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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 chinesis 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 adapted, 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 peninsula length 900m and 400m height was entrenchment of the hill since Venecian Times.](image1)

![Fig. 2: Greek neoclassic Buildings elabotated by Palm Trees in Nauplio](image2)

### 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

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

<table>
<thead>
<tr>
<th>Kennedia rubricate</th>
<th>Aster novi-belgie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chacona</td>
<td>Marjorie</td>
</tr>
<tr>
<td>Howea bellmoreana</td>
<td>Hypericum patulum</td>
</tr>
<tr>
<td>Livistona chinensis</td>
<td>Sesbania punicea</td>
</tr>
<tr>
<td>Alocasia odora</td>
<td>Ceanothus sp</td>
</tr>
<tr>
<td>Odontonema strictum</td>
<td>Leonotis leonorus</td>
</tr>
<tr>
<td>Hibiscus rosa sinensis</td>
<td>Anisodontea x hypomandarum</td>
</tr>
<tr>
<td>Hibiscus syriacus</td>
<td>Leptospermum sp</td>
</tr>
<tr>
<td>Lantana camara</td>
<td>Abelia grandiflora</td>
</tr>
</tbody>
</table>

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).

4.6 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

Fig. 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.

References: