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Early Arrival of New World Species Enriching the Biological Assemblage of the Santi Quattro Coronati Complex (Rome, Italy)

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ABSTRACT

This paper reports the archaeobotanical and archaeozoological data from a disposal pit, whose use started after the partial closure of a staircase, and from a mortar surface within a former porch in the Santi Quattro Coronati complex in Rome, Italy. The two contexts were in use in the Early Modern Age, when the complex served as a cardinal seat. The element that distinguishes the Santi Quattro Coronati from other contemporaneous contexts is the presence of New World species, until now only hypothesized based on a letter sent by the first resident bishop in Santo Domingo to Lorenzo Pucci, then cardinal with the titulus of the Santi Quattro Coronati. Pumpkin seeds (*Cucurbita pepo* and *C. maxima/moschata*) were found in the pit, while a pelvis of guinea pig (*Cavia porcellus*) was found in a former porch. Numerous archaeobotanical remains preserved by mummification, identified mostly as food, and many archaeozoological specimens were found in the pit. Based on the data, it is hypothesized that the pit was used mainly as a deposit for table waste. The results as a whole help towards the investigation of the eating customs and daily habits of a Renaissance high-status clerical community.

1. Introduction

The discovery of the New World by Columbus in 1492 caused a series of revolutions, among which the arrival of new vegetal and animal edible species that were gradually introduced in the diet and habits of Europeans and soon became a substantial part of it. The plants include *Capsicum* spp. (pepper and hot chili), *Cucurbita* spp. (gourds and pumpkins), *Helianthus* spp. (sunflower), *Phaselous* spp. (beans), *Solanum lycopersicum* L. (tomato), *Solanum tuberosum* L. (potato), *Theobroma cacao* L. (cocoa), *Zea mays* L. (corn), and the not edible, but quite important plant from an economic point of view, *Nicotiana* spp. (tobacco). Domestic animal species, in contrast, are much fewer: *Meleagris gallopavo* L. (turkey), *Cavia porcellus* Pallas (guinea pig), and *Cairina moschata* L. (Muscovy duck). Their introduction occurred at different times and rates as can be highlighted by iconographic pieces of evidence, ancient texts and recipes, as well as rare archaeobotanical and archaeozoological findings (Moffet, 1992; Karg, 2010; Benes *et al.*, 2012).

In the reconstruction of the spread of new species, written sources play a key role. The first indications come from Columbus himself who, for instance, in a letter dated November 13th, 1493, described maize as a type of millet. The following year, 1494, some *Zea mays* caryopses were delivered from Mesoamerica by Peter Martyr to Cardinal Ascanio Maria Sforza Visconti in Rome, favouring its distribution not only in Italy, but also in Spain, Portugal and Turkey (Janick, 2011). The fast spread of this plant is

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also attested by the first depictions of maize in Rome in the festoons of the Loggia of Cupid and Psyche painted by Raphael (1515–1518). The fresco shows also *Phaselous vulgaris*, *Cucurbita maxima* and *C. pepo* (Caneva, 1992). The latter, however, had already been represented a decade before in the 1503–1508 *Grandes Heures d'Anne de Bretagne*, a prayer book compiled and illustrated in Touraine, France (Paris *et al.*, 2006). The earliest finding of *Cucurbita moschata*/*C. maxima* appears to derive from a 15th–16th century cesspit in a Renaissance monastery in Argenta, Northern Italy (Mercuri *et al.*, 1999); again in Northern Italy, between 16th and 17th century, we find *Cucurbita* seeds in kitchen trash of the Guerrieri Gonzaga Palace in Volta Mantovana (Bosi, Buldrini and Rinaldi, 2015). Since the 16th century it appeared widespread in central Europe (Teppner, 2000).

Capsicum spp. appears to have been immediately accepted by Europeans because of its pungent taste, reminiscent of the black pepper that Columbus was originally looking for (Janick, 2011). The first European illustrations of chili pepper are dated to 1540 (*Codex Amphibiorum*) and, along with other Renaissance images, indicate that hot chili was the first variety of *Capsicum* to be introduced. *C. annuum* seeds are attested in Europe since the 16th–17th century in the Dutch site of Hertogenbosch (Hallavant and Ruas, 2014), in early modern sites in Northern Poland (Karg, 2010) and in a 17th–18th brick cesspit belonging to the college of the Theatine order in Prague, Czech Republic (Čulíková, 2014).

Helianthus annuus L. (sunflower) is also part of the vast heritage acquired after the discovery of the New World. Its first European depiction dates to 1568 and is found in *Florum et Coronariarum* by the Flemish botanist Dodoens. Archaeobotanical findings of sunflower in the Old World were found between the 15th and the 18th centuries in south-western Germany, where also *Z. mays* is attested (Rösch, 1998).

The arrival of potato to Europe is attributed to Francis Drake in association with the rescue of Roanoke colonists (Janick, 2012). The delay in the introduction of potato and tomato was partly due to their land of domestication, respectively the Inca Empire, conquered by Francisco Pizarro in 1531–1536 and the Aztec Empire, whose conquest occurred in 1521 (Daunay, Laterrot and Janick, 2006). Potato is first mentioned in herbals, where an illustration is also found, by Gerarde in 1597. Tomato is first mentioned in a 1544 chapter on mandrake by P. A. Matthioli (Daunay, Laterrot and Janick, 2006). The first illustration appears in Fuchs' unpublished *Vienna Codex*, painted by A. Meyer between 1542 and 1565 (Daunay, Laterrot and Janick, