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THE REHABILITATION OF INTERTROPICAL AND SEMITROPICAL PLANTS IN SPECIAL MICROCLIMATIC MEDITERRANEAN CONDITIONS THE CASE OF OF NAUPLIO TOWN, GREECE

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Abstract: - Palms is one of the most important plant families, with great contribution to human aesthetic and use. Planted in groups, combined with other plants, or separately, their elegant form is impressive and imposes to the Landscape. Its versatility is admirable. Most Palm genus are abstemious, with extreme resistance and minimum demands. People always showed great interest to adopt exotic plants, trying to transfer and harmonize tropical and subtropical environments to their own surroundings. This report evaluates the results of similar past motions and presents a fairly comprehensive list of reasons of the potential of using Palms at urban parks, under special microclimatic conditions, in the Mediterranean basin. In particular is examined the case of Nauplio town in Greece, proposed planting design with tropical plants and ending up with useful recommendations for future.

Key-Words: - Mediterranean planting, palms, exotic plants, tropical design, semitropical, palm's uses, landscape design

1 Introduction

Over 3,000 years ago the Phoenicians were the dominant seafaring nation of the Mediterranean. From the current Lebanon, they used to explore the West world, establishing colonies and new plant's habitats [1]. However, despite these early beginnings, the use of hardy palms and other "exotic" plants really owes its origins to eighteenth and nineteenth century [2]. Since then many people follow this new line to planting design and start cultivate exotic plants in alien climates. Previous experiences suggested that several palm species could be grown successfully with minimal winter protection [3]. According to *Meerow, 1994* [4], their beauty, durability and variety rank palms among the most highly valued of all landscape plants in subtropical and tropical regions. By their very bold, exotic and dramatic nature, palms easily command the most visible, high-profile and strategic locations [2]. As landscape plants, palms have a delicate architecture structure with a vertical accent and a special form and fabric in their leaves and stems [2]. According to *Muirhead, 1961* [5], spaces effectively landscaped with palms must be shaped by the structural use of palms in combination with other plant forms, paving, lawns, water and buildings [2]. According to *Bouchair, 2004* [6], palm trees can

modify the microclimatic and can also shade the ground surface causing a reduction in the environmental temperature, with the advantage of cooling by evapotranspiration through the leaves.

Aims of this Study

Through the case study of Park O.S.E. in Nauplio, we will examine the possibility of the development of intertropical and semitropical species, in special Mediterranean conditions, and according to the evaluation of the current situation of each plant, we would like to perform a proposal of "City – Open Botanical garden" "Urban open-air Botanical garden" in order to encourage the recreational use of the site and attract the tourism's interest.

The concept of the design was inspired by the city of Nauplio. Our primarily objective was to combine the park with the history and the culture of the region, which is diffused in the entire city, and trying to gather hopefully in useful conclusion, so to encourage similar practices, in the Mediterranean basin.

2 Literature Review

2.1 The potential of palms like landscapes

The idea of using palms in Landscaping is to give a tropical effect [2]. The usage of palms, indeed changes the mood of a place, depending the

mixtures you suggest. This family can work separately but also it can be combined with other trees or shrubs (of other families). The effect will be dramatic because palms are elegant plants with upright stems and thin tall trunks, so they add energy and motion in places. They are suitable for symmetrical uses, in lines or in tree rows, or as focal points in entrances, but also their form and texture can be combined with most of the plants so they can be used in groups. Palms are plants which can easily be adapted to new conditions as long as the climate is warm and the soils are moist but well – drained [7]. Most of them are low maintained, that's why in most cases the results are successful. Palms only are frightened by the frosts and the low temperatures [7].

2.2 An evaluation of similar cases

Similar studies with this in Nauplio have been recorded in all over the Mediterranean basin, like in Genova, in San Remo, in South France (Nikaia, Monaco) and in Spain in Majorca, but also in Rhodes in South Greece and in Antalya in Turkey. Following it is mentioned the Italian Riviera and Monaco examples.

2.2.1 The Italian Riviera

The Italian Riviera is widely known and greatly appreciated by Northern Europeans for its very agreeable climate. Especially in the old and famous city of Genova, has been encouraged a similar planting style, which was trying to establish a great variety of palms and other exotic plants. The most common plants which have been used were *Phoenix canariensis* and *Chamaerops humilis*. These two seem particularly well suited to the climate and dryness in summer and succeed in places where other plants are having a hard time. Together with *Washingtonia*, they are also the only palms to be self-reproducing in undisturbed locations. Other common palms along the Riviera are *Washingtonia filifera* and *Washingtonia robusta*, an occasional *Phoenix dactylifera*, and some *Trachycarpus fortunei*, which seem very unhappy in Italy's hot & dry summers, most of them having only a few leaves, with dried tips. In Imperia, there are many fine public gardens and parks and rare palms that can be found there include *Brahea armata*, a very nice grove of fruiting *Brahea edulis*, tall *Livistona australis*, *Livistona chinensis* and *Butia capitata*. Finally the San Remo's public places are imaginatively planted with many palms, including those less often seen, such as *Rhapis excelsa* and *Syagrus romanzoffianum*. There is a *Butia capitata*

var. *strictior*, and one *Butia eriospatha*, with its distinctive, woolly spathe. An *Archontophoenix cunninghamiana* provides living proof of San Remo's mild climate.

2.2.2 Palms in Monaco

Also known as the Jardin Exotique de Monaco. Truly exotic gardens are perched high on the bluffs overlooking Monaco, Monte Carlo, and the beautiful Mediterranean. The cacti and succulent specimens are enormous, exquisite and well-labelled along the paths which zig-zag up and down the cliffs.

As we can see, in the above cases the concept to encourage tropical plants (palms, cacti & succulents) in warm Mediterranean places indeed worked well. Palms managed to adapt, relatively quickly, to the new environments, adding new features and new elements in the Landscape. With their imposed, accurate, forms they succeeded to dominant to the new places. From the other side, people accepted the invasion of the alien plants joining the brand new environments.

3 Methodology

This report concerns the rehabilitation of O.S.E. Park, in the municipality of Nauplio, in Greece, with tropical plants, so that to come up future recommendations to similar practices to the Mediterranean basin. At first stage, similar situations in the Mediterranean countries have been examined and evaluated. Therefore has been examined the followings:

1. Similar practices to the Mediterranean countries have been recorded
2. Estimation of the current condition of palms in these cases
3. Promotion and establishment of the new planting design to the Park O.S.E. in Nauplio
4. Examine the growth rate of palms
5. Evaluate the results
6. Make Future recommendations

4. The case of rehabilitation of O.S.E. park in Nauplio in south Greece

4.1 The Landscape: The Case study is in the South part of Greece in Peloponnesus, in the municipality of Nauplio. It's an ancient city, with a great historical and cultural importance. Nauplio

succeeded to combine the charm of the mountains but also the warming of seaside areas. Its Architectural structure is magnificent. Three different rhythms can be described: the Venetian, the Islamic and the Greek neoclassic. In every part of the city you can admire sustainable buildings, monuments and ancient constructions.

In particular the place of study concerns four formatted borders along the Old Interchange, which called Park O.S.E. The general formation of the landscape is flat and in the sea elevation. Northwest is Palamidi, a castle on a mountain, with 1000 steps, and the Old city of Nauplio, where many buildings exist as they were in the ancient years.



Fig. 1: The acropolis of Nauplio. Natural rock formation penicula length 900m and 400m height was entrenchment of the hill since Venetian Times.



Fig.2: Greek neoclassic Buildings elaborated by Palm Trees in Nauplio

4.2 The climate: Nauplio is a place with gentle, mild temperatures. Its longitude is 37,7°C. The mid annual temperature point is 18, 7°C, with July as the warmer month and January the cooler one. The mid annual rainfall is 510,1mm, with low points during the summertime. Nauplio chances lack of strong Winds, or winter frosts, or summer desiccations, as it happens in many places in all over Greece. Thus Nauplio has specific microclimatic conditions, so it could be the

appropriate place to practice the new planting style.

4.3 The soil: Geologically the place of the study consists by current illuviations of valleys and plains. The grounds of the valley are adobes, suitable for rural cultivations. But the water level is relatively high, no more than 1m from the ground surface and it's much enhanced with salts because of the adjacency with the sea side area.

Table 1. Existing species in O.S.E. park

<i>Acanthus mollis</i>	<i>Bougainvillea</i>
<i>Acca sellowana</i>	<i>spectabilis</i>
<i>Albizia julibrissin</i>	<i>Grevillea robusta</i>
<i>Alocasia</i>	<i>Harpephyllum caffrum</i>
<i>macrorrhiza</i>	(μοναδικό)
<i>Pyrus spinosa</i>	<i>Hibiscus mutabilis</i>
<i>Archontophoenix</i>	<i>Jacaranta mimosifolia</i>
<i>cunninghamiana</i>	<i>Jasminum humile</i>
<i>Bambusa aurea</i>	<i>Livistona decipiens</i>
<i>Bauhinia variegata</i>	<i>Magnolia grandiflora</i>
<i>Buddleia davidii</i>	<i>Malvaviscus arboreus</i>
<i>Butia capitata</i>	<i>mexicanus</i>
<i>Callistemon</i>	<i>Melia azedarah</i>
<i>citrinus</i>	<i>Parkinsonia aculeata</i>
<i>Canna indica</i>	<i>Passiflora edulis</i>
<i>Casuarina cristata</i>	<i>Persea americana</i>
<i>Catalpa</i>	<i>Pinus halepensis</i>
<i>bignoinoides</i>	<i>Phoenix canariensis</i>
<i>Clivia miniata</i>	<i>Phoenix theophrastii</i>
<i>Corynocarpus</i>	<i>Photinia glabra</i>
<i>laevigata</i>	<i>Punica granatum flore</i>
<i>Cotarderia argentea</i>	<i>pleno</i>
<i>Cotinus laurifolius</i>	<i>Rosa sp.</i>
<i>Eletaria</i>	<i>Sabal causiarum</i>
<i>cardamomum</i>	<i>Saccharum officinarum</i>
<i>Erythrina crista-</i>	<i>Schefflera</i>
<i>gali</i>	<i>actiniphylla, S.arboricola</i>
<i>Ficus australis</i>	<i>Strelizia .augusta</i>
<i>Ficus belinger</i>	<i>Thevetia neriifolia</i>
<i>Ficus nitida,</i>	<i>Trachycarpus fortunei</i>
<i>Ficus microphylla</i>	<i>Weigelia florida</i>
<i>F.begalensis</i>	<i>Bignonia contesa sara</i>
<i>Ficus alba</i>	<i>Bignonia unguis cati</i>
<i>Ficus elastica</i>	<i>Pandorea jasminoides</i>
<i>Ficus elastica</i>	<i>Brachychiton acerifolius</i>
<i>decora belgaplant</i>	
<i>Ficus magnolioides</i>	
<i>Bougainvilleaglabra</i>	

4.4 The vegetation: Nauplio is a city with special landscape. Especially in the place of study the dominant, existing plants are the tropical and the semitropical plants, meanwhile the lack of color and the lack of groundcovering plants is obvious enough. In the following table (Table 1, 2) have been recorded the existing species in O.S.E. Park.

Table 2. Intertropical and Semitropical plants which have been recorded and grown up successfully, in park O.S.E., the last 15 years, but have been destroyed by human activity [9]

<i>Kennedia rubricate</i>	<i>Aster novi-belgie</i>
	<i>Marjorie</i>
<i>Chaconia</i>	<i>Hypericum patulum</i>
<i>Howea bellmoreana</i>	<i>Sesbania punicea</i>
<i>Livistona chinensis</i>	<i>Ceanothus sp</i>
<i>Alocasia odora</i>	<i>Leonotis leonorus</i>
<i>Odontonema strictum</i>	<i>Anisodonte x</i>
	<i>hypomandarum</i>
<i>Hibiscus rosa sinensis</i>	<i>Leptospermum sp</i>
<i>Hibiscus syriacus</i>	<i>Abelia grandiflora</i>
<i>Lantana camara</i>	

4.5 Main uses of the site.

The place of study “The Old Interchange” is a park that used mainly by tourist and by locals as well. It’s a special park where concerts or recitals usually take place. At last the area offers hospitality to a traditional café where people enjoy spend their leisure time by walking or sitting (fig 3).



Fig. 3. Top View of Park of OSE

5 Results and discussion

5.1 The growth rate of palms

According to Zona, 2001, [8], in the question "How fast do palms grow?", reference books may give relative terms, such as "slow" or "moderately fast,"

but actual growth rates are seldom reported. So we would like to start the discussion by the presentation of the following growth rate data gathered from relatively small- sized palms in Nauplio in South Greece (fig 4).

In the Figure 5 it can be can observed the development of the palms in the Park O.S.E. in Nauplio [9].



Fig. 4 *Washingtonia filifera* is elaborate the main walkway of Park of OSE

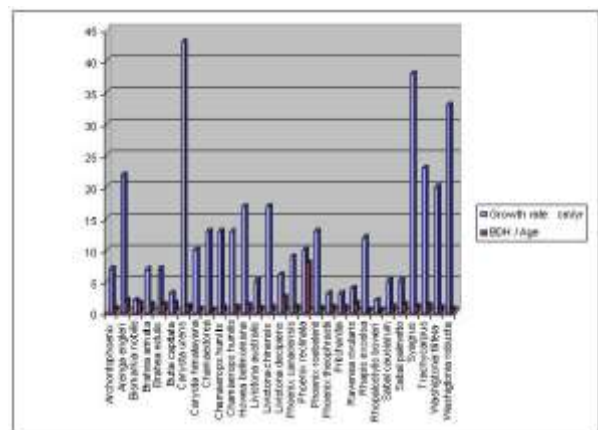


Figure 5. The growth rate in Palm Trees in Nauplio [9]

5.2 An evaluation of the growth rate of palms

The results (Fig. 1) imply that a considerable variation exists in average growth rates. The up growth of each plant has been affected by environmental conditions like lighting, watering, spacing, or by genetic factors like inheritance,

vitality, competitiveness. So it's difficult to exploit the results of that figure 5. It can only be descry which tropical plants are the most tolerant, the most easily adaptable and easy and fast growing.

5.3 The proposal

5.3.1 The concept design

This study implies the rehabilitation of Park O.S.E. in the municipality of Nauplio.

The intervention was demanding:

- ❖ The aesthetical improvement of the site
- ❖ Conservation of the structure and planting elements, which were in a good condition
- ❖ The Enrichment of the existing plant species, with particular emphasis to the coverage of the ground and the augmentation of color features and elements (Fig. 6).

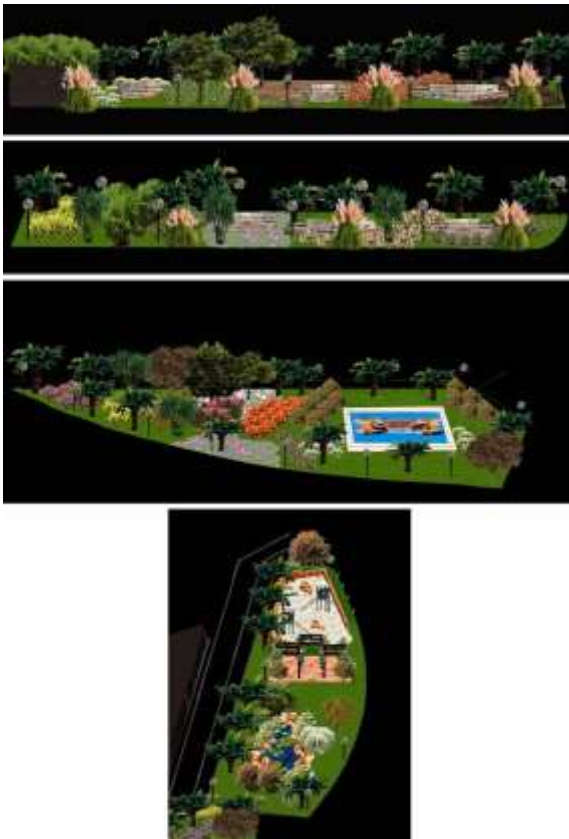


Figure 6. The overall design of the site

- ❖ The creation of special water features and dry constructions, like water jets or rock gardens.
- ❖ Effectual and adequate lighting
- ❖ The establishment of an irrigation system
- ❖ Low cost maintenance

The place of study is surrounded by the situated routes and roads so the general form of the design

should be firmly geometric. But the lines the textures the forms of the planting design we wanted to be more free and irregular.

5.3.2 The constructions

The proposed constructions were made of rock and were followed the same line of design as the historical elements of the city in Nauplio. The proposed steps looks like the steps of Palamidi, with the same native rock material, in the same color, and texture. So the rock gardens were two or three steps in parallelogram shapes in linear set up. The width of the borders was relatively small (5m-30m) and the distance of the inhabited area was quite close (10m), so the height of the constructions should be kept low.

Its been followed the same concept to the water features too. A big parallelogram shape with two perimetric steps around and in the middle the same rock gardens steps in linear set up.

5.3.3 The lighting

The lighting should be adequate enough so thus to breathe security but also to be accurate and district in order to project the features but also to display optionally some particular specimen plants.

5.3.4 The planting design concept

The planting design concept was the creation of a tropical and semitropical arboretum (palmetum), with palms and ornamental grasses but also with colorful shrubs and low covering sedges, rushes and ferns. Therefore has been proposed few shade trees to continue the existing tree lines and help also to heat mitigation. The evergreen shrubs and ground covers at the understory can also slow winds through the site and allow summer breezes to filter through.

Around the lake it is proposed wetland, marginal and floating plants to encourage the tropical wildlife.

6 Conclusions

The establishment of intertropical and semitropical plants is possible and works successfully unless you don't take in consideration the special requirements they demand, like warm climate, rich soils, sunny or shaded areas (it depends on the species). In general are easy going and fast adjustable species and in rapidly rhythms infest totally

areas and manage to dominate to the Landscape. They predispose for a much warmer style in designing concept but also affect user's minds because they symbolize the hot weather, the sea side areas and summer vacations. Public spaces are modulated by their users, so

Landscape Architects can use design to increase vegetation throughout the city and adjust the design proposals to the surrounding landscape, trying to combine the proposed lines with the existing ones and the users' preferences. Tropical plants dispose an exquisite style. So don't be afraid to use especially in places that have been adapted.

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