

DANTE'S JOURNEY IN THE BOTANICAL GARDEN

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Abstract

"Dante's journey in the Botanical Garden" is a project that aims at a broader knowledge of Dante's poetry and his love for Nature and the cultural, environmental and naturalistic heritage exhibited in the Museums and Botanical Gardens, through a multimedia application that engages visitors in an interactive and pleasant way in a cognitive process, using their mobile device, be it smartphone or tablet. The project offers to the visitors an innovative way of using what is contained in the Botanical Garden Museum of the University of Salento, in its natural development, and it can be replicated in other similar contexts, following an application model structured according to a well-defined path of preparation, management and presentation of contents.

Keywords

Cultural and Environmental Heritage, Multimedia Technologies, Dante poet and ecologist, Nature in Dante Alighieri, Biodiversity in the Divine Comedy, Botanical garden University of Salento, Plant Biodiversity, QR codes

"Dante's journey in the Botanical Garden" is a project that aims at a broader knowledge of Dante's poetry and his love for Nature and the cultural, environmental and naturalistic heritage exhibited in the Museums and Botanical Gardens, through a multimedia application that engages visitors in an interactive and pleasant way in a cognitive process, using their mobile device, be it smartphone or tablet. The project offers the visitors an innovative way of using what is contained in the Botanical Garden Museum of the University of Salento, in its natural development, and it can be replicated in other similar contexts, following an application model structured according to a well-defined path of preparation, management and presentation of content.

The multimedia application developed for this project is functional to reaching a wide audience, with particular attention to the new generations, more inclined to the use of mobile technologies and primary actors for the dissemination of cultural values rooted in tradition

It aims to increase the knowledge that the Botanical Garden Museum can transmit to visitors: information on biodiversity, botanical insights, images, documents, freely accessible audio and

video files, references to local traditions, historical and cultural references.

The use of QR (Quick Response) codes, installed near the areas and plants of interest, allows visitors to reach, simply by framing them with the lens of the camera of their mobile device (smartphones, PDAs, handheld computer, netbooks, tablets, iPad), the web application that manages text and multimedia contents.

It is therefore possible, using a free App for QR Code reader with your mobile phone, to integrate, in a second and at will, a simple visit to the Botanical Garden with additional information, available in real time and directly on site, making the visit a rich, interactive and participatory experience (see Figs. 1-2).

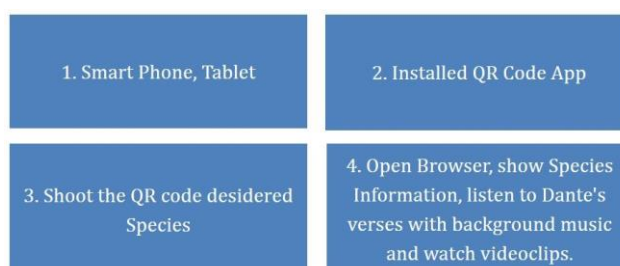


Fig. 1: Procedure to downloading multimedia information of plant species



Fig. 2: Botanical Garden Museum of the University of Salento. See videoclips:
https://www.biofuturo.net/media/videos/2022/05/20/img_0235.mp4
https://www.biofuturo.net/media/videos/2022/05/20/img_0241_trim.mp4

QR technology is now well established in this type of context, as it was introduced in 1994 by the Toyota subsidiary, Denso Wave, for the storage and management of industrial components warehouses¹.

The method therefore lends itself well to the management of large and distributed information.

However, it is the originality of the applied case study that makes the project a new concept particularly suitable for dissemination activities for the cultural sphere.

It is an innovative itinerary able to make literature, art, music, plant species, biodiversity and in-depth analysis interact through new technologies.

The title of the project "*Dante's journey into the Botanical Garden*" reveals the presence of an

exceptional guest: Dante, the ecologist who will virtually accompany us on this trip. In it appear the plants and flowers to which Dante refers in the Divine Comedy, directly or in similes, with the relative verses (Valzano & Sartor, 2021).

Antonio Della Rocca's reciting voice², demonstrates interpretative wisdom; the background music of Maestro Andrea Gargiulo of the MusicaInGioco Association³, of Mauro Durante of the Canzoniere Grecanico Salentino⁴, and Daniele Durante, artistic director of the "La Notte della Taranta"⁵ (recently passed away prematurely), contribute to make it an instructive and even more enjoyable travel.

These musical contents, expressed in digital form through quality audio recordings, were also used as an accompaniment for numerous video clips relating to the reproductive cycle of plants,

¹ Denso Wave Incorporated. QRcode.com [Internet]. Aichi (JP): Denso Wave Incorporated; 2014 Available from: <http://www.qrcode.com/en/>

² Antonio Della Rocca is a Journalist of the "Corriere del Mezzogiorno" - Apulian edition of the "Corriere della Sera", Agi (Italian News Agency); narrator for documentaries, voice actor.

³ MusicaInGioco: Music 'n' Play is a non-profit association, founded in Apulia in 2010 by the musician Andrea Gargiulo with the aim of social promotion of children and young people through an innovative path of musical education. It is an orchestra for social inclusion, using music to unite differences, to bring diversities together, and to break down prejudice.

Based on Abreu's "El Sistema" method, it offers free lessons and musical instruments to children and teenagers, especially those with socio-economic, personal or physical difficulties and/or different disabilities.

⁴ The Canzoniere Grecanico Salentino, founded by the writer Rina Durante and the musician Daniele Durante, who later passed the leadership to his son Mauro, is the multi-award winning group at the top of the world folk music charts.

⁵ "La Notte della Taranta" is the biggest popular music festival in Europe, dedicated to the revival of the ancient dance of Salento "Pizzica", as well as to the fusion with other music styles.

accompanied by animated images to represent the different evolutionary stages of the documented tree species.

The video clips, stored using standard playback formats, such as MP4, are accessible via the Web, through numerous hardware platforms, and can be directly reached by scanning the QR codes (see Figs. 3-4).

The Project "Dante's journey in the Botanical Garden" was launched on the occasion of the seven hundred years after the death of Dante Alighieri and carried out as part of the numerous initiatives related to "Dantedì" (national day dedicated to Dante Alighieri, 25th March 2020-2022) and is also in line with the Manifesto of the journal SCIRES -IT (SCIENTIFIC RESEARCH and INFORMATION Technology <http://www.sciresit.it/>), an international, eco-sustainable and open-access scientific journal, which combines the main principles of the Berlin Declaration on Open Access with the objectives of the International Convention on Biological Diversity, for open access to knowledge, for the conservation and sustainable use of biodiversity and the restoration of the natural environment.

The journal also provides, for each open access electronic publication, an environmental restoration intervention in protected, sensitive areas, ecological networks, with the introduction

of local ecotypes of indigenous species. (Proietti & Valzano, 2011; Boero & Lucarella, 2018; Valzano & Cigola 2020; Valzano & Gallo, 2021).

"Our mission of disseminating knowledge is only half complete if the information is not made widely and readily available to society. New possibilities of knowledge dissemination not only through the classical form but also and increasingly through the open access paradigm via the Internet have to be supported." (Berlin Declaration).

"We can survive as a species only if we live by the rules of the biosphere. The biosphere has enough for everyone's needs if the global economy respects the limits set by sustainability and justice." (Vandana Shiva, Indian environmental activist). (SCIRES-IT Manifesto, 2011).

The Project, promoted by Virginia Valzano (Technical-Scientific Coordinator of CEIT - Euro-Mediterranean Center for Technological Innovation for Cultural and Environmental Heritage and Biomedicine, founder and Editor-in-Chief of the magazine SCIRES-IT), was created in collaboration with Rita Accogli (Technical-scientific manager of the Botanical Garden Museum of the University of Salento), Gabriella Sartor (Professor and owner of the "Incontri con Dante" course at the UTE of Udine) and Maurizio



Fig. 3: QR code "The Project"



Fig. 4: Label with the QRC and Dante's verses placed at the entrance to the Botanical Garden

«Non avea pur natura ivi dipinto, / ma di soavità di mille odori / vi faceva uno incognito e indistinto.»

«Nor in that place had nature painted only, / But of the sweetness of a thousand odors / Made there a mingled fragrance and unknown. »

Purgatory VII, 79-81

Romani (Senior Associate CNR-IBE - Institute for the Bioeconomy), all three members of the SCIRES-IT Editorial Team.

Maria Regina Maggiore (manager of the "SIT - Ecotekne" - Telematic Information Service at the Department of Biological and Environmental Sciences and Technologies of the University of Salento and member of the Editorial Team of SCIRES-IT) has collaborated in the realization and dissemination of the Project.

The authors of the Project widely agree that the unstoppable urban and industrial development of the past two centuries has resulted in the gradual reduction of green areas and of many botanical species, also jeopardizing the survival of widely share them.

It is undeniable that the natural vegetation of coastal, flat, hilly and mid-mountain landscapes, which evolved over millenary periods, has given way to urban conglomerates and intensive cultivation, often to monocultures.

The most obvious negative consequences were, in addition to the shrinkage of green areas, the extinction of numerous species, the growing threat to biodiversity and the emergence of new and persistent plant diseases.

The plant world cannot continually be offended and threatened; its role is of primary importance in an ecosystem, since it represents the essential energy resource for countless forms of life on earth: secular trees, plants, bushes up to the humblest couch grass, are basic in local ecosystems and therefore precious.

If a species is threatened, and therefore, is reduced and disappears, the balances are altered and damaged, so that mechanisms are triggered with results that are not always predictable, which are difficult to contain and often unstoppable.

The aim of the project is to arouse, maintain and perhaps enhance attention to the botanical species present in Italy and in particular in Salento, and that the path we have undertaken can be shared with people projected towards the enhancement of natural biodiversity, the conservation of the autochthonous flora of Salento and the cultivation of local agricultural products, hoping for an ever wider sensitivity and

knowledge of the plant world, essential bases for its protection.

Knowledge is a common good and it is important to encourage its widest dissemination

The project "*Dante's journey in the Botanical Garden*" already reveals in the title an interesting peculiarity in the conception. In fact, it is connected to Dante's poetics, highlighting the solid and spontaneous love of the Supreme Poet for nature; theme already addressed and illustrated, in various ways, by the authors Virginia Valzano and Gabriella Sartor: in one of the "*Dialoghi al femminile*" (Female Dialogues), accessible on the CEIT website (<http://www.ceit-otranto.it/index.php/progetti/362-dantedi>), in the electronic publication, open access, "*In viaggio con Dante. 'Vago già di cercar dentro e dintorni'. Un itinerario virtuale ad accesso aperto.*" (eISBN 979-1280503-13-8), available on the website of the CLIOedu Publisher (<https://www.clioedu.it/in-viaggio-con-dante>), in the electronic publication "*Dante ecologo e poeta nel mondo. Illustrazioni 'divine' di Gustave Doré.*", also freely accessible on the website of the publisher CLIOedu (www.clioedu.it/dante-ecologo-poeta) and in the English version of the homonymous essay "*Dante as an ecologist and poet in the world. 'Divine illustrations' by Gustave Doré*", published in 2021 on n. 1 of vol. 11 of SCIRES-IT journal (DOI:<http://dx.doi.org/10.2423/i22394303v11n2p41>).

The elements of the plant world present in the Divine Comedy find their place in the project, illustrated by means of fact sheets that contain their characteristics, the citation of the verses referring to them, their presence in the national territory and in Salento, the botanical description, the habitat, collection, use and, finally, their properties and benefits (see for example Figs. 5-6).

The list includes laurel, fig, ash, mulberry, apple, olive, pine, oak, flax, myrtle, lemon, papyrus, rush, couch grass, marsh cane, nettle, ryegrass, ivy, rose, lily, daisy, violet, red and yellow flowers, to name a few.

The Project, therefore, focuses on the plants, herbs and flowers that Dante inserts in the Divine Comedy, directly or through similes and metaphors.⁶

⁶ For the Italian text of the Poem, the Authors referred to *La Commedia secondo l'antica vulgata* (4 vols.), edited by G. Petrocchi, Edizione Nazionale della Società Dantesca Italiana,

Milano 1966-1967. The English translation of Dante's verses is taken from *The Divine Comedy of Dante Alighieri*. Translated by Henry Wadsworth Longfellow, Elsa Edition 2021.



Fig. 5: QR code “La Quercia”



Fig. 6: Label with the QRC and Dante's verses placed next to the oak

«Lo secol primo, quant'oro fu bello, / fé savorose con fame le ghiande, / e nettare con sete ogni ruscello»

«The primal age was beautiful as gold; / Acorns it made with hunger savourous, / And nectar every rivulet with thirst.»

Purgatory XXII, 148-150.

«La carne d'i mortali è tanto blanda, / che giù non basta buon cominciamento / dal nascer de la quercia al far la ghianda.»

«The flesh of mortals is so very soft, / That good beginnings down below suffice not / From springing of the oak to bearing acorns.»

Paradise XXII, 85-87

As can be seen from the list, not only illustrious plants are the object of attention, but also the humblest ones, such as rush, ryegrass, couch grass, clover and even fescue.

Dwelling on Dante's interest in the elements of Creation (both as a divine Creature and as a reality of potential interest in itself) and on the broad knowledge that he reveals about them, we understand the reasons why some critics place a particular emphasis on Franciscan formation, as it is based on a great love for nature in its many forms.

The tercets (terza rima) inspired by nature are so numerous as to prompt some scholars to adopt a key to reading the Poem that enucleates the references to the plant world.

The verses, in which plants, herbs and flowers appear, highlight the wonder and surprise that Dante feels at the presence of some plants, their shape, their growth, the blossoming of flowers, the sprouting of the grass, to the swaying of branches and leaves in the wind.

Furthermore, they reveal his extraordinary ability to synthesize the fruit of his observation of the natural environment and the vast knowledge

of cultural sources, centered on the world of nature.

Dante, in fact, draws on his experiences, on the works of the Latin Classics, such as Virgil, Horace, Ovid (poets of the “bella schola” met in Limbo), on Pliny's *Naturalis Historia*, on the work *De Vegetalibus* by Alberto Magno and on books on herbs and on plants contemporary to him.

It should also be noted that Dante's enrolling to the Apothecary Corporation, besides opening access to political offices, also allowed him to get further knowledge on the plant heritage.

Naturally, botany in the in the Divine Comedy is strongly connected to allegorical meanings: the journey in the three worlds must, first of all, make us reflect on our mistakes, arouse the hope of salvation, basing our actions on evangelical principles.

Nature, then, is to be loved because it is the fruit of divine creation, but Dante's felt need to know, to give an important role to each element of nature and to describe its various aspects, with admirable verse, awareness and interest, claims his role as a Poet in the world and at the same time as an ante litteram Ecologist.

Dante's descriptions do not stop only at the morphological aspect of the plant elements, the changing colors of the fruits but also their scent which attracts both man and insects and animals, evoking taste and goodness.

Dante's references to plants constitute an important testimony not only to their regional and national presence but also to their use, consumption and cultivation methods. News that have been preserved in the culture of our country, for centuries passing on information on cultivation methods, on the ripening and harvesting times of their fruits or parts to be used in the preparations suggested by the popular pharmacopoeia. News also confirmed by the Salento ethnobotanical studies carried out within the scientific activities of the Botanical Garden Museum of the University of Salento, established in the years (1991-1992) in which the Rio de Janeiro Convention on the defense and conservation of biodiversity was drafted.

Environmental problems and new educational needs have led the Botanical Garden Museum to open up to the territory, which had to face the need for information, answers and correct behavior.

The explorations, with floristic collections and propagative material, have made it possible to draw up the check list of the Salento Flora and to multiply its species, in order to preserve them *ex situ*, in the Botanical Garden, to set up living collections to be visited by the public. to study ecological and reproductive aspects, for their subsequent reintroduction in sites now devoid of biological equilibrium destroyed by human activities.

In the Botanical Garden Museum of the University of Salento, areas of Mediterranean scrub have been reproduced, with structuring woody species (oaks, cypresses and various shrubs), which form the scaffolding of the plant cover and allow the spread of many herbaceous species that form a turf rich in biodiversity and, above all, of species known to the local ethnobotanical culture for their nutritional value (alimurgic plants), pharmacological and officinal (wild chicory, sow thistle, various stinking hawksbeards, cardoons...).

In this environment it is possible to come across numerous species mentioned by Dante: oaks, laurel, pine, myrtle, flax, field daisies, wild roses, nettle, ryegrass, ivy, and others.

The plant biodiversity of a territory cannot be separated from the agricultural one, therefore,

species and their many local varieties of food use in danger of extinction, overwhelmed by the Global Market, by the abandonment of the countryside and from the change in food trends, have been recovered and kept in Botanical Garden Museum. *Ex situ* conservation techniques have also been refined for agricultural biodiversity (germplasm banks, catalog fields) but, above all, farmers have been persuaded to conserve *on farm* and citizens, looking for and consuming local products, in the recovery of taste and health properties.

The plant biodiversity of a territory also includes all those wild species that have been subject to domestication by man, hence local agriculture, thanks to which today we can still recover a large number of crop varieties by species. So it was for the numerous varieties of figs still found in Salento, vines, mulberries, pears, citrus fruits, pomegranates, which for centuries have represented the sweet fruit available locally and which still today mark the history, the traditions, knowledge and food trends of our population.

Alongside the commonly known fruit trees, there are many others, less known, apparently not domesticated and which therefore retain their wild character, but equally linked to human care and a well-preserved naturalistic context. Such are, for example, the Carob (*Ceratonia siliqua* L.), the Jujube (*Zyzyphus lotus* (L.) Lam.), the winter Medlar (*Mespilus germanica* L.), the Rowan (*Sorbus domestica* L.), the Blackthorns (*Prunus sp pl*), the Quince (*Cydonia oblonga* Mill.), the Azarole (*Crataegus azarolus* L.), the Pomegranate (*Punica granatum* L.) and many others that are losing their character of "gentle" (cultivated) fruits and return to their wild habitus because they are no longer cultivated.

A small nucleus of olive trees, recovered after uprooting from their original site and transplanted into the Botanical Garden, represents one of the most important agricultural ecosystems in the area: the olive grove. In this habitat, numerous wild species spread, believed to be the progenitors of plants domesticated by agriculture, such as artichoke, carrot, chicory, lettuce, oats, barley, wild pear, blackthorn.

A small area with agricultural soil is used for educational and experimental purposes, here catalog fields of herbaceous species (and their varieties) of horticultural interest are created.

In recent years, exploration activities, interviews, bibliographic and economic

investigations, recovery of germplasm (propagation material, especially seeds), have brought to light the agricultural biodiversity in Salento, one of richest in the Puglia Region.

There are about 400 herbaceous varieties recovered (Horticultural, Leguminous and Cereal) and whose germplasm is preserved; many of these are at risk of extinction or genetic erosion, others are niche, typical of very small localities or communities, which do not even know the local market (the yellow-purple carrot of Tiggiano, know as Pestanaca Santo Ippazio, the Chicory white catalonia, White eggplant, Summer melon, Tomato "pappacogu", Lupine bean, dwarf pea, black-eyed bean, black chickpea, lentil from Soleto, local barley).

The seeds of these varieties are purified and preserved, in order to exchange them or use them for future improvement programs of the currently most adopted commercial varieties.

Water bodies are important for the ecological conditions of a territory, as they mitigate aridity, allow the passage and the stationing of migratory birds and provide humans with multiple plant species to be used in the local crafts sector.

The reclamation of wet areas (small or large) led, first of all, to the alteration of the water network that ensured the circulation of water both on the ground and on the surface, making some areas even more arid and depopulated. There were numerous aquatic species used by local crafts for the creation of objects essential to peasant and domestic life.

In the Botanical Garden Museum, two small artificial ponds have been created, covering an area of about 500 m², which house as many as 20 aquatic species (hydrophytes) such as Water Lilies (*Nymphaea* sp pl), Papyri (*Cyperus* sp pl), Bulrush (*Typha angustifolia* L., *Typha latifolia* L.), Common reed (*Phragmites australis* (Cav.) T. ex S.), Water iris (*Iris pseudoacorus* L.), Swamp Sawgrass (*Cladium mariscus* (L.) Pohl), Rushes (*Juncus* sp pl); some of them are mentioned by Dante in his *Cantiche*, confirming their age-old knowledge and use.

Another important scientific research sector of the Botanical Garden Museum is that of the recovery and multiplication of species at risk of extinction with particular regard to those included in the Regional and National Red List, endemic to Salento and of phytogeographic interest.

Of equal interest are the medicinal, aromatic, pharmaceutical and ethnobotanical species, which have had so much importance in the local diet and which have been handed down over the centuries.

Ornamental plants also have their own area of focus: an elevated crag rockery housing several species of succulents, with their strange morphology and beauty, attracts visitors, more than any other collection, probably, because they already grow them in their own gardens and they know some of their names.

Arboreal and herbaceous ornamental plants, including some belonging to the genus *Iris*, such as *Iris Florentina* (known as the Lily of Florence), the rose, the violet, the daisy and other species that Dante mentions in his *Cantiche*, prosper around the rockery, rich in succulents.

The multimedia application implemented at the Botanical Garden Museum of the University of Salento was used and particularly appreciated on the occasion of the Apulian Biodiversity Week.

Students and professors of the same University, of the Research Institutes and of the Apulian Schools of all levels, visitors in general, as well as nurserymen who produce flowers and plants in the nursery, were able freely to enjoy the spectacle of the Botanical Garden, the beauty of the spring flowering of plants and Dante's poetry wisely declaimed and accompanied by an original musical background.

They had the opportunity to learn and deepen, without any guide, in a free path, chosen at their leisure and according to their specific interests, through a multisensory and interactive experience, the characteristics of the species present in the Botanical Garden, the importance of plant biodiversity and the message of love and respect for nature by Dante poet and ecologist ante litteram (Valzano & Sartor, 2021).

The Project is accessible on the CEIT website, (<http://www.ceit.otranto.it/index.php/progetti/393>) and on the Biofuturo.net website (<https://www.biofuturo.net>), created on the initiative of a research group of the Institute of Biometeorology (IBIMET), now the Institute for Bioeconomy (IBE) of the National Research Council and of the Study Center for the Application of Informatics in Agriculture (CeSIA) of the Academy of Georgofili.

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