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SAMUEL PIERCY EVANS

Plant and charcoal remains from the Iron age site of Santorso (Vicenza, Northern Italy)

ABSTRACT

EVANS S.P., 1994 - Plant and charcoal remains from the iron age site of Santorso (Vicenza, Northern Italy). [Resti vegetali carbonizzati dal sito dell'età del Ferro di Santorso (Vicenza, Italia Settentrionale)] - *Preistoria Alpina*, 27: 263-273.

A 6-year sampling programme (1982-1987) for the retrieval of charcoal and carbonized plant remains was carried out in a single living unit at the Iron age site of Santorso, northern Italy.
The site dates from the mid-Vth to the mid-Ist centuries BC.
Identified remains are divided into cultivated, infestant and woody species. Data are discussed in terms of sinanthropic vegetation, possible cultivation practices and local, extra-local and regional vegetation.
The structure of local, extra-local and regional vegetation around the site of Santorso is reconstructed by integrating charcoal and plant remains with available pollen evidence from the area.

Parole chiave: Antracologia, Paleoetnobotanica, Archeologia, Età del Ferro, Italia settentrionale, Infestanti, Agricoltura, *Vitis*.

Key words: Wood-identification analysis, Palaeoethnobotany, Archaeology, Iron age, Northern Italy, Weeds, Agricolture, *Vitis*.

Samuel Piercy Evans, Laboratorio di Dendroecologia, Istituto di Chimica Agraria ed Ambientale, sezione Vegetale, Facoltà di Agraria, Università Cattolica del Sacro Cuore, Via Emilia Parmense 84, I-29100 Piacenza, Italy.

Introduction

In 1982 a long-term research programme was undertaken by the regional ancient monuments commission, the Soprintendenza Archeologica del Veneto, at the paleo-Venetian Iron age site of Santorso, ending in 1987. Excavation concentrated on a single semi-interred dwelling unit, characteristic of most Iron age sites sharing the same cultural complex. Well-documented relative pottery sequences date activity from the mid-5th to the mid-1stcenturies BC.

Site location

The site is located in north-eastern Italy, along the pre-Alpine foothills (figure 1) at 218 m a.s.l. Site coordinates are (45° 44' 10" N, 1° 03' 32" W).

The rock sustrata of the area are: calcareous rocks and marls in the W; marls and sandstone in the E; calcareous-dolomitic gravels in the depression between the pre-Alpine hills. Soil are varied, and belong to the «Calcimagnesic» and «Brown Soil» classes, evolving on calcareous-marls and basaltic-tuphaceous substrata respectively (Duchafour 1976, Balista *et. al.* 1982, Balista and Leonardi 1984). The settlement developed on the terminal episodes of a detritic-calcareous conoid (Balista *et al.* 1982).

Materials and methods

Research design (Popper and Hastorf 1988) was originally aimed at providing samples for 2 objectives:

a) to provide diachronic information as to man-induced changes in the local and extra-local vegetation;
b) to integrate archeo-botanical data with explanation of archaeological phenomena.

Two *sampling criteria* were consequently adopted during the course of excavation:

- soil samples containing plant and charcoal were taken from 1x1 m quadrants within single stratigraphic units;
- visible individual charcoal remains were sampled from single stratigraphic units.

Financial limitation made total coverage impossible. Year-to-year fluctuations in funding are reflected in area-clustered sampling. As a result the second research objective was dropped at the end of the first season, given the high number of archaeological context encountered. Sampling shifted towards adequate representation of temporally-succeeding stratigraphic units.

Recovery techniques changed as a new methods became available (Wagner 1988). Initial recovery was carried out by means of machine-assisted flotation:

- soil samples were placed in a water submerged screen-bottom container;
- buoyancy was stimulated by compressor-pumped air being evenly distributed under the screen-bottom container *via* 1 mm holes present along an anular bronze pipe, and by the use of a range of frothing chemical agents;
- collection of carbonized material was obtained by directing overflowing water into a nest of 5 differently-graded sieves (400 μm to 2.5 mm from bottom to top);

- samples were allowed to dry at ambient temperature after removal from the sieves.

Three negative side-effects were however observed:

1) loss and damage occurred during the transfer of the sieved remains to the drying container;
2) the majority of carbonized material, evidently heavier than water or water-saturated, remained in the heavy submerged fraction, despite machine-, chemically and manually-induced stimuli. Published reports confirms these observations (JARMAN *et al.* 1972; WAGNER 1988);
3) in order to recover all plant material from the heavy unsorted submerged fraction, it became necessary to examine the sediment microscopically, and remove identifiable plant parts.

Flotation certainly aids separation of carbonized remains, but in order to obtain total representation, recovery directly from the sediment using stereomicroscopy is inevitable.

A mixed water-machine screening technique was adopted from 1985 onwards:

- samples are placed onto a tray, and large objects (stones, sherds, bones, etc.) are manually removed;
- < 400 μm soil particulate is removed by machine-screening aided by low pressure water sprays;
- particulate containing plant remains and charcoal is removed from the screening machine and dried on trays (30x30 cm) at ambient temperature;
- dry samples are separated into sub-samples of homogenoeus size categories using a nest of sieves (400 μm to 2.5 mm from bottom to top), and these undergo stereomicroscopic examination. Separation eases the singling out of carbonized plant remains from an amorphous and differently-coloured minerogenous background.

Abrasion of carbonized remains is observed, for instance the partial rounding of angular charcoals, but species recognition is not impeded.

The recovery efficiency of these techniques can be measured by the number of infestant species identified, since seeds measure less than 0.8 mm. A total of 14 have been identified to the species or *genus* level.

Microscopic identification was carried out using:

- a Leitz M8 zoom stereomicroscope (objectives 1x and 1.5x-eye pieces 15x, and 32x) for magnification up to 230x;
- an Olympus Ch-2 optical microscope for magnification upon to 1000x.

Occasional thin sections of some charcoal samples (< 1.5 mm^3) were cut after embedding of remains on plexiglass (SCHWEINGRUBER 1982) with an Officine Galileo sliding microtome.

Results

A total of 153 samples were collected during the 6-year programme. Data has been organized into tables according to type of remain:

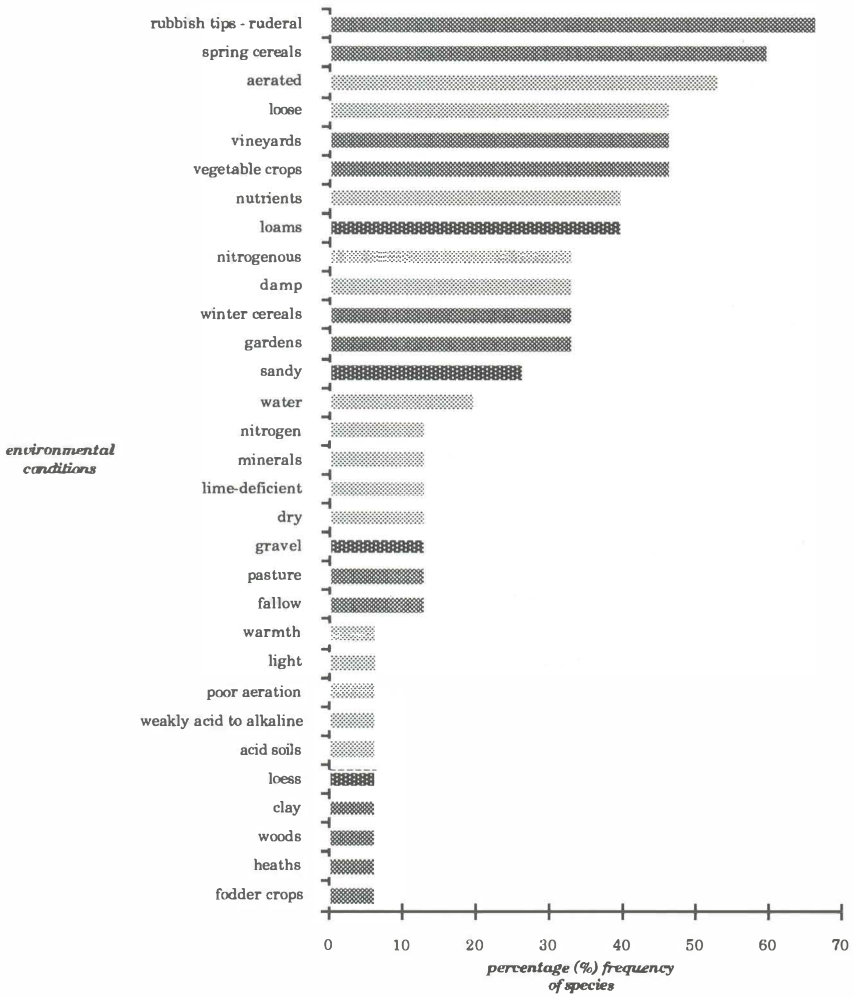
- table 1 lists the cultivated plants;
- table 2 the sinanthropic plants;
- table 3 the woody species.

All remains are in a carbonized state, unless otherwise stated.

Discussion

The terminology used by palinologists to confer a spatial dimension (local, extra-local and regional vegetation; Andersen 1970, 1974), to the data is adopted. The superimposing of modern autoecological and ecological plant behaviour to the ancient data set (concept of uniformitarianism, Gould 1965; comparative reconstruction approach, Birks & Gordon 1985) serves to highlight trends in the data.

Infestants provide detailed information on local agricultural practices and soil conditions. A sinathropic plant is one whose numerical presence is directly or indirectly favoured by man and tends to become characteristic in areas under his management, such as built-up enclosed spaces and cultivated fields.

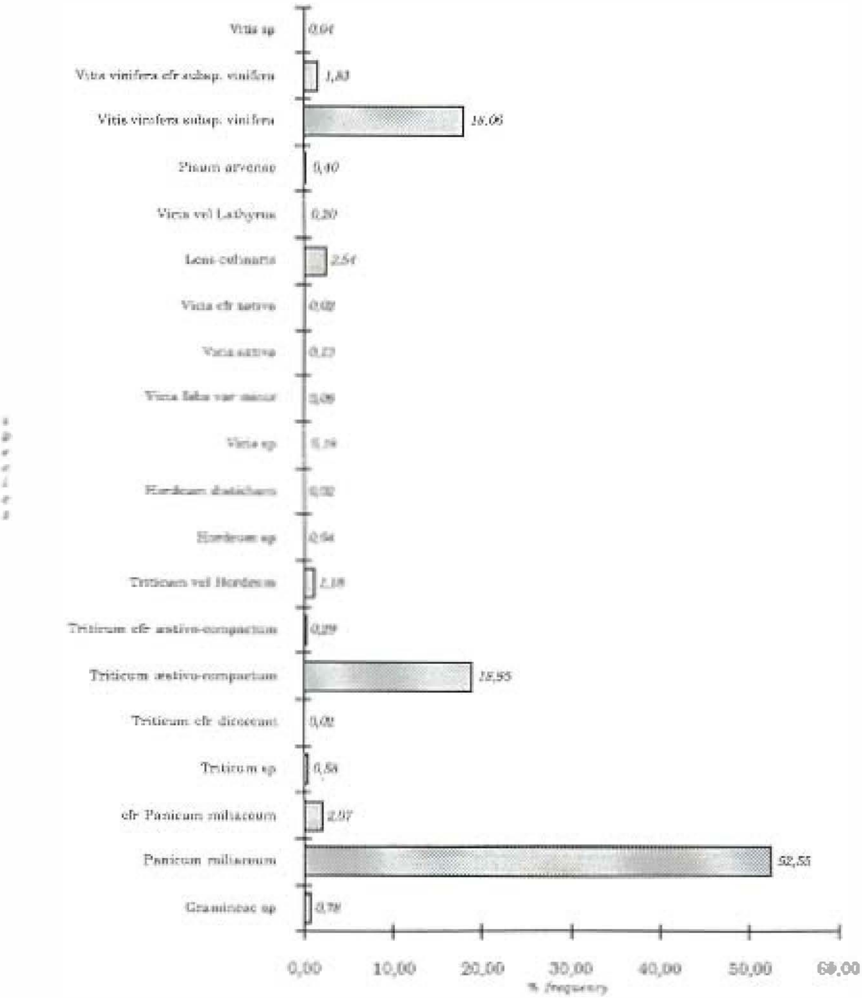


Graph 1 - Santorso: local and extra-local site conditions reconstructed using present-day conditions of growth of identified infestant sinanthropic species.

Monocots in the local vegetation

As illustrated in tables 1 and 2, a wide range of cultivated and sinanthropic species have been identified. The site has been classified as a rural agricultural settlement, operating in a landscape of power (De Guido *et al.* 1986), a hierarchical system of sites. It is one of a network providing perishable foodstuffs and artefacts to the larger protourban and urban settlements such as Vicenza (Balista *et al.* op. cit.).

Table 4 gives current conditions of growth for ancient infestants identified to the species level (Hanf 1983). Graph 1 summarizes local and extra-local environmental site conditions. The majority of species are to be found in ruderal (intra-site) areas and on cultivated soils, under different crop regimes, and on loose, well-aerated, nutrient- and nitrogen-rich, damp, loam soils.



Graph 2 - Santorso: percentage frequency of identified cultivated species.

Graph 2 highlights the significant presence of spring crops: the most frequent, both numerically and throughout the site's lifetime, are *Triticum aestivo-compactum* and *Panicum miliaceum*. *Tr. aestivo-compactum* is a classification of caryopses which share many morphological characteristics (Percival 1921) of both club and bread wheat and whose distinction is not wholly satisfactory.

It would seems that intensive cultivation of club/bread wheat and millet was being carried out in fields adjacent to the site. Both are high-yield free-threshing hexaploid cereal species. Millet on the other hand is not as productive as wheat (Gill & Vear 1980), and although still used for human consumption, may well have been used as a forage plant for domestic cattle. Domesticated cattle remains have been found at the site.

Intesive cultivation results in surplus production. It is probable that the distribution network operating for prestige goods (De Guio *et al.* 1986) relies on another used for the trading of surplus wheat.

The presence of field irrigation systems cannot be excluded, given that intra-site systems of water chanelling are common in paleo-Venetian sites (Balista *et al.* op. cit.).

A comparison with modern associations of weeds in cultivated fields of the same area (Lorenzoni 1962, 1963) shows that the majority of ancient species are still present as troublesome weeds, especially in maize crops. Field conditions which favour their insurgence in spring crops are manuring, shallow ploughing and irrigation, all of which apply to ancient field conditions. Artefactual evidence indicates that wooden ploughs with iron ploughshares were in use in other paleo-Venetian sites, together with a range of agricultural tools such as hoes and sickles (De Guio *et al.* 1986) indicating that fields required regular hoeing to reduce weed competition.

The same range of weeds can also be found growing in vegetable crops and in vineyards.

Legumes in local vegetation

Six different cultivated legume species have been identified. Numerically thay appear to be less important that the monocots, (graph 2) but sample survival may not be a fixed rate of their original number (Popper 1988; cfr. Kadane 1988). It is assumed that cultivation was carried out in domestic plots and satisfied domestic or intra-site requirements only, given the low number of legume species compared to that of the high-yield monocots.

Vine in local vegetation

Particularly interesting is the presence of cultivated vine seeds (graph 2). The area was renown during Roman times for the production of Retic wine, and Iron age vine cultivation is not to be excluded.

Data is available from 2 other sites in the area:
- the nearby paleo-Venetian site of Trissino (province of Vicenza Evans, unpubl.);
- the Retic necropolis of Laimburg, south of Bozen, has yielded vine seeds as part of a offering on cremation pyres (Evans, 1991).

Numerical evaluations of pollen data (Huntley & Birks 1982) also indicates that *Vitis* was certainly present in the area during the Iron age; an attempt is presently being made to distinguish wild grapes from cultivars on the basis of pollen morphology (Alleweldt & Dettweiler 1986). Its presence in the area is also confirmed by the frequent wild vine seeds found in Bronze age lake-dwelling sites in the Lake Garda area.

Further evidence is required in order to prove that cultivation was widespre-ad, but what has long been suspected by archaeologists (Sereni 1965, 1972) may well have some empirical basis.

Woody species in extra-local vegetation

A series of woody shrub species have been identified, both as plant remains and as charcoal. These can be referred to the extra-local vegetation.

The elder *(Sambucus ebulus)* is a shrub particularly active on loose, damp nitro-gen-rich soils, and in cultivated areas. Other sinanthropic woody species include different fruit-yielding cherry and plum species, possibly kept in a semi-cultivated state. These can be found as minor components in the modern oak-dominated forest which characterizes the lower pre-Alpine slopes (Giacomini & Fenaroli 1958).

Data indicates that the local, intra-site vegetation was made up of ruderal sinanthropic herbaceous species (table 2). Extra-locally, intensive cultivation of high-yielding monocots were the backbone of the local agronomic economy, while household requirements were satisfied by garden vegetable plots (table 2). Both were subjected to competition from weeds. Some low fruit-yielding woody plants probably grew along the margins of fields. These also provided pliable wood for woodcraft *(Pomoideae* and *Prunus)* and tool-making *(Sambucus).* Vineyards along the terraced slopes (Leonardi & Balista 1984) can be hypothesized, but further evidence is required.

Extra-local and regional woody vegetation

A series of 102 pollen diagrams are available for north-easthern Italy. Data from these diagrams has been subjected to numerical evaluation (Evans 1992), and results have been used to map ancient vegetation types.

Results indicate that the dominance structure of the vegetation in this area during the first millennium BC, for the zone from 0 to 200 m above sea level, was a mixed oak - alder - hazel - beech formation; in cooler microclimates a mixed oak - beech - hazel - silver fir formation. Both mesophylous deciduous formations developed on brown soils in an oceanic climate.

