

ENVIRONMENTAL AND LANDSCAPE STUDIES ON SOME ORNAMENTAL PLANTS USED IN NORTH COAST VILLAGES OF EGYPT

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ABSTRACT

The current investigation aimed to study the effects of environmental and landscape conditions on some ornamental plants used for landscape planning in some North Coast Villages of Egypt during the successive years from 2003 to 2006.

Three resorts at the North Coast of Egypt; Costa Dell Sol, Green Beach and Marina (phase 5), were chosen to carry out this study. In each resort, certain vegetative measurements were conducted to determine the growth and development of some ornamental plants growing at the distances of 100 and 500 m from the seashore. These measurements were carried out at the four climatic seasons (autumn, winter, spring and summer). The evaluated plants in this work were *Vinca rosa* L., *Acalypha wilkisia* Muell. and *Erythrina indica*.

The obtained results showed significant differences in all investigated characteristics between the three resorts. The evaluated plants growing in Costa Del Sol resort showed the best values of plant height, plant diameter, number of main branches and stem diameter followed by Marina. Green Beach resort presented the lowest values of the investigated characteristics. Additionally, the tested plants grown at the distance of 500 m from the seashore showed better results than those grown at the distance of 100 m from the seashore. The summer gave the best results of all investigated characteristics when compared with other seasons.

Most of the interaction treatments represented significantly effects in all investigated characteristics. Generally, the plants growing in Costa Del Sol resort at the distance of 500 m from seashore and in summer, showed the best values of plant height, plant diameter, number of main branches and stem diameter.

INTRODUCTION

In the cities, especially in the densely populated like in Egypt, many people suffer from a lot of healthy problems resulted from pollution, stress and neurosis. For many people, recreation improves the physical and mental health. Research clearly showed that recreation can lead to fewer health problems and higher productivity at work.

The explosive population growth in Egypt induces many problems. One of them is the need of recreation areas for a great share of population. The deficiency of recreation areas in Egypt can be observed through overuse of existed areas inside or outside the cities.

Coastal areas are popular areas for a lot of people for recreation. Old coastal cities like Alexandria, Ras El Bar, Baltem and Gamasa became overcrowded, especially in summer, and assimilate more than their own capacity. Therefore, the Egyptian government began to develop and urbanize many new coastal areas in Egypt which could be suitable to establish new recreation areas. The most important one of these areas is the North-Western Coast of Egypt which extends for about 550 kilometers from

Alexandria to Al- Salloum. This area is a narrow strip of land with a width ranging from 5 to 40 km (Balba, 1990). Ministry of Population made plans to develop this area and already built a lot of resorts such as Maraqua, Arabella and Marina. Ministry of Information took a part in the development of this area through define and encouragement the private sector to invest in this area and create new resorts. Also, Ministry of Tourism has a plan to exploit this area and adding it to the international tourism map. Along the coastline from Alexandria to Al- Salloum, many resorts for recreation were established and their infrastructure like drink water, electricity, roads and hospitals were saved. There are 126 resorts some of them are still under construction. In all these resorts strict regulations and instructions were enforced to keep built-up areas on only 20% of the given lands while the remaining 80% must be open and green areas (Heider, 1994).

Many researches were carried out to study the environmental conditions of North- Western Coast of Egypt like climate, soil, water resources, geology and topography. On the other hand, there were only few studies on green areas in this region to define their problems and requirements.

The present study aimed to investigate the effects of environmental and location conditions of three recreation resorts in North- Western Coast of Egypt on growth and development of some ornamental plant species which are already cultivated in these resorts.

MATERIALS AND METHODS

The current investigation was carried out at North-Western coast of Egypt throughout the years from 2003 to 2006.

The study included the following aspects:-

- 1- Surveying all summer resorts from Alexandria to Al Alamein. There are 126 resorts some of them are still under construction.
- 2- Surveying all plant species growing in the previous resorts which are represented in tables.
- 3- Three resorts were chosen at different distances from Alexandria as a sample for this study.

The chosen resorts are: -

- | | |
|------------------|------------------------|
| A- Costa Del Sol | 80 km west Alexandria |
| B- Green Beach | 88 km west Alexandria |
| C- Marina | 106 km west Alexandria |

- 3.1 - Surveying all plant species growing and widely exist in these three resorts.
- 3.2 - Chose seven ornamental plant species of common plants in the three resorts for evaluation, taking in consideration the effect of distance from the seashore throughout the four climatic seasons of the year.
- 3.3 – Determination of the mechanical and chemical properties of the soils taken from the planted areas in the three resorts at the two the distances of 100 and 500 m from the seashore and in a depth of 10 and 30 cm from soil surface in every distance (Page *et. al*, 1982). Table (1) showed some mechanical and chemical analysis of the tested soils.

Table (1): Soil analysis of the three resorts.

Resorts	Costa Del Sol				Green Beach				Marina			
	100 m		500 m		100 m		500 m		100 m		500 m	
Distance from sea	10 cm	30 cm	10 cm	30 cm	10 cm	30 cm	10 cm	30 cm	10 cm	30 cm	10 cm	30 cm
PH	8.47	8.31	8.71	8.73	8.57	8.54	8.45	8.66	8.44	8.62	8.57	8.55
Nppm	85.05	75.60	42.53	75.60	42.53	23.63	33.08	37.80	106.04	95.60	94.30	84.80
P	60.00	60.00	67.50	67.50	105.00	67.50	75.00	67.50	69.50	64.30	70.10	66.00
K	174.00	185.60	232.00	266.80	232.00	127.60	278.40	162.40	285.00	263.30	291.00	278.10
Fe	102.00	100.00	98.00	90.00	70.00	42.88	92.00	62.00	45.00	51.00	57.00	62.00
Mn	48.00	48.00	46.00	44.00	54.00	50.00	52.00	56.00	52.00	48.00	58.00	54.00
Zn	2.36	3.12	2.74	0.70	3.86	1.32	1.68	2.54	2.26	2.84	1.95	2.18
Cu	0.28	0.12	0.12	0.14	1.64	1.34	0.38	2.70	2.82	2.47	2.30	2.05
Co3	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO3	1.00	0.75	0.88	1.00	0.63	0.63	0.75	0.88	0.84	0.86	0.79	0.75
CL	0.38	0.52	0.80	0.75	0.66	0.66	0.85	1.03	0.82	0.78	0.85	0.80
So4-	0.16	0.12	0.43	0.04	0.56	0.71	0.45	0.19	1.08	0.99	1.05	0.90
Ca	0.44	0.44	0.55	0.55	0.44	0.44	0.44	0.33	0.43	0.42	0.42	0.40
Mg	0.33	0.62	0.51	0.60	0.71	0.81	0.62	0.63	0.71	0.68	0.70	0.67
Na	0.73	0.23	0.91	0.52	0.62	0.70	0.88	1.10	1.45	1.32	1.36	1.21
Sand %	88	89	88	90	61	88	55	86	76	86	78	85
Silt %	7	6	6	5	18	2	21	3	13	4	10	5
Clay %	5	5	6	5	21	10	24	11	11	10	12	10
Soil Texture	Sand	Sand	Sand	Sand	Sandy Loam	Sand	Sandy Clay Loam	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand

Table (2): The percentage of each kind of water in the three resorts

Resorts	Kind of water%			
	Well water	Tap water	Dusty water	Treated water
Costa Del Sol	5	2	90	3
Green Beach	8	0	92	0
Marina	1	3	87	9

3.4 –Determination of the kind, quantity and quality of water used for irrigation as well as the methods of irrigation in the three resorts (Tables 2, 3 and 4).

3.5 – Investigation the conditions of fertilization in the three resorts such as kind of fertilizers, quantity and application time (Table 5).

Table (3): Water analysis of the three resorts(ppm)

Resort	Well water						General water		
	Costa Del Sol		Green Beach		Marina		Tap water	Dusty water	Treated water
	Distance from sea(m)								
Water properties	100	500	100	500	100	500			
Salts	960.00	896.00	940.00	870.40	968.91	776.40	497.20	678.40	2176.00
CO ₃	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO ₃	122.00	198.25	125.30	182.20	144.31	156.70	137.25	149.82	350.75
CL	223.58	190.21	217.41	184.31	228.60	172.40	110.12	185.31	620.68
SO ₄	321.70	258.82	311.34	237.60	294.30	241.37	93.50	132.62	516.77
Ca	74.80	52.80	63.40	48.71	78.57	43.60	30.80	48.30	79.20
Mg	51.89	122.69	72.58	118.43	63.10	109.42	13.78	31.50	53.86
Na	153.40	19.40	132.60	84.91	148.20	40.58	103.80	158.30	580.40
K	10.56	11.52	10.89	11.34	10.10	11.72	3.84	7.42	12.48

Table (4): Percentage of the used irrigation methods in the three resorts

Resorts	Irrigation methods%	
	Sprinkle system	Manual by workers
Costa Del Sol	99	1
Green Beach	33	67
Marina	70	30

Table (5): Kinds, quantity and application time of fertilization in the three resorts

Resorts	Fertilization		
	Kinds	Quantity/fad	Application time
Costa Del Sol	Organic Matter	42 m ³	March
	Nitrogen (urea)	23.25unit(N)	(May- June- July- August- September)
	Phosphorus (super)	8.25 unit(P)	(May- June- July- August- September)
Green Beach	Nitrogen (urea)	48.8unit(N)	(May- June- July- August- September)
Marina	Potassium (potassium nitrate)	24 unit(K)	March
	Phosphorus (super)	8.25 unit(P)	November
	Nitrogen (sulphate)	10.5 unit(N)	November – January
	Nitrogen (urea)	23.25unit(N)	March- May- July- September

In the three resorts, three from the seven evaluated plant species were selected for the current article to demonstrate the effects of the following factors on growth and development of these species:

- 1- Resort's conditions (as a total); for example location and maintenance managements (Resort's location).
- 2- Planting distance from seashore; 100 and 500 m.
- 3- Climatic seasons; autumn, winter, spring and summer .

The selected plant species for evaluation are:-

- *Vinca rosea* L., Fam. Apocynaceae .
- *Acalypha wilkisia* Muell., Fam. Euphobiaceae.
- *Erythrina indica*, Fam. Leguminosae

The selected plant species were evaluated according to the following parameters:

- 1- Plant height (cm): measured from the soil surface till the top of the plant.
- 2- Plant diameter (cm): measured as an average of two perpendicular dimensions for each plant.
- 3- Stem diameter (cm): determined exactly above the surface of the soil.
- 4- Number of main branches of each plant.

Statistical analysis

In the chosen resorts, three replicates of each plant species were randomly selected at the distance of 100 meters from the seashore and another three replicates of the same species were also randomly selected at a distance of 500 meters from the seashore. Each replicate included five plants.

