2023 IMEKO TC-4 International Conference on
Metrology for Archaeology and Cultural Heritage
Rome, Italy, October 19-21, 2023

The Acait of Tricase (LE, Apulia, Italy): an agricultural cooperative for tobacco production. Surveys and conservation status.

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Abstract **– The tobacco industry in Puglia has been for about a century the main economic resource for the farmers and the dealers. The first processing with Levantine tobacco began in Terra d'Otranto (the current provinces of Lecce, Brindisi and Taranto) between the late XIX and early XX centuries and were linked to the Agricultural Consortium of the Capo di Leuca territory (from 1938 Acait - Società Cooperativa Agricola Industriale del Capo di Leuca). Acait was the first cooperative agricultural consortium of the Terra d'Otranto born in Tricase (Lecce, Italy) in December 1902. In 2003 the municipality of Tricase acquired the historic factory, considered a "monument" of the industrial heritage of southern Italy, as a peculiar economic, social and human testimony of the territory. In 2018, the southern part of building was affected by a collapse. Given the high value of this industrial heritage artifact, a restoration project of the entire building was promoted. The paper illustrates some results of an ongoing study that combines data from historical-archival research with an architectural survey campaign and diagnostic analyses on the state of conservation.**

I. INTRODUCTION

At the end of the nineteenth century, western society stopped smelling tobacco and preferred to smoke it; therefore, the consumption of snuff decreases and progressively increases the consumption of "spagnolette" (cigarettes) [1]. This situation produced an increase in demand for tobacco that immediately posed the problem of a rapid development of indigenous tobacco cultivation. Therefore, in the last decade of the nineteenth century began the first attempts to experiment to grow Levantine tobacco (better known as oriental, light or yellow) for the production of cigarettes. The tobacco industry represented a very important reality for the economy and employment in the national agricultural context. This led the government to consider the question of a national tobacco growing that could relieve the country from heavy foreign imports. This led the government to consider the question of a national tobacco growing that could relieve the country from heavy foreign imports. The oriental tobacco cultivation and processing, between the last decade of the nineteenth century and the end of the last century, has represented, with the production of oil and wine, the main economic resource in the province of Terra d'Otranto specially in the surrounding area of Lecce and Gallipoli [2,3,4]. In Tricase, in province of Lecce, the first cultivation experiments were carried out by Giuseppe Gallone, prince of Tricase and senator of the kingdom of the Two Sicilies. He planted a variety of tobacco called "xanti jakà" to check whether the climate and soils were suitable for this cultivation. The results were excellent so much so that he asked and obtained from the Government the authorization to continue the experiments; from these attempts were recognized immediately the potential that the cultivation of oriental tobacco in Terra d'Otranto.

Following these first encouraging results, in 1897 the Reale Manifattura of Lecce started the production phase of the Levantines; the period between 1900 and 1915 sees the flourishing of this new industry that in a little more than a decade will become one of the pillars of the Salento economy. Starting from 1901, to supply a greater quantity of raw tobacco to the State Manufactures, the system of "Special Concessions" was introduced, the most important regulatory form with which tobacco was cultivated and processed in Italy. They arose to meet the needs of the Manufactory, which, with the increase in the consumption of tobacco products (cigars and cigarettes), required an increase in production. With the spread of these concessions, from the early twentieth century and immediately after the First World War, the "golden age" of Italian tobacco growing began, with the construction of hundreds of warehouses for the pre-manifacturing processing of the leafs [5,6,7].

Dealers need to handle tobacco grown in the countryside in suitable premises; hence the need to find special environments to carry out the second phase so-called "pre-manufacture"; that is, the processing, the manipulation and the preparation of the product that was carried out through some operations: selection, stowage, sorting, brazing, etc.. [2].

In almost all the municipalities of Salento between 1905 and about 1930 many historic buildings (convents, monasteries, baronial palaces, castles, etc.) were converted or new warehouses were built; due to the significant increase of the tobacco cultivation. In 1929 there were 511 dealers and 784 warehouses [7,8]: among these there was also the "tobacco warehouse" of Acait of Tricase.

II. THE TOBACCO "FACTORY": FROM KNOWLEDGE TO THE PROPERTY OF CAPITALIZATION

The idea of a Consortium linked to the first processing of Levantine tobacco comes from the initiative of Alfredo Codacci-Pisanelli, a tenacious interpreter and supporter of proposals aimed at reducing the economic difficulties of the territory. He concentrated on the only true resource of Terra d'Otranto, the agricultural one, enhancing it in the form of a cooperative [9]. The historic warehouse of Tricase, known as the "tobacco factory" of the Consorzio Agrario Cooperativo del Capo di Leuca, is considered a "monument" of the industrial heritage of Southern Italy because it has been a unique economic testimony, social and human for the whole territory of southern Italy (Figure 1). Over the years the Company has distinguished itself in initiatives in the economic and social field, with measures aimed at promoting cultural education, childcare and, in general, the development of the Cape of Leuca. Starting in 1921, the Consortium awarded wedding prizes, in 1937 it built a school (later became a state school) and in 1952 it donated 800 square meters of land for the construction of the "House of the Mother and the Child".

Fig. 1. Acait of Tricase, main entry.

On 22 May 1938, an extraordinary shareholders' meeting sanctioned the transition from Consorzio Agrario to Cooperativa Agricola [10,11]. In the same year, a crèche (Fig. 1) with an adjoining nursing room and a medical-surgical clinic were established in the structure, which provided free of charge to all workers with medicines, eye checks and tuberculosis prevention initiatives. In short, we can say with conviction that Acait was a precursor of the welfare state, known today as welfare.

At the end of the seventies of the last century, began the crisis of tobacco cultivation that led many companies to close permanently. Although Acait was a strong structure, it unfortunately did not escape the market crisis and bad policy at national and regional level. Tobacco growing it was no more part of national policy strategies and, despite numerous national conferences (one of which was held in Tricase in December 1979), the situation worsened. The twenty-year crisis of tobacco also leads the Acait, the most prestigious and long-lived cooperative of Puglia and southern Italy, to failure and the consequent alienation of historic buildings and attractive land.

The Cooperative closed in November 1995 because it was put into liquidation; thus began a long state of abandonment of about twenty-five years. On 21 July 2003 the industrial complex was acquired by the municipality of Tricase. It is built on an area of 19 thousand square meters, 3800 of which intended for the production process and offices. The architectural structure is located along the streets F.lli Allatini, Leonardo da Vinci and L. Pirandello; it has a sober facade facing A. Codacci Pisanelli square, with a refined door with ashlars for access to the warehouse: on the north side is the entrance to the offices. (Fig. 2).

Fig. 2. Acait of Tricase: factory nursery photo (1950s).

The original building developed only on the ground floor. After the transfer of ownership to the Agrarian Consortium, it underwent several extensions and remodeling of the plan, both to meet the health and social needs of the many workers, and to make room for the technological innovations developed in those years.

Around the early forties of the'900, an elevation was made in the central portion, accessible by an internal staircase.

At the beginning of the fifties there were extensions in the back: a filter area with a small courtyard and a shed for the mechanization of the production process. In the shed there are still some machineries such as the humidifier cage, the sliding tables for the first sorting and a conveyor belt: from here the tobacco went first into a mixer and then to the mechanical press, from which came the ballets ready for stewing and subsequent fermentation [12].

The plant of the factory is almost square (Fig. 3); on the east front, on the north-south axis, are: the room of the president and the council; the waiting room; the offices; the guesthouse (then technical office); the assembly room; the nursery with the nursing room and the toilets. At the center of the long elevation is the rusticated portal for driveway access to the warehouse and a large open atrium. Around the atrium are the rooms for the sorting of leaves (then storage of dried packages); the workshop; the boiler; five drying cells; the control room; the environment with freight elevator; the toilet and laundry; a modern oil mill to produce olive oil. The large processing room (built in 1948) on the west side, along the north-south side, was intended for the first processing of tobacco, then for the handling and preparation of raw material. The structure is in local calcarenitic stone ashlars, and the rooms are almost all covered by Lecce vaults called "at the corners": the large room has a barrel vault with a low sixth.

Fig. 3. Acait of Tricase: general plan.

The significant asset value of the site allowed, after the knowledge process, the activation of patrimonialisation processes [13,14,15], aimed at the recovery and enhancement of the important production structure. (AM)

III. THE ARCHITECTURAL SURVEY

To produce a structural analysis of the architectural evidence has been necessary to plan a 3D survey campaign capable to offer an accurate multiscale digital reproduction. In particular, the survey concerned elevations of the building and was based on acquisition methods already tested in previous research projects [16-17,18], with the combined use of the 3D laser scanning and the close-range digital photogrammetry techniques. The terrestrial survey was performed using a Leica P20, a time-of-flight topographic laser scanner, with an acquisition capacity of approximately 120 m of radius and a speed of 1 million points per second.

The matching of the point clouds was performed manually with the Leica Cyclone software (v 8.1.1), then exported in .pts format. The file was then imported into Geomagic (Studio 2003) with a decimation of 50% and processed for the calculation of the mesh. The work in situ was set up to cover the exterenal perimeter and required 25 scan station set at resolution of 6 mm on a dome of 10 m.

About the digital photogrammetry survey, were acquired 2238 photos using a Sony Alpha 7R digital camera equipped with CANON EF 24MM F/1.4 L USM II lens. The data set was processed within Agisoft Metashape Pro, obtaning an accurated 3D textured models. The 3D Image-Based models, perfectly scaled and oriented, were merged in the same 3D space with the .obj model obtained from the laser scan (Fig. 4). (IF, FG)

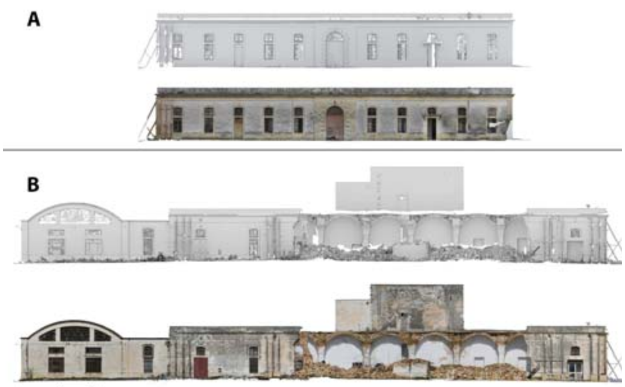

Fig. 4. Acait of Tricase, 3D Laser scanner and digital photogrammetry survey: A) est façade; B) sud façade.

IV. THE DIAGNOSTIC STUDY

The diagnostic campaign conducted by an IR thermographic survey in situ and laboratory investigations. The former was aimed to detect the presence and distributions of the humidity within the building structure. Laboratory investigations were aimed to assess the effects of a fire, whose evidence was suggested by macroscopic observations, although this event was not reported in any historical documents. In 2018, after a strong rainstorm, part of the structure collapsed. The vault collapse revealed traces of an historic fire, which were hidden by the presence of plasters, in the form of fumes and a diffuse grey and reddish color across the thickness of the masonry units up to some centimeters from the surface.

A. Thermographic survey

The thermographic survey was carried out using a FLIR Mod. T650SC thermal camera with a 640x480 sensor, with a resolution better than 20 mK. The survey was carried out in the late morning of 19 January 2019 with sunny weather and temperatures varying between 5 and 10 °C. In a passive thermographic investigation, this climatic condition was not exactly suitable to highlight thermal contrasts inside the building [19]. On the contrary, better results were obtained from the thermographic survey carried out on the external surfaces exposed to solar irradiation, where the natural heating better highlights thermal contrasts due to alteration forms. The thermographic shots taken on the vaults and masonry walls within the building rooms showed areas with low temperature values (Fig. 5).

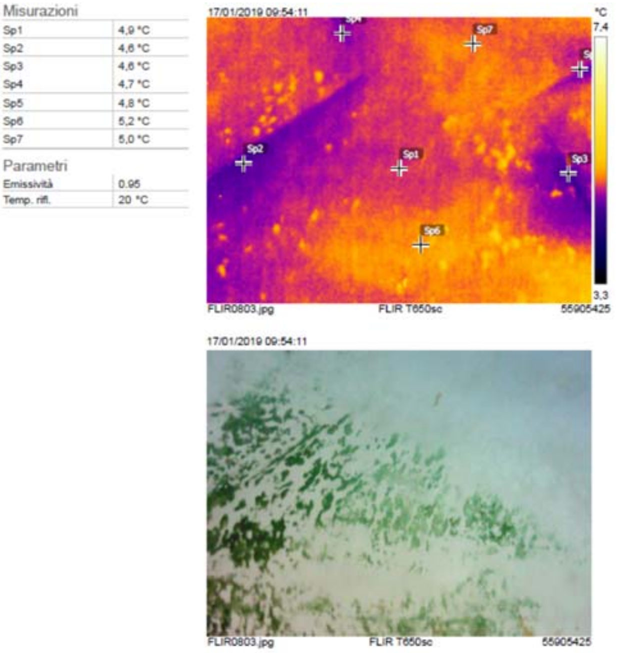

Fig. 5. Thermographic image of a vault.

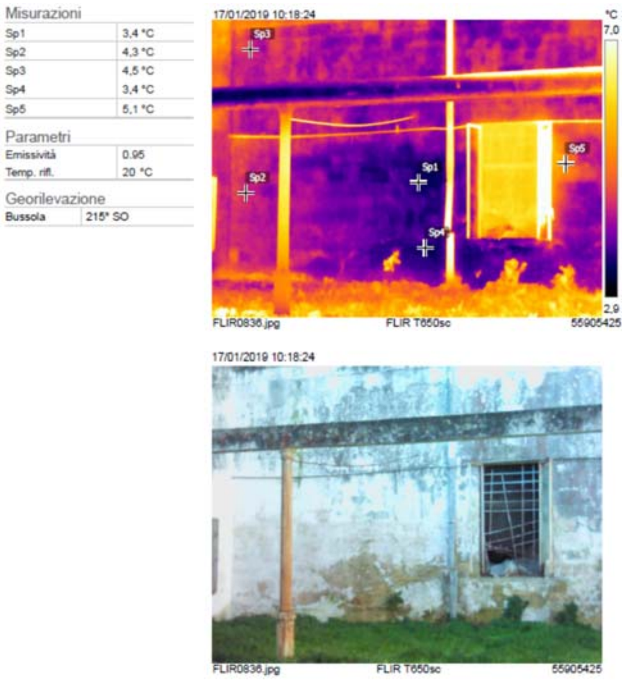

Fig. 6. Thermographic image of a part of the external wall.

These areas seem to be due to the presence of humidity, often confirmed by biological patinas. In some cases, low temperatures were recorded on the central parts of the vaults. Such cold areas likely determine as these parts of the vaults are nearest to the external surface, due to the lowest thickness of the filling material. Thermographic images taken on the external masonry walls (Fig. 6) showed thermal contrasts, which mainly relate to rising dump and plaster loss from the surface.

B. *Laboratory analyses and tests*

The diagnostic study aimed to assess fire effects was conducted by investigating changes in mineralogical composition, microstructure and mechanical performance of the stone within the building.

At this purpose, the following technics were used:

- Optical microscopy (OM) in transmitted light. Thin-section samples were observed by means of an optical microscope (Eclipse LW100 Nikon).
- Scanning Electron Microscopy (SEM). Observations of the stone microstructure were performed in low vacuum mode (EHT 20kV VPSE Signal), by means of a ZEISS microscope (Mod. EVO 40).
- X Ray diffractometry (XRD). Diffractometric analyses were performed by means of a Philips 1742 diffractometer (APD - 3.6j version) in the following work conditions: CuKα, 40kV, 20mA, 2θ step size of 0.02°, counting time 1.25s, scan interval between 3° and 60°. The diffraction data were processed with a X'Pert software - Philips Analytical.
- Ultrasonic Pulse Velocity (UPV) propagation. The propagation velocities of the ultrasonic waves were measured according to ASTM D2845-05 (ASTM 2005) by direct transmission method using a TDAS 16 (Boviar) instrument and probes with a frequency of 55kHz. Measurements were taken on cube specimens 70mm side obtained from collapsed masonry blocks after drying at 70°C, and along each x, y, z direction.
- Uniaxial Compressive Strength (UCS) tests. They were performed according to the UNI EN 772-1 (UNI 2011) on the same specimens used for UPV test, after drying at 70° C. A universal testing machine (Metrocom Engineering spa), with a load capacity of 200kN and a speed of 0.2 mm/min, was used for the test.

The diagnostic investigations supported at microstructural and compositional levels the evidence of a fire in the calcarenite employed in the building, macroscopically marked by color changes from the yellow-beige to grey and reddish color (Fig. 7a).

The OM observations showed that the building stone is a biocalcarenite of grainstone type, made of calcareous fossil remains, having sizes mainly between 0.3 and 0.4 mm. Sporadic quartz and feldspar crystals were observed. The micrite is nearly absent and the cement is poor. It is made of calcite, with a texture varying from micro-sparitic to sparitic type. Some iron rich agglomerations and red pigmented bioclasts were observed and they were found to increase in the grey and reddish color levels within the stone (Fig. 7b, c). This finding suggests an effect of high temperatures on the iron rich components by mineralogical changes, as resulting from XRD analyses. The patterns obtained for the yellow-beige and red levels in the stone showed different mineralogical compositions (Table 1). The presence of goethite was detected in the yellow-beige level. Goethite was absent in the red level, instead hematite was detected. The transformation of goethite to hematite comes from a dehydroxylation process. Such a transition takes place at temperature of 300°C [20]. Therefore, the change from yellow-beige to reddish color of the stone is consistent with the thermally induced transformation of goethite to hematite. This transition phase indicates that temperatures around 300°C, at least, were reached in the red stone levels during the fire.

	Mineralogical composition	**UPV**	**UCS**
Yellow level	calcite, quartz, feldspar, goethite	2,248±36	2.85±0.44
Red level	calcite, quartz, feldspar, hematite	1,766±104	2.74±1.16

Tab. 1. Mineralogical composition, ultrasonic pulse velocity (UPV) and uniaxial compressive strength (UCS) detected for the yellow-beige and red stone levels.

Evidence of a thermal damage in the form of micro-fissuring affecting red and grey levels were observed by SEM (Fig. 7d). Microcracks were mainly between the grains, and their widths were under 1 µm, mostly between 0.2 and 0.6 µm. Moreover, a decrease of the propagation velocities in the samples from the red level was recorded by UPV test (Table 1). It was 21 %.

UPV decrease as an effect of the heating is reported in the literature [21, 22], with entities depending on the temperature and stone structure, as well. It comes from the thermal micro fissuring, which causes the reduction of the propagation velocities.

Nonetheless, the recorded micro-fissuring had a negligible effect on the mechanical performance of the stone. Very close values of the compressive strength were measured in both yellow and red levels, corresponding to a strength loss of 4% in the discolored level (Table 1). High porosity may account for a slight microstructural damage recorded for the investigated calcarenite, where pores likely prevent an extensive damage as they behave as free spaces for the expansion of calcite grains. UCS decrease with entities similar as those recorded in the investigated red stone level have been recorded for porous limestones [23]. (AC, GQ, EV)

V. CONCLUSIONS

An interdisciplinary study of the ACAIT complex in Tricase was carried out. Historical and architectural knowledge was acquired, and they better highlight the value of this monument of the industrial archaeological heritage. Diagnostic investigations, as well, provided basic information concerning the state of conservation, to support conservation works to be planned.

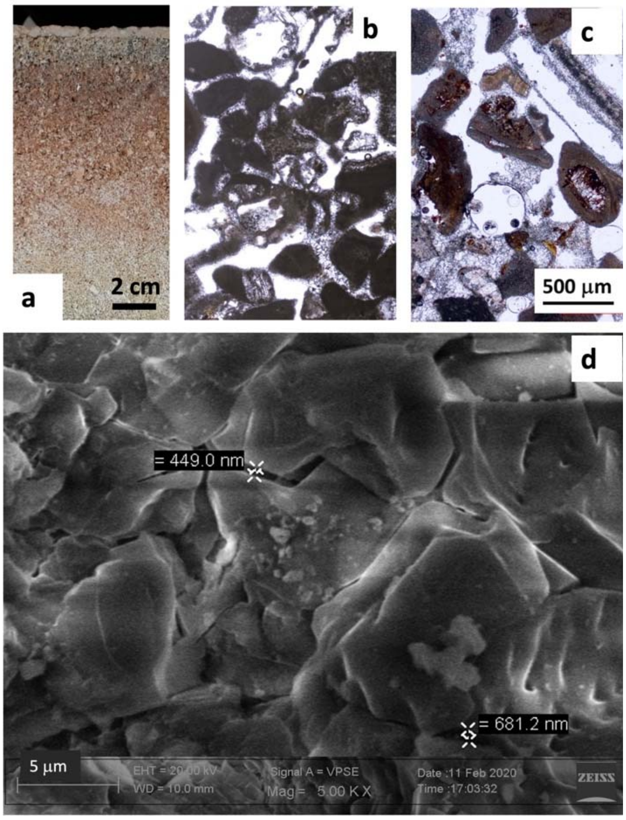

Fig. 7. Macroscopic stone colour change (a); thin section of yellow coloured stone level (b); thin section of red coloured stone level (c); microcracks in the red-coloured stone level (SEM micrograph).

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