The dominance structure of vegetation during the first millennium BC between 200-120 m above sea level for the pre-Alpine area indicates:

1) a silver fir - common spruce - Scots pine - mixed oak formation, a mixed conifer-deciduous forest on deep soils in the more continental climate of the Alpine valleys;
2) a Scots pine - beech - common spruce - mixed oak formation, along the more sunny and exposed slopes of the pre-Alpine hill system, on deep soils but in a more oceanic climate.

The composition of the modern vegetational zones (Giacomini & Fenaroli op. cit.) of the area indicates:

1) an oak-dominated mixed forest mesophylous vegetation, relict stands of which are still visible along the pre-Alpine hills;
2) an upper beech dominated layer at heights between 800 and 1000 m above sea level.

Charcoal remains indicate that species from the two zones were felled, and primarily those growing along the lower portion of the slopes.

It would appear that during the first millennium an oak-dominated mixed forest formed the lower of two vegetational zones, which extended from the plain up to approximately 800-100 m above sea level. The upper layer is probably similar to that dominated by beech in modern vegetation, a climax forest normally accompanied by the silver fir and the hornbeam as understorey vegetation.

Man-induced changes

Anthropic infiltration appears to be massive in the lower zone, with 11 different woody species, both dominant and understorey, being selected for felling. Only 3 species are representative of the upper zone. Their presence indicates that the mixed oak forest may not have been able to satisfy timber requirements for building and domestic purposes, possibly because of an expansion of cultivated fields and terraces (Balista *et al.* 1982). This may have lead to a further contraction and depauperation of the mixed oak forest, especially after extensive Bronze and early Iron age activity. An upward shift of the bottom treeline is not to be excluded.

Forest felling and the creation of pastures for the transhumance of domestic cattle and sheep is highly probable, especially in the upper vegetational zone (Balista *et al.* 1982). Evidence of widespread seasonal movement of herds is documented for later periods, and may well have its roots in Bronze and Iron age zootechnical practices.

Gathering of dead wood does not appear to be a major supply of wood fuel. No hyphal damage was observed in the wood cells, and secondary branches account for 3.6% of the charcoal sample. It is interesting to note that branches belong to the 3 dominant species, namely oak, beech and silver fir. Perhaps adult trees were felled for building or commercial purposes, and their branches burnt, or animals pasturing in the upper zone may have been used to carry branchwood to the site.

Note

On request, complete lists giving botanical name and frequency of all species identified, may be obtained from the author.

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SUMMARY

Results indicate that information concerning ancient vegetation as derived from palynology, wood-identification analysis and paleoetnobotany can be used to the reconstruct local, extra-local and regional vegetation surrounding single archaeological sites. The use of modern autoecological and ecological conditions of plant growt, especially for herbaceous weeds, allow the reconstruction of local site conditions, both edaphic and agricultural.

The site of Santorso is described as a rural site with garden-plot cultivation of legume species, surrounded by extensive cereal fields. Nearby cultivation of *Vitis* is hypothesized. Elders and prunes, present along field margins or along the edges of the local oak-dominated pre-Alpine forest, were felled for tool-making and woodcraft. Timber construction wood and fire wood were collected in primary vegetation growing between 0 and 800-1000 m a.s.l. Limited infiltration took place in alpine vegetation, probably to be associated with transhumance practices.

RIASSUNTO

I risultati indicano che i dati sulla vegetazione antica e derivanti dalla palinologia, dall'antrocologia e dalla paleoetnobotanica possono essere utilizzati assieme per ricostruire la vegetazione locale, extra-locale e regionale per singoli siti archeologici. L'uso di condizioni autoecologiche ed ecologiche di crescita delle piante, in particolare delle malerbe, consente di ricostruire le condizioni locali del sito, sia edafiche sia agronomiche.

Il sito di Santoso viene descritto come un insediamento rurale, con orti coltivati a legumi, e circondato da campi a cereali. Viene ipotizzata la coltivazione della vite nelle aree prossime all'abitato. Sambuchi e pruni presenti lungo i margini dei campi venivano abbattuti per la produzione di attrezzi e manufatti lignei; la vegetazione arborea extra-locale era dominata dalla quercia. Legname per costruzioni e da ardere veniva raccolto in vegetazione primaria compresa tra 0 e 800-100 metri s.l.m.Viene inoltre registrata una limitata infiltrazione antropica per la vegetazione dei piani alpini, probabilmente da associarsi con la pratica della transumanza.

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