The collected data were statistically analyzed as a factorial (3 locations x 2 distances from seashore x 4 seasons of the year) in a split-split plot design according to Snedecor and Cochran (1974). The main plot was the location: Costa Del Sol, Green Beach and Marina. The sub plot was the distance from the seashore: 100m and 500m, and the sub-sub plot was the climatic season: spring, summer, autumn and winter. Means of treatments were compared using the New-L.S.D. test at 5% level.

RESULTS AND DISCUSSION

I - *Vinca rosa* L.

1. Effect of resort's condition, distance from the seashore and the year's season on plant height (cm)

A. Effect of resort's conditions:

Data in Table (6) showed that there were no significant differences among plant height between the three resorts. *Vinca* plants grown in Costa Del Sol resort had the highest growth (28.05 cm) while those of Marina and Green Beach resorts were lower (27.64 and 27.55 cm, respectively).

B. Effect of distance from the seashore:

Data in Table (6) cleared that there were significant differences between plants grown at the two distances, 100 and 500 m, from the seashore. Plants located at the distance of 500 m were higher than those at the distance of 100 m (28.92 and 26.58 cm, respectively). These results could be attributed to the effect of salt spray from the sea which affected the growth of plants. Usui and Shimizu (1986) studied salt spray distribution from beach line to costal terrace. They found that salt deposition was higher on the face of the terrace slope than at its foot or at the top.

C. Effect of year's season:

Table (6) indicated that there were significant differences of plant height among plants under investigation in the four seasons of the year. Generally, the highest growth was in summer (31.97 cm) and the lowest was in autumn (24.83 cm).

D. Interaction effects between resort's condition, distance from the seashore and year's season:

Results in table (6) showed that summer season gave the greatest values of plant height of *Vinca* grown at the distance of 500 m from seashore in the three resorts when compared with the other seasons or the other distance. The values of plant height were 33.74, 33.54 and 33.00 cm for Costa Del Sol, Marina and Green Beach, respectively. These followed by 31.00, 30.48 and 30.04 cm in the same season at the distance of 100 m for Green Beach, Costa Del Sol, and Marina respectively. In summer, there were no significant differences in plant height between the two distances from seashore in the three resorts. These could be attributed to the effect of protection methods from wind, sand and sea sprays for the plants grown beside the seashore, also the design gave the same protection.

The lowest value of plant height (23.64 cm) was recorded in Marina resort in autumn at the distance of 100 m from seashore.

Table (6): Effect of resort's condition, distance from the seashore and the year's season on plant height (cm) of *Vinca rosa L.*

Season. Season. (C)	Distance (m) Distance (m) (B)	Resorts (A)			Mean of Mean of (B)	Mean of Mean of (c)
		Costa Del Sol	Green Beach	Marina		
		Costa Del Sol	Green Beach	Marina		
Autumn	100	27.88	26.16	27.48	(100m)	27.30
	500	29.62	28.36	29.28		
Autumn	100	28.16	27.74	27.98	(100m)	28.83
	500	28.92	27.00	28.98		
Winter	100	28.26	26.24	27.24	(500m)	28.74
	500	30.80	29.40	30.50		
Spring	100	27.20	26.24	26.82	(500m)	28.45
	500	27.44	27.34	26.86		
Summer	100	30.10	29.16	29.80	28.92	31.97
	500	30.48	31.00	30.04		
Mean of (A)		28.05	27.55	27.64		
LSD 5%		A 1.53	B 1.13	C 0.92	ABC 4.16	

2. Effect of resort's condition, distance from the seashore and the year's season on plant diameter (cm)

A. Effect of resort's conditions:

Data in Table (7) showed that there were no significant differences among plant diameter between the three resorts. *Vinca* plants grown in Costa Del Sol resort had the biggest diameter (31.72 cm) then Marina (30.22 cm) and finally Green Beach with the smallest diameter (28.49 cm).

B. Effect of distance from the seashore:

As shown in Table (7), there were no significant differences in plant diameter due to the differences in distances from the seashore, although the plants grown at the distance of 500 m from seashore had bigger diameter (30.40 cm) than those at the distance of 100 m (29.89 cm).

C. Effect of year's season:

There were significant differences among plant diameter in the four different seasons (Table, 7). Plant diameter in summer was bigger than other seasons (34.30 cm) while the lowest diameter was given in autumn (27.30 cm).

Table (7): Effect of resort's condition, distance from the seashore and the year's season on plant diameter (cm) of *Vinca rosa L.*

	500	33.30	28.42	31.16	30.40	
Summer	100	34.94	32.70	33.94		34.30
	500	36.90	32.56	34.74		
Mean of (A)		31.72	28.49	30.22		
	A	B	C	ABC		
LSD 5%	3.87	1.39	1.14	1.45		

D. Interaction effects between resort's conditions, distance from the seashore and year's season:

Results in Table (7) indicated that Vinca plants grown in Costa Del Sol resort at the distance of 500 m from the seashore and in the summer gave significantly the highest value of plant diameter (36.90 cm) when compared with all other cases. Additionally, Vinca plants in the same resorts grown at 100 m from the seashore and in the summer gave also the highest value of plant diameter (34.94 cm) when compared with all other cases. The lowest value of plant diameter (25.36 cm) was recorded in Green Beach resort at the distance of 500 m from the seashore and in the autumn.

3. Effect of resort's condition, distance from the seashore and the year's season on number of main branches per plant

A. Effect of resort's conditions:

Data in Table (8) showed that there were no significant differences among the plants regarding to number of main branches/plant between the three resorts. The number of main branches/plant was 3.93, 3.75 and 3.60 for Costa Del Sol, Marina and Green Beach, respectively.

B. Effect of distance from the seashore:

As shown in Table (8), there were no significant differences in number of main branches/plant due to the differences in distances from the seashore. However, the branching was more in plants grown at the distance of 500 m from seashore (3.87 branches/plant) than in those grown at the distance of 100 m (3.65 branches/plant).

C. Effect of year's season:

Results in Table (8) indicated that Vinca plants gave in summer significantly the highest value of number of main branches/plant (4.77), followed by spring (3.73). On the other hand, the autumn and the winter gave the lowest values (3.27 and 3.26, respectively) and there were no significant differences between these both seasons.

D. Interaction effects between resort's conditions, distance from the seashore and year's season:

Results in Table (8) indicated that Vinca plants grown in Costa Del Sol resort in the summer gave significantly the highest values of number of main branches/plant either at the distance of 500 m or 100 from the seashore (5.20 and 4.80, respectively) when compared with all other cases. Also, the lowest value of number of main branches/plant (3.00) was recorded in Green Beach resort from plants grown at the distance of 100 m from the seashore and in the autumn.

Table (8): Effect of resort's condition, distance from the seashore and the year's season on number of main branches/plant of *Vinca rosa* L.

4. Effect of resort's condition, distance from the seashore and the year's season on stem diameter (cm)

A. Effect of resort's conditions:

Data in Table (9) showed that there were no significant differences in stem diameter among the plants grown in the three resorts. The values of stem diameter were 0.60, 0.59 and 0.57 for Costa Del Sol, Marina and Green Beach, respectively.

B. Effect of distance from the seashore:

Season. (C)	Distance (m) (B)	Number of branches			Mean of (B)	Mean of (c)	
		Resorts (A)					
		Costa Del Sol	Green Beach	Marina			
Autumn	100	3.20	3.00	3.20	(100m) 3.65	3.27	
	500	3.60	3.20	3.40			
Winter	100	3.20	3.00	3.20		(500m) 3.87	3.26
	500	3.60	3.20	3.40			
Spring	100	3.80	3.60	3.60	3.73		
	500	4.00	3.60	3.80			
Summer	100	4.80	4.60	4.60	4.77		
	500	5.20	4.60	4.80			
Mean of (A)		3.93	3.60	3.75			
LSD 5%		A 1.33	B 0.56	C 0.46	ABC 0.1		

As shown in Table (9), there were no significant differences in stem diameter between plants grown at the distance of 100 and 500 m from seashore.

C. Effect of year's season:

Results in Table (9) indicated that *Vinca* plants gave in summer the highest value of stem diameter (0.73 cm), followed by spring (0.62 cm). On the other hand, the autumn and the winter gave the lowest values (0.48 and 0.53 cm, respectively) and there were no significant differences between these both seasons.

Table (9): Effect of resort's condition, distance from the seashore and the year's season on stem diameter (cm) of *Vinca rosa* L.

D. Interaction effects between resort's conditions, distance from the

Season.	Distance	Stem diameter (cm)			Mean of	Mean of
		Resort				
(C)	(B)	Costa Del Sol	Green Beach	Marina	of (B)	(c)
Autumn	100	0.48	0.42	0.48	(100m)	0.48
	500	0.52	0.46	0.50		
Winter	100	0.52	0.50	0.50	0.57	0.53
	500	0.56	0.54	0.54		
Spring	100	0.60	0.56	0.62	(500m)	0.62
	500	0.64	0.64	0.65		
Summer	100	0.74	0.68	0.72	0.61	0.73
	500	0.76	0.72	0.74		
Mean of (A)		0.60	0.57	0.59		
LSD 5%		A 0.55	B 0.22	C 0.17	ABC 0.23	

seashore and year's season:

Data in Table (9) indicated that Vinca plants grown in Costa Del Sol resort in the summer gave the highest values of stem diameter either at the distance of 500 m or 100 from the seashore (0.76 and 0.74 cm, respectively) when compared with all other cases. Also, the lowest value of stem diameter (0.42 cm) was recorded in Green Beach resort from plants grown at the distance of 100 m from the seashore and in the autumn.

II - *Acalypha wilkisia* Muell.

1. Effect of resort's condition, distance from the seashore and the year's season on plant height (cm)

A. Effect of resort's conditions:

Data in Table (10) showed that *Acalypha* plants in Costa Del Sol and Marina resorts were significantly higher (83.93 and 82.54 cm, respectively) than those growing in Green Beach (44.28 cm).

B. Effect of distance from the seashore:

Data in Table (10) cleared that there were significant differences between plants grown at the two distances, 100 and 500 m, from the seashore. Plants located at the distance of 500 m were higher than those at the distance of 100 m (73.60 and 67.20 cm, respectively). These results could be attributed to the effect of salt spray from the sea which affected the growth of plants. Usui and Shimizu (1986) studied salt spray distribution from beach line to costal terrace. They found that salt deposition was higher on the face of the terrace slope than at its foot or at the top.

Table (10): Effect of resort's condition, distance from the seashore and the year's season on plant height (cm) of *Acalypha wilkisia* Muell.

(C)	(m) (B)	Resorts (A)			(B)	(c)	
		Costa Del Sol	Green Beach	Marina			
Autumn	100	76.78	36.64	75.32	(100m)	65.62	
	500	79.32	48.28	77.40			
Winter	100	78.28	37.46	76.98		67.20	67.16
	500	81.46	49.24	79.56			
Spring	100	82.80	39.86	82.42	(500m)	71.39	
	500	88.02	49.70	85.56			
Summer	100	88.78	41.74	89.34		73.60	77.41
	500	96.02	54.82	93.76			
Mean of (A)		83.93	44.72	82.54			
LSD 5%		A 5.48	B 2.87	C 2.35	ABC 2.98		

C. Effect of year's season:

Results in Table (10) indicated that *Acalypha* plants were in summer significantly higher than in other season (77.41cm), followed by spring, 71.39 cm. Autumn and winter seasons gave the lowest values (65.62 and 67.16, respectively) and there were no significant differences between them.

D. Interaction effects between resort's conditions, distance from the seashore and year's season:

Data in table (10) indicated that *Acalypha* plants grown in Costa Del Sol resort at the distance of 500 m from seashore and in summer gave significantly the highest values of plant height (96.02 cm) when compared with most of the other cases. The highest plants at the distance of 100 m were observed in Marina resort in summer (89.34 cm). The lowest values of plant height were registered in Green Beach resort at 100 m from the seashore in autumn (36.64 cm).

2. Effect of resort's condition, distance from the seashore and the year's season on plant diameter (cm)

A. Effect of resort's conditions:

Data in Table (11) showed that *Acalypha* plants in Costa Del Sol and Marina resorts gave significantly the highest values of plant diameter 77.59 and 76.75 cm, respectively when compared with Green Beach resort (32.94 cm).

B. Effect of distance from the seashore:

As shown in Table (11), there were significant differences in plant diameter between the two distances from the seashore. Plants grown at 500 m gave bigger diameter (65.54 cm) than those at 100 m from seashore (59.31 cm). These results were in agreed with those of Usui and Shimizu (1986).

C. Effect of year's season:

There were significant differences among plant diameter in the four different seasons (table, 11). Plant diameter in summer was bigger than other

seasons (68.46 cm) while the smallest diameter was given in autumn (58.50 cm).

Table (11): Effect of resort's condition, distance from the seashore and the year's season on plant diameter (cm) of *Acalypha wilkisia* Muell.

D. Interaction effects between resort's conditions, distance from the seashore and year's season:

Season. (C)	Distance (m) (B)	plant diameter (cm)			Mean of (B)	Mean of (c)	
		Resorts (A)					
		Costa Del Sol	Green Beach	Marina			
Autumn	100	70.18	26.68	70.82	(100m)	58.50	
	500	75.34	34.84	73.12			
Winter	100	71.46	27.48	72.28		59.31	59.82
	500	77.12	35.50	75.06			
Spring	100	75.12	29.62	74.62	(500m)	62.93	
	500	82.42	37.52	78.30			
Summer	100	79.78	31.32	82.38		65.54	68.46
	500	89.28	40.58	87.42			
Mean of (A)		77.59	32.94	76.75			
LSD 5%		A 4.58	B 2.31	C 1.89	ABC 2.40		

Data in Table (11) indicated that *Acalypha* plants grown in Costa Del Sol and Marina resorts at 500 m from the seashore in summer gave significantly the highest values of plant diameter (89.28 and 87.42 cm, respectively) when compared with most of the other cases and there were no significant differences between them. The lowest values of plant diameter were observed in Green Beach resort at 100 m from the seashore in the autumn (26.68 cm).

3. Effect of resort's condition, distance from the seashore and the year's season on number of main branches per plant

A. Effect of resort's conditions:

Data in Table (12) showed that there were no significant differences among the plant regarding to number of main branches/plant between Costa Del Sol and Marina resorts (6.30 and 5.80, respectively). The lowest value of number of main branches/plant was registered in Green Beach resort (4.30).

B. Effect of distance from the seashore:

Results in Table (12) indicated that there was a significant difference between the two distances, 100 and 500 m from the seashore. Plants grown at 500 m gave the highest value (6.07) when compared with those at 100 m (4.87). These results were in agreed with those of Headley (1989) who found that salt spray reduced the growth of *Hedera helix* cultivars. He also indicated that the older shoot growth and dormant axillary buds were generally unaffected, but the soft young leaf and stem tissues were severely damaged.

C. Effect of year's season:

Results in Table (12) indicated that *Acalypha* plants gave in summer significantly the highest value of number of main branches/plant (6.27), followed by spring (5.40). On the other hand, the autumn and the winter gave the lowest values (5.10 and 5.10, respectively) and there were no significant differences between these both seasons.

D. Interaction effects between resort's conditions, distance from the seashore and year's season:

Data in table (12) indicated that plants grown in Costa del Sol resort at 500 m from the seashore and in the summer gave significantly the highest number of main branches/plant (8.80) when compared with most of the other cases, followed by those grown in Marina resort (7.40) at 500 m from seashore in same season and in Costa del Sol at 500 m from the seashore in the spring (7.40). It was clear that plants grown in Green Beach resort at 100 m from the seashore in all the seasons gave the lowest values for number of main branches (4.00).

Table (12): Effect of resort's condition, distance from the seashore and the year's season on number of main branches/plant of *Acalypha wilkisia* Muell.

Season. (C)	Distance (m) (B)	Number of branches			Mean of (B)	Mean of (c)
		Resorts (A)				
		Costa Del Sol	Green Beach	Marina		
Autumn	100	5.00	4.00	5.00	(100m) 4.87	5.10
	500	6.60	4.40	5.60		
Winter	100	5.00	4.00	5.00		5.10
	500	6.60	4.40	5.60		
Spring	100	5.00	4.00	5.00	(500m) 6.07	5.40
	500	7.40	4.60	6.40		
Summer	100	6.00	4.00	6.40		6.27
	500	8.80	5.00	7.40		
Mean of (A)		6.30	4.30	5.80		
LSD 5%		A 1.63	B 0.84	C 0.69	ABC 0.88	

4. Effect of resort's condition, distance from the seashore and the year's season on stem diameter (cm)

A. Effect of resort's conditions:

Data in Table (13) showed that *Acalypha wilkisia* in Costa Del Sol and Marina resorts gave the highest values of stem diameter (2.31 and 2.24 cm, respectively), but there was no significant difference between them. Green Beach resort gave the lowest value (1.08 cm).

B. Effect of distance from the seashore:

Data in Table (13) cleared that there were no significant differences between the two distances 100 and 500 m from the seashore (1.77 and 1.98 cm, respectively).

Table (13): Effect of resort's condition, distance from the seashore and the year's season on stem diameter (cm) of *Acalypha wilkisia* Muell.

Season. (C)	Distance (m) (B)	Stem diameter (cm)			Mean of (B)	Mean of (c)
		Resorts (A)				
		Costa Del Sol	Green Beach	Marina		
Autumn	100	2.12	0.76	2.06	(100m) 1.77	1.74
	500	2.18	1.24	2.10		
Winter	100	2.16	0.82	2.14	(500m) 1.98	1.80
	500	2.26	1.28	2.16		
Spring	100	2.30	0.84	2.24	(500m) 1.98	1.90
	500	2.40	1.34	2.28		
Summer	100	2.42	0.92	2.44	(500m) 1.98	2.05
	500	2.40	1.46	2.48		
Mean of (A)		2.31	1.08	2.24		
LSD 5%		A 1.08	B 0.54	C 0.44	ABC 0.56	

C. Effect of year's season:

Data illustrated in Table (13) showed that there were no significant differences between all seasons regarding to stem diameter of *Acalypha* plants, but the summer gave the highest value of 2.05 cm followed by the spring (1.90 cm). The autumn and the winter gave the lowest values (1.74 and 1.80 cm, respectively).

D. Interaction effects between resort's conditions, distance from the seashore and year's season:

Data in table (13) indicated that plants grown in Marina resort at 100 and 500 m from the seashore in the summer gave the highest stem diameter (2.44 and 2.48 cm, respectively) when compared with most of the other cases. It was also clear that plants grown in Green Beach resort at 100 m from the seashore in the autumn gave the lowest value of 0.76 cm for stem diameter.

III- *Erythrina indica*

1. Effect of resort's condition, distance from the seashore and the year's season on plant height (cm)

A. Effect of resort's conditions:

Data in Table (14) showed that *Erythrina* plants grown in Costa Del Sol and Marina resorts gave the highest values of plant height (239.62 and 239.31 cm, respectively), but their were no significant differences between them. Green Beach resort gave the lowest value of plant height (226.91 cm).

Table (14): Effect of resort's condition, distance from the seashore and the year's season on plant height (cm) of *Erythrina indica*

]B. Effect of distance from the seashore:

Data in Table (14) indicated that there were no significant differences in plant height due to the differences in distances from the seashore, although the plants grown at the distance of 500 m from seashore had bigger

Season. (C)	Distance (m) (B)	Plant height (cm)			Mean of (B)	Mean of (c)
		Resorts (A)				
		Costa Del Sol	Green Beach	Marina		
Autumn	100	209.34	193.54	206.08	(100m) 234.21	206.94
	500	224.98	198.76	208.96		
Winter	100	218.66	202.76	216.52	(500m) 236.35	212.93
	500	212.60	208.44	218.60		
Spring	100	246.18	232.64	246.18	(500m) 236.35	241.70
	500	241.60	236.00	247.60		
Summer	100	282.28	271.10	285.24	(500m) 236.35	279.54
	500	281.36	272.02	285.28		
Mean of (A)		239.63	226.91	239.31		
LSD 5%		A 3.95	B 2.81	C 2.29	ABC 2.92	

diameter (236.35 cm) than those at the distance of 100 m (234.21 cm) that because *Erythrina* plants grown very good along the cost zone.

C. Effect of year's season:

Results in Table (14) indicated that *Erythrina* plants gave in the summer significantly the highest values of plant height (269.55 cm) when compared with the other seasons, followed by the spring (241.70 cm). But, it was observed that the autumn gave significantly the lowest value for plant height when compared with the other seasons (206.94 cm).

D. Interaction effects between resort's conditions, distance from the seashore and year's season:

Data in table (14) indicated that plants grown in Marina resort at 500 m from the seashore in the summer gave significantly the highest values of plant height (285.28 cm) when compared with most of the other cases, followed by 285.24 and 282.28 cm for Marina and Costa Del Sol resorts at 100 m from seashore in same season, respectively. It was also clear that plants grown in Green Beach resort at 100 m from the seashore in the autumn gave the lowest value for plant height (193.08 cm)

2. Effect of resort's condition, distance from the seashore and the year's season on plant diameter (cm)

A. Effect of resort's conditions:

Data in Table (15) showed that *Erythrina* plants in Costa Del Sol and Marina resorts gave the highest values of plant diameter (173.22 and 172.54 cm, respectively), but their was no significant differences between

them. Green Beach resort gave the lowest value for plant diameter (168.18 cm).

Table (15): Effect of resort's condition, distance from the seashore and the year's season on plant diameter (cm) of *Erythrina indica*

B. Effect of distance from the seashore:

Data in Table (15) indicated that there were no significant differences in plant diameter due to the differences in distances from the seashore,

Season. (C)	Distance (m) (B)	plant diameter (cm)			Mean of (B)	Mean of (c)
		Resorts (A)				
		Costa Del Sol	Green Beach	Marina		
Autumn	100	136.280	122.360	133.600	(100m)	130.227
	500	130.320	123.840	134.960		
Winter	100	148.880	135.040	146.280	170.083	146.270
	500	143.440	156.560	147.420		
Spring	100	184.180	172.100	181.060	(500m)	182.090
	500	180.640	193.200	181.360		
Summer	100	232.260	220.860	228.100	172.538	226.657
	500	229.740	221.480	227.500		
Mean of (A)		173.218	168.180	172.535		
LSD 5%		A 4.788	B 3.067	C 2.505	ABC 3.186	

although the plants grown at the distance of 500 m from seashore had bigger diameter (172.54 cm) than those at the distance of 100 m (170.08 cm) that because *Erythrina* plants grown very good along the cost.

C. Effect of year's season:

There were significant differences among plant diameter in the four different seasons (table, 15). Plant diameter in summer was bigger than other seasons (226.66 cm) while the lowest diameter was given in autumn (130.23 cm).

D. Interaction effects between resort's conditions, distance from the seashore and year's season:

Data in table (15) indicated that plants grown in Costa Del Sol resort at 100 m from the seashore in the summer gave significantly the highest plant diameter (232.26 cm) when compared with most of the other cases, followed by plants grown in the same resort at 500 m from the seashore (229.74 cm). It was also clear that Green Beach resort at 100 m from the seashore in the autumn gave the lowest value for plant diameter (122.36 cm).

3. Effect of resort's condition, distance from the seashore and the year's season on number of main branches per plant

A. Effect of resort's conditions:

Data in Table (16) showed that there were no significant differences among the plants regarding to number of main branches/plant between the

three resorts. The number of main branches/plant was 4.53, 4.50 and 4.25 for Costa Del Sol, Marina and Green Beach, respectively.

B. Effect of distance from the seashore:

As shown in Table (16), there were no significant differences in number of main branches/plant due to the differences in distances from the seashore. However, the branching was more in plants grown at the distance of 100 m from seashore (4.45 branches/plant) than in those grown at the distance of 500 m (4.40 branches/plant) because of Erythrina plants grew very good along the cost and there were good maintenance practices like fertilization and irrigation where many important people own gardens at that distance.

Table (16): Effect of resort’s condition, distance from the seashore and the year’s season on number of main branches/plant of *Erythrina indica*

C. Effect of year’s season:

Data illustrated in Table (16) showed significantly differences among

Season. (C)	Distance (m)	Number of branches			Mean of (B)	Mean of (c)	
		Resorts (A)					
		Costa Del Sol	Green Beach	Marina			
Autumn	100	3.80	3.40	3.80	4.45	3.63	
	500	3.60	3.60	3.60			
Winter	100	3.80	3.40	3.80		4.40	3.63
	500	3.60	3.60	3.60			
Spring	100	4.80	4.40	4.80	4.40	4.63	
	500	4.60	4.60	4.60			
Summer	100	6.20	5.40	5.80	4.40	5.80	
	500	5.80	5.60	6.00			
Mean of (A)		4.53	4.25	4.50			
LSD 5%		A 1.27	B 0.55	C 0.45	ABC 0.43		

the number of main branches of Erythrina plants which gave in the summer the highest value of number of main branches/plant (5.80), followed by spring (4.63). On the other hand, the autumn and the winter gave the lowest values 3.63 of each.

D. Interaction effects between resort’s conditions, distance from the seashore and year’s season:

Data in table (16) indicated that plants grown in Costa Del Sol resort at 100 m from the seashore in the summer gave significantly the highest number of main branches per plant (6.20) when compared with the other cases. Plants grown in Green beach at 100 m from the seashore in the autumn and winter gave the lowest values of 3.40.

4. Effect of resort’s condition, distance from the seashore and the year’s season on stem diameter (cm)

A. Effect of resort’s conditions:

Data in Table (17) showed that there were no significant differences in stem diameter among the plants grown in the three resorts. The values of stem diameter were 7.22, 7.12 and 6.94 for Costa Del Sol, Marina and Green Beach, respectively.

Table (17): Effect of resort’s condition, distance from the seashore and the year’s season on stem diameter (cm) of *Erythrina indica*

B. Effect of distance from the seashore:

As shown in Table (17), there were no significant differences in stem diameter between plants grown at the distance of 100 and 500 m from

Season. (C)	Distance (m) (B)	Stem diameter (cm)			Mean of (B)	Mean of (c)
		Resorts (A)				
		Costa Del Sol	Green Beach	Marina		
Autumn	100	6.380	5.700	6.100	(100m)	6.213
	500	6.240	6.460	6.400		
Winter	100	6.700	6.000	6.420	6.917	6.543
	500	6.580	6.820	6.740		
Spring	100	7.440	6.740	7.140	(500)	7.307
	500	7.520	7.500	7.500		
Summer	100	8.480	7.780	8.120	7.262	8.293
	500	8.380	8.480	8.520		
Mean of (A)		7.215	6.935	7.117		
LSD 5%		A 1.233	B 0.751	C 0.614	ABC 0.780	

seashore.

C. Effect of year’s season:

Results in Table (17) indicated that *Erythrina* plants gave in the summer the highest value of stem diameter (8.29 cm) when compared with the other seasons, followed by the spring (7.31 cm). But it was also observed that the autumn gave the lowest value (6.21cm).

D. Interaction effects between resort’s conditions, distance from the seashore and year’s season:

Data in table (17) indicated that *Erythrina* plants grown in Marina resort at 500 m from the seashore in the summer gave the highest value of stem diameter (8.52 cm), followed by those in Green Beach (8.48 cm) at the same distance and season. Additionally, the plants grown in Costa Del Sol resort at 100 m from the seashore in the summer gave higher values than those grown in the other resorts at the same distance and in the same season. The plants grown in Green Beach resort at 100 m from the seashore in the autumn gave the lowest value of stem diameter (5.70 cm).

According to the obtained results from this study, it could be concluded that all investigated plant species grown in Costa Del Sol resort gave in general better results in all studied parameters than those grown in the other results. Plant species located at the distance of 500 m from the seashore grew better than those at the distance of 100 m with few exceptions

which were achieved due to protection and/or well maintenance practices. The summer was the best season for growing all plant species followed by spring, whereas autumn and winter gave the least results. The highest values of investigated characteristics were almost registered from plant species grown in Costa Del Sol resort combined with the distance of 500 m from the seashore and the summer season.

Based on own observations and the obtained results of this investigation, the followings could be recommended:

1. North Coast of Egypt still needs more researches to add more ornamental plant species for using in landscape gardening.
2. The condition (direction – overhead) is a very effective factor for landscape gardening and serving on the resorts.
3. Plants grown beside the seashore need protection methods from wind, sand and sea sprays especially in autumn and winter months. Also, we need more plant species which are tolerant to the previous conditions and grow well like *Erythrina indica* and *Vinca rosea*.
4. To increase the benefits and improve the function of the recreation areas, the resorts need more areas for sports play ground.
5. It must be using a completely serving program from the green areas in the resorts round the year.
6. Serving gardens must be done by a technical and it must be Agronomist all tools.
7. Preferring to use only a kind of sand called (Heba) for planting all the plant without any average of clay that caused decreasing of overhead from the construction and giving the best plants. It is preferable to use organic manure (Compost) to cover all nutrient requirements (the soil clay carry causing of many disease like nematode and it s price is very expensive).
8. It must be using the modern methods for irrigation, differences kinds of water, and perfect quantity from irrigation.
9. Construction resorts must be done by professional company.

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دراسات بيئية ولاندسكابية على بعض نباتات الزينة المستخدمة بالقرى السياحية بالساحل الشمالي في مصر
محمد نزيه شرف الدين ، حسين على أحمد ، محمد يونس على عبد الله و باسم عوض فوزى علام
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أجرى هذا البحث خلال الفترة من عام 2003 الى 2006 م على بعض نباتات الزينة المستخدمة في تنسيق الحدائق بالقرى السياحية في الساحل الشمالي. وقد اختيرت لهذا البحث ثلاثة منتجات أستجمامية هي (كوستا ديل سول – جرين بينتش - مارينا المرحلة الخامسة) وهي تمثل تقريبا الأنواع المختلفة للمنتجات الإستجمامية بالساحل الشمالي في مصر. ويهدف هذا البحث إلى دراسة تأثير كلا من ظروف المكان والبعد عن شاطئ البحر (100 و 500 م) وفصول السنة الأربعة على بعض نباتات الزينة المنزرعة بهذه القرى. ولقد شملت هذه الدراسة ثلاثة نباتات ممثلة لثلاثة مجموعات نباتية هي الونكا كنبات عشبي ، الأكاليفا كشجيرة والإرثرينا كشجره. ولقد أوضحت النتائج المتحصل عليها أن هناك فروق معنوية بين المنتجات الثلاث في غالبية الصفات المدروسة. ولقد تميز منتج كوستا بأفضل نتائج لكل الصفات المدروسة لنباتات الزينة المنزرعة به فقد أعطت النباتات النامية به أعلى القيم بالنسبة لارتفاع النبات، قطر المجموع الخصري، عدد الافرع الرئيسية على النبات وقطر الساق، تبعه مباشرة منتج مارينا. أما منتج جرين بينتش فقد أعطى أقل قيم لهذه الصفات.

بالإضافة إلى ذلك فإن القرب من شاطئ البحر يعرض النباتات لعوامل تؤثر سلبيا على نموها فالنباتات المنزرعة على بعد 100 متر من شاطئ البحر كانت أقل كفاءة في نموها بالمقارنة بالنباتات المنزرعة على بعد 500 متر من شاطئ البحر والتي أعطت نتائج أفضل للصفات المدروسة. و يمكن تقليل التأثير السلبي للقرب من شاطئ البحر عن طريق وضع التصميمات المناسبة وعمل حماية للنباتات.

وجدت فروق معنوية بين فصول السنة الأربعة ،فقد أعطى الصيف أعلى النتائج تبعه الربيع وبفروق قليلة ،أما الخريف والشتاء فقد أعطيا أقل النتائج.

أعطى منتج كوستا ديل سول مع مسافة 500 متر من شاطئ البحر في موسم الصيف أفضل نتائج من حيث (ارتفاع النبات، قطر النبات، عدد الافرع الرئيسية وقطر الساق).