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Evaluation of ornamental plants and soil type for landscaping in privet and public gardens of Madinaty City, Cairo Governorate, Egypt

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Abstract

In the domains of landscape and human existence, ornamental plants -such as trees, palms, shrubs, climbers, herbaceous plants, succulents, cacti, and lawns-are regarded as essential plant materials. Madinaty is a city project east of Cairo, the Egyptian capital. Construction began in July 2006. The project was built on a land area of 8,000 feddan. This location had several private and public gardens. So, the current study assessed to evaluate the ornamental plants species as well as soil and irrigation water types in this area. Form the obtained results; the soil type was sandy texture, pH (8.02), Electrical conductivity (1.50 mmohs/ cm) and $CaCO_3$ (2.75 %). All soil samples have low fertility, so the recommendation was this area want a good balanced fertilization program according to the type of plants. The water samples were considered to have medium or moderate salinity. Thus, it is suitable for irrigate all ornamental plants, as its salinity is low and the sodium and chloride percentages is low, and it does not cause any problems to the lands that are irrigated. Moreover, a totally 122 plant species belong to 44 families were recorded and they follow trees (17.2 %), shrubs (20.5 %), palms (8.2 %), cactus and succulents (7.4 %), ornamental bulbs (7.4 %), internal coordination (10.7 %), climbers (4.1 %), soil covers (17.2 %) and aromatic plants (5.7 %). From surveying work, it has been found that the shrubs and palm and ornamental herbaceous numbers must increase to make a different variation in gardens landscape.

Keywords: *Landscaping, Madinaty gardens, ornamental plants, soil, aromatic plants*.

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1. Introduction

New cities displayed in Egypt to have more citizens. These cities should be having private and public gardens to give a landscaping beauty and relaxation as well as sport [1]. Ornamental and landscape plants are vital to human existence. In addition to offering shade and aesthetic value, they can be found in municipal parks, along roadways and highways, around residences, schools, markets, shopping centers, and workplaces. They also aid in the preservation of soil, water, and air quality as well as energy. In contrast to many other beautiful arts, "garden design" originated from the need to organize the land as a living area outside of work activities when the first people settled there [2, 3]. Plants grown for their aesthetic qualities in public spaces like parks or backyard gardens are known as ornamental plants. Visitors to the garden will find these plants' leaves, blooms, stems, fruits, and foliage textures to be visually appealing. These decorative plants are cultivated in gardens for their cut blooms, as well as for landscape design and exhibition purposes [4].

Therefore, the current study established aiming to survey by several visits to evaluate count of ornamental plants, soil analysis and water irrigation analysis was done. To assess the landscaping situation and to recommend the best treatments and plants that must be increase in this area.

2. Materials and Methods

The current study assessed to evaluate the ornamental plants variation as well as soil and water irrigation analysis in Madinaty city (Fig. 1) located in Cairo Governorate, Egypt, during 12th April to 24th June. The study location under review situated between latitude (30°08°44°N) and (31°63'77"E). About eight visits were done every ten days from 12th April to 24th June to count and listed ornamental and aromatic plants groups as well as to take soil and irrigation water samples. Thus, the following data were collected.

2.1: Families and species count

In the scope of the study, (trees, palms, shrubs, soil covers, ornamental bulbs, internal coordination, green landscapes, climbers, cactus and succulent plants and aromatic plants) in Madinaty private and public gardens were listed depending on eight visits. Data about the plant materials was obtained through observations and with the help of horticultural experts as recommended by [5].

2.2: Soil analysis

Surface soil samples (30 cm) were collected from different areas in Madinaty gardens, Cairo Governorate, Egypt to represent sandy soil. The obtained soil samples were analyzed according to [6] in a scientific laboratory for agricultural analysis (named Merwad LAB), Zagazig City, Sharkia Governorate, Egypt.

2.3: Irrigation water analysis

Irrigation water was analyzed in a scientific laboratory for agricultural analysis (named Merwad LAB), Zagazig City, Sharkia Governorate, Egypt.

3. Results and Discussion

3.2: Families and species count

It was listed as a data of the current survey that totally 122 ornamental plant species belonging to 44 families are grown in Madinaty gardens. The highest families in number of species were *Areaceae* (10 species), *Fabaceae* (9 species), *Lamiaceae* (6 species), *Malvaceae* (6 species), *Moraceae* (6 species) and *Verbenaceae* (6 species). Moreover, sixteen families had only one species for each, eight families had two species for each, three families had three species for each, one family had four species for each and four families had five species for each (Table 1). Furthermore, Fig. 2 showed the number of surveyed species according to their plant groups as follows: trees (21), shrubs (25), soil covers (21), palms (10), ornamental bulbs (8), cactus and succulents (5), climbers (5), green landscapes (2), internal coordination (13) and aromatic plants (7). Also, Fig. 3 showed the percentages of each group. In this regard, subsequently, 31 tress, 23 Shrubs, 4 woody vines, 9 Ground covers and 120 herbaceous perennials were evaluated for their uses in landscaping by [7]. Moreover, [8] reported that totally 83 woody plant species belong to 33 families were recorded and they follow trees (40%), palms (12%), shrubs (41%), and vines (7%) were found in Cairo Festival City gardens, Cairo Governorate, Egypt.

3.3: Soil analyses

Results in Table 2 reveal that all soil samples sent to the laboratory are considered sandy in texture. The percentage of organic matter (OM) is low (land fertility is low). The proportion of macro nutrients in the earth is low (nitrogen, phosphorus, and potassium). The percentages of microelements (iron - zinc - manganese - copper) are considered rather low, that is, less than the optimal limits. Soil samples are considered non-calcareous lands, meaning they have a calcium carbonate percentage of $CaCO_3$ less than 10%. All soil samples' soil pH is alkaline, meaning less than 8.5. Finally, soil samples sent to the laboratory are considered non-saline soils where the EC is less than 4 m.mhos/cm.

3.3. Irrigation water analysis

From data obtained in Table 3 it is clear that the water samples are considered to have medium or moderate salinity, where the EC is less than 2.25 mm/cm. The percentage of dissolved sodium is very low, with SSP less than 60%, and the chloride concentration is low, with a concentration of less than 4 meq/l /L. The percentage of boron B, iron Fe, and nitrate NO_3 is low and within appropriate limits. In this connection, Irrigation managers must accurately analyze water quality reports in addition to detecting all potential stresses because management decisions have an impact on the health of the soil and plants [9].

Figure 1. Location of Madinaty city, Cairo Governorate, Egypt

Table 1: Distribution of evaluated species based on families

Family	Number of species	Family	Number of species	Family	Number of species	Family	Number of species
Agavaceae	4	Asteraceae	6	Geraniaceae	2	Oleaceae	5
Aizoaceae	2	Bignoniaceae	3	Iridaceae	1	Phyllanthaceae	1
Amaranthaceae	1	Cactaceae	2	Lamiaceae	6	Pittosporaceae	2
Amaryllidaceae	2	Cannaceae	1	Liliaceae	2	Plumbaginaceae	1
Apocynaceae	5	Commelinaceae	1	Lythraceae	1	Poaceae	2
Araceae	5	Crassulaceae	2	Malvaceae	6	Portulacaceae	1
Araliaceae	2	Cupressaceae	2	Meliaceae	1	Primulaceae	1
Araucariacea	1	Cycadaceae	1	Moraceae	6	Rosaceae	1
Arecaceae	10	Daisy	1	Myoporaceae	1	Solanaceae	2
Asparagaceae	3	Euphorbiaceae	5	Myrtaceae	1	Strelitziaceae	1
Asphodelaceae	3	Fabaceae	9	Nyctaginaceae	1	Verbenaceae	6

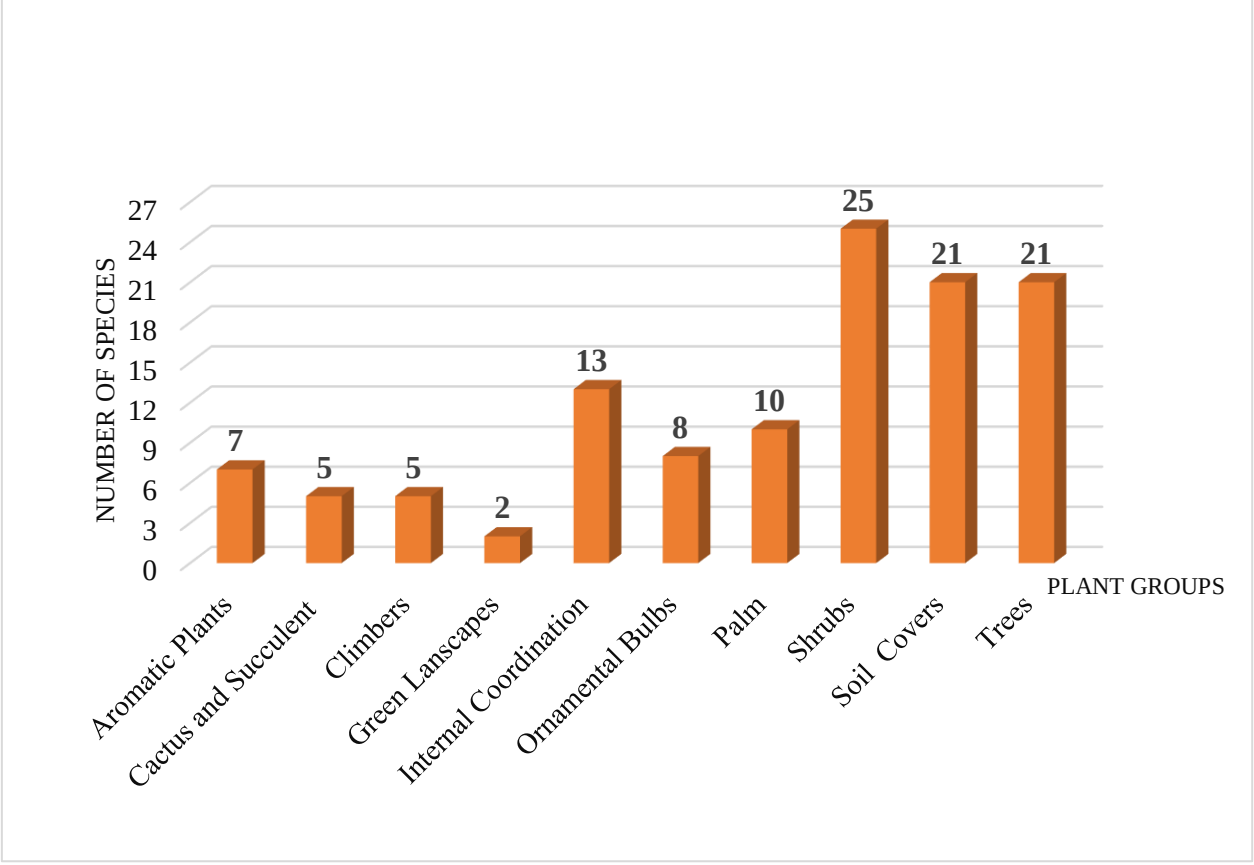

Figure 2. Number surveyed species according their groups

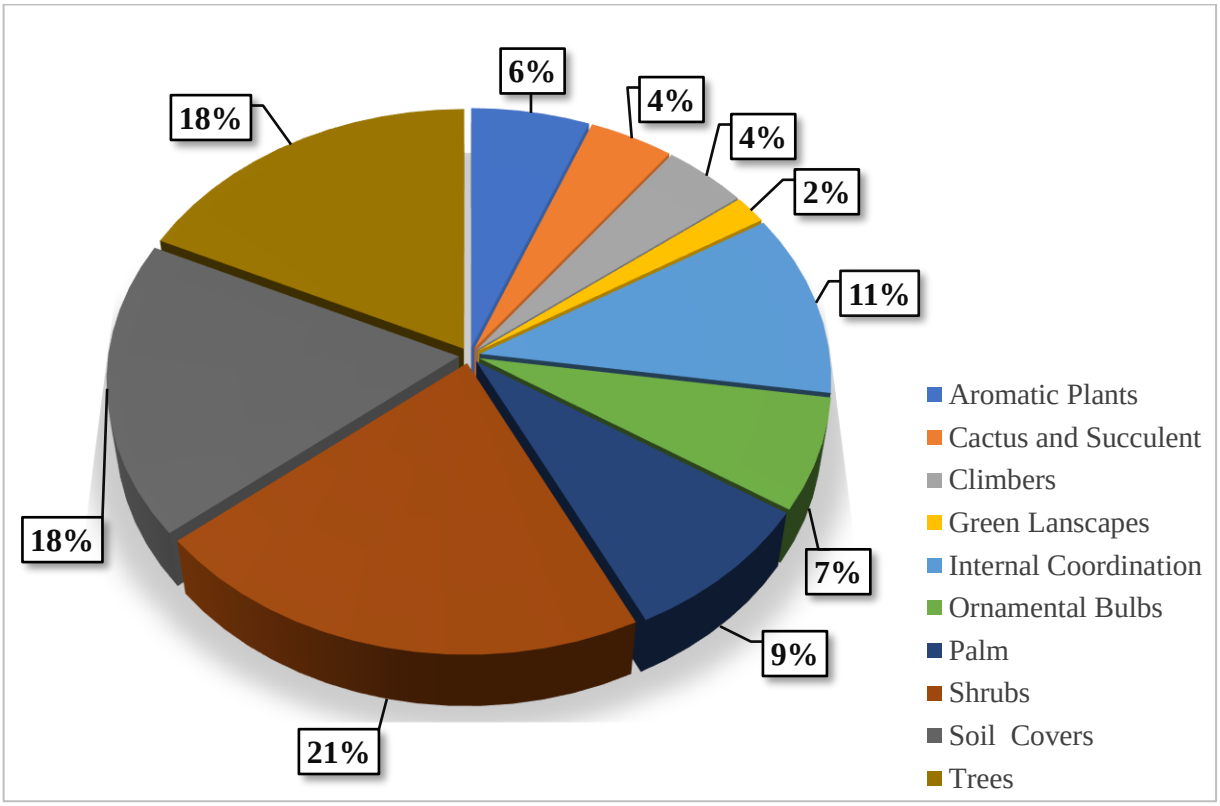

Figure 3. Percentages of surveyed species according their groups

Table 2. Physical and chemical analyses of the location soil

Physical analyses	
Sand ,%	91.6
Silt,%	6.33
Clay,%	2.07
Textural class	**Sandy**
Saturation point, %	18.6
Field capacity (FC),%	9.3
Organic matter,(%)	0.19
Chemical analyses	
pH*	8.02
EC,(dSm^{-1}) **	1.50
$CaCO_3$,%	2.75
Soluble cations and anions, (mmolc L^{-1})**	
Ca^{++}	5.72
Mg^{++}	4.91
Na^{+}	3.40
K^{+}	0.97
$CO_3^{=}$	0.00
HCO_3^{-}	5.62
Cl^{-}	5.75
$SO_4^{=}$	3.63
Available nutrient , (mg kg^{-1}soil)	
N	24.5
P	11.7
K	89.2
Fe	1.06
Zn	0.59
Cu	0.64
Mn	0.49

* Soil-water suspension 1: 2.5 ** Soil water extract 1:1

Table 3. Analyses of water used in irrigation

	Value
EC, dS/m	0.99
EC, ppm	634
pH	7.97
Soluble and Cations and Anions, mmole/L	
Ca^{+2}	4.09
Mg^{+2}	4.6
Na^{+}	0.67
K^{+}	0.54
Cl^{-}	1.3
CO_3^{-}	0.0
HCO_3^{-}	4.9
SO_4^{-2}	3.7
Salinity	C3, medium
Chloride Classification	Low, Safe
Quality parameters of water	
B, mg L^{-1}	0.24, (Low, safe)
Fe, mg L^{-1}	0.33, (Low, safe)
NO_3-N, mg L^{-1}	1.06, (Low, safe)
SSP,%	6.7
SAR	0.31 (S1, low)
SCAR	0.32
SAR/SCAR	0.95
RSC	22 (No hazard)
RSBC	26
RSC/RSBC	0.82 (A1, Normal water)
USDA Class	C3S1

SAR: Sodium Adsorption Ratio (SAR ≥ 10 : Low for sodium); SSP: Soluble sodium percentage (SSP ≥60%: Low for soluble sodium):; ESP: Exchangeable Sodium Percentage ; SCAR: Sodium to Calcium Activity Ratio ; RSC: Residual Sodium Carbonate (RSC ≥1.25 : Moderate for irrigation) ; RSBC: Residual Sodium Bicarbonate

4. Conclusion

From surveying work of ornamental plants, it has been found that the shrubs and palm and ornamental herbaceous numbers must increase to make a different variation in gardens landscape. Moreover, all specimens have low fertility, so they need a good balanced fertilization program according to the type of crop. Also, foliar spraying with microelements during the season of any crop, two doses only/ season. Finally, irrigated water is suitable for irrigating all ornamental and aromatic plants under all soil conditions, as its salinity is low and the percentage of sodium and chloride is low and does not cause any problems to the lands that are irrigated.

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