garden city of Surabaya.

2 . METHOD/ EXPERIMENT

This research was conducted by observing the sample directly with analyses on morphological characters of vegetative and generative organs of the plants. Afterwards, the obtained data were analyzed by using descriptive method. Data analysis is then used for performing the Grouping. The research steps are as follows:

a. Data on identification of morphological traits (stature, flowers, leaves, stems, fruit, and rhizomes) that have been obtained subsequently are arranged in a matrix Taxonomy Operational Unit (OTU) versus character to be quantified as multivariate data.
b. OTUs expressed as the type of sample in the form of species or varieties of Canna were investigated and the number of character is expressed as (1) and (0) and the multivariate of morphological data obtained for each sample was used.
c. After the scoring, the data was processed in SPSS program by choosing, analyzing, and classifying the hierarchical cluster. This is conducted to determine the similarity index or an index of similarity (IS) (OTU vs OTU) by using the Simple Matching coefficient. Simple Matching coefficient is used to look at the role of the presence and absence of morphological data characters in the grouping.
d. Combining morphological characters (phenotypes) with average linkage, to determine the OTU to be clustered with one another. Similarity index will affect the average linkage of clustering OTU.
e. Results of grouping by average linkage will be reconfirmed by PCA (Principal Component Analyses). PCA results are used to determine the weight value distinguishing characteristics in the separation OTU.
f. With hierarchical cluster analysis also produced a dendrogram showing the phylogenetic relationship between taxa or also called fenogram.
g. OTU separation can be seen through the results of dendogram average linkage clustering and PCA can be used to determine the phylogenetic relationship between OTU based on analysis of morphological characters (phenotypes) (Hamidah, 2009).

3. RESULTS

This study was an observational study with seven kana samples and using morphological characters approach, especially the external morphology to determine the grouping both between species and between varieties of kana plants. Seven samples used in this study consisted of two kana plant species (*C. indica* and *C. glauca*) and five varieties of kana plants (C. 'Warscewiczii', C. 'King Humbert', C. 'Bengal Tiger', C. 'Cleopatra', and C. 'Orange Punch'). Of the seven types of plants, 39 characters of the vegetative organs and generative organs of plants that can represent groupings of plants kana are used. After analyzing the descriptive data to determine differences in any plant species, the entire data characteristics of seven plant species of kana are reprocessed using SPSS 16. computer program. This data processing can be used as a supporting

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evidence of the kinship of kana plants based on the morphological characters of the seven kana plant samples in this study. The groupings are based on similar characteristics in the external morphological character possessed by each sample. The hierarchical cluster analysis was conducted to produce the distribution of morphological characteristics of kana plants.

Diagnostic Description of *Canna indica* :

Canna indica has ovatus-shape leaves, the leaf blade is wavy, the leaf tip is obtusus, leaf base is obtusus, surface adaksial and abaksial leaves are a combination of dark green (dark green) with red-purple (medium violet red), leaf edges are purplish red (medium violet red), the direction of the angle leaf growth is > 40 °, the grown leaf blade grown has a length of about 40-45 cm with a width of about 25-28 cm, the surface of the pseudo-stem is red (maroon), the rhizome is thick with surface purplish red (medium violet red), braktea is red (maroon), brakteola is red (magenta), outer perigonium is red (magenta), inner perigonium is pale yellow with a length of <5.5 cm and a width of <1 cm, sterile stamen (staminodea) and fertile stamen have a shape like a spatula with an edge flat, bright red with a yellow base color, and have length of <6 cm and width of <1.5 cm, pistilum is bright yellow with narrow and flat stigma, the density of protrusions on the wall ornament pollen is tenuous, rind (unripe fruit) is light green.

Table 1 Code names of species and varieties of kana plant samples

Code	Information
C.in1	*Canna indica* 1
C.in2	*Canna indica* 2
C.in3	*Canna indica* 3
C.wr1	*Canna 'Warscewiczii'* 1
C.wr2	*Canna 'Warscewiczii'* 2
C.wr3	*Canna 'Warscewiczii'* 3
C.gl1	*Canna glauca* 1
C.gl2	*Canna glauca* 2
C.gl3	*Canna glauca* 3
C.kh1	*Canna 'King Humbert'* 1
C.kh2	*Canna 'King Humbert'* 2
C.kh3	*Canna 'King Humbert'* 3
C.bt1	*Canna 'Bengal Tiger'* 1
C.bt2	*Canna 'Bengal Tiger'* 2
C.bt3	*Canna 'Bengal Tiger'* 3
C.cl1	*Canna 'Cleopatra'* 1
C.cl2	*Canna 'Cleopatra'* 2
C.cl3	*Canna 'Cleopatra'* 3
C.op1	*Canna 'Orange Punch'* 1
C.op2	*Canna 'Orange Punch'* 2
C.op3	*C.anna'Orange Punch'* 3

After the merger or grouping values obtained, then the next value that grouping visualized in the form of dendrogram in Figure 3.1. Grouping by the first order is a group that has the closest kinship, while the value of the last sequence shows kinship far between *Canna* sp used as a sample in this study.

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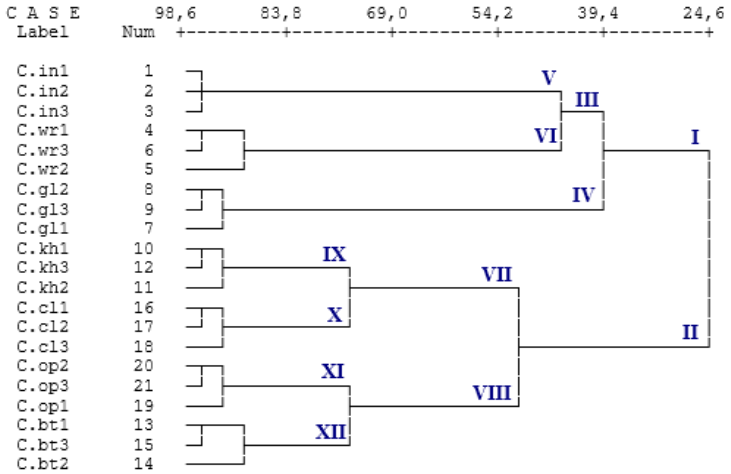

Figure 1 Dendrogram grouping of 21 samples of Canna sp. based on morphological characters

The results of analysis of 21 individual groups of Canna sp. described in the dendrogram (Figure 3.1) were able to show the grouping of the plants. It is seen the kinship relationship of the 7 species and varieties of *Canna sp*. From the dendrogram above, it can be seen that the smaller the similarity values (on a scale from 98.6 to 24.6) from the line that connects the individual to one another, the greater the difference between the individual plant.

Observation Results of the city park, in Surabaya

Park city in Surabaya

City park is a beautiful garden surrounded by a landscape plants. It is very suitable as a recreation center for the community due to its strategic location. An area can be regarded as a city park if the area is a public space consists of several aspects as follows:

a. Biological aspects
   In a city park there are various kinds of trees to make the land a little shady.
b. Aspects of taste
   The taste aspect looks at ways of giving meaning concerning the social values, culture, and economy.
c. Aspects of provision
   This aspect involves the ability of the park in accommodating a wide variety of activities, such as trafficking activities, sporting events, etc.
d. Aspects of achievement
   Aspect of achievement is associated with an area of green open land. In this aspect, the visitors can move easily from one place to another.

4. DISCUSSION

As a result of the cross breeding between Canna species, currently there are a lot of diverse varieties of Canna have generated successfully. This is in accordance with the purpose of the breeders of ornamental plants who want to make Canna be more than just agricultural crops. The cross breeding aimed to produce new varieties of Canna with a variety of colors of flowers and leaves which are more beautiful than the usual Canna plants, thus, are suitable to be used as ornamental plants. From the literature review, a

cross between more than one species of an elder from *Canna* varieties exists today. The most widely cross breed *Canna* species are *Canna* indica, *Canna glauca*, and *Canna iridiflora*, especially on *Canna* x generalist as it is used as a sample in this study. From these information, it is possible that some varieties of *Canna* x generalist have similar character traits and characteristics as *Canna indica* species which was firstly recognized and utilized by the public as agricultural crops and medicinal plants. N this study, the similarity is the basis to *determine the groupings and kinship among the species based on morphological characters* of Canna plants. Although having a common characteristic, the results of the data obtained in the study indicate a difference similarity value for the plants belonging to one species being compared. This happens because there will never be two individuals which are exactly the same in this world (Campbell, N.A., 2003).

The closeness of kinship of the seven samples of both species and varieties of Kana plants can be seen from the similarity index and the construction of the dendrogram. In the table of similarity index, it is known that C.in1 (an OTU of C. indica) and C.kh1 (an OTU of C. 'King Humbert) have the smallest similarity value index of 0.07. This value indicates that at least both have traits in common. Giving attention to the construction of dendrogram formed, it is seen that they are also far apart when forming groups. The distance of these groupings is also due to the small value of the index of both plants. The opposite happens for the two OTU *Canna* sp. which in comparison have a great value. The great similarity index value indicates the number of traits in common are shared, and the great similarity index value of the groups that formed in the construction of dendrogram become adjacent one to another.

The Construction of dendrogram obtained as a result of this study showed that the 7 species and varieties of plants kana are divided into two main groups, the first group includes C. indica, C. 'Warscewiczii', and C. glauca and C. Group II includes ' King Humbert ', C.' Bengal Tiger ', C.' Cleopatra ', and C.' Orange Punch '. It is clear that there is a little common trait or characteristics (in this study the nature of the phenotype or morphology) between OTU in group I and II. Each group is then clustered again to form smaller groups until finally the mutual inter-faction grouped itself. The fact proves that there are similarities in the nature sizeable among the Group, both of species and varieties so that each OTU Canna sp. can join the faction itself.

The formation of the main groups I and II, which only have the similarity coefficient of 24.6 on the dendrogram due to the many differences in the character of the parts of the flower, in particular, differences in character length and the width of staminodea, the staminodea form, the nature of stigma, and the character density of the bulge of the pollen wall ornamentation. The main group I have flowers which are relatively small when compared with those of the main group II. The flowers in group II tend to be longer and wider (a large flower).The staminodea of the main group I generally has spatula shape while for the group II is generally oval upside down. The stigma in group I also tends to be narrow while the stigma in the group II tends to be wide. Meanwhile, the bulge in the wall of pollen of main group I tend to be less dense (tenuous) while in group II it is more protrusions and tight.

According to Stone (1970) in Haryanto *et al*. (2007), the character of flower is indeed the most useful characters in the classification of Angiospermae. However, certain vegetative characters such as leaf length, leaf width, leaf color, size braktea, and other vegetative organs characters also have an important role. The statement can be proved by the members of the main group I. Group *C. indica* and group *C. 'Warscewiczii'*

which have the value of similarity coefficient of 47.9, while the *C. indica* and group of *C. glauca* have the similarity coefficient only 39.9. This suggests that *C. indica* group is closer to *C. 'Warscewiczii'* group than to C. *glauca* group. The closeness of kinship between groups of C. *indica* with *C. 'Warscewiczii'* is due to the many similarities in the character of the flowers, as well as the same vegetative character trait of the leaf blade. This is also supported by Singh (1999) which states that the organ / vegetative characters, namely the nature of the leaf blade, the type of leaf tips, leaf width, surface color stems, rhizome of thickness, and color of brachtea are importants in determining the kinship grouping of organisms.

Regrouping which occurs in four main members of the group II showed that the group of *C. 'Cleopatra'* is closer to group of *C. 'King Humbert'* with a similarity value of 76.5. While the group of *C. 'Orange Punch'* is closer to group of *C. 'Bengal Tiger'* on the similarity value of 76.3 which was also clumped into one. However, both groups (*C 'Cleopatra'-C.' King Humbert'* groups and *C.' Orange Punch'-C. 'Bengal Tiger* groups) apparently had previously been a member of the same group on the similarity value of 53.2. They were then splitted into two groups due to the differences in the nature of the stigma. Just as in the main group I, this grouping is also heavily influenced by the common characters of the generative organs (flowers). Meanwhile, the group of *C. 'Cleopatra'* and group of *C. 'King Humbert'* are mutual clumped due to the pattern of the staminodea color, whereas in group of *C. 'Orange Punch'* and group of *C. 'Bengal Tiger*, the staminodea color is not patterned.

Flower beads (*Canna indica L.)* originating from tropical America, usually grown as an ornamental plant. There are some which also grow wild in the woods and mountains to an altitude of approximately 1000 m above sea level. The other type, *Canna edulis Ker.Gawl* (canna) has a smaller flower petal. The leaves are large and wide, vivid green pinnate (no colored tengguli), edible rhizomes. In Australia, the plants are a producer of starch, known as the "arrow-root of queensland". They are terma big, annual, up to 2 m in the ground and have such a large rhizome bulbs. The leaves are large, wide, pinnate and green. They have large flowers with bright colors (red, yellow) and are arranged in a series of shaped bunches.

From the literature, it is known that aside from being a landscape plant, kana (*Canna* sp) also plays a role as a tuber. Its rhizome is used for the manufacture of flour, because of its sweetness. It is also used as conditioning, fever reliever, laxative urine, tranquilizers to lower blood pressure , menstrual or vaginal discharge, hepatitis drug, natural food coloring, natural preservatives, anti-carcinogenic, anti-inflammatory, antihepatoxic, antibacterial, antiviral, antialergenik, Whitish (leucorrhoea), Stopping Bleeding (hemostatic),Yellow pain (acute icteric hepatitis), Ambein (hemorrhoids), Swollen glands Spleen, cancer Gynecology, antithrombotic, as protection from damage caused by UV radiation, and antioxidants. Related to its function as a crop protection plant, *Canna sp.* ptotects us from the damage caused by UV radiation. The City Government of Surabaya is highly supported the plantation of *Canna* sp in any city park, plant roadblock / green line in Surabaya as identified from the image observations of the researchers.

5. CONCLUSION

Based on the results and discussion, the conclusions drawn are as follows:

1. The seven samples of Kana plants (Canna sp.) used in this study can be grouped in the form of a dendrogram fenogram through phenetic analysis based on the

morphological characters. Grouping was first done for the main group I (includes C. indica, C. 'Warscewiczii', and C. glauca group) and the main group II (includes group C. 'King Humbert', C. 'Cleopatra', C. ' Bengal Tiger ', and C.' Orange Punch '). The main group I formed two smaller groups, i.e. group III (includes group C. indica and C. 'Warscewiczii') and group IV. Then the group III formed two groups of inter-faction itself, namely the V (includes group C. indica) and group VI (includes group C. 'Warscewiczii). The main group II also formed two smaller groups, i.e. groups VII (includes group C. 'King Humbert' and C. 'Cleopatra') as well as the group VIII (includes group C. 'Bengal Tiger' and C. 'Orange Punch'). Furthermore group VII formed two different groups among its own faction, the group IX (covering group C. 'King Humbert') and the X group (including group C. 'Cleopatra'). Meanwhile, the group VIII formed two groups between themselves as well, namely the group XI (includes group C. 'Bengal Tiger') and group XII (includes group C. 'Orange Punch').

2. The roles of Canna sp as garden plant of the city (landscape plants) in the city of Surabaya are as protection from damage cause by UV radiation and as an antioxidant, and bulbs in use for the manufacture of flour, because of the sweet rhizomes and as conditioning, fever reliever, laxative urine, and sedative.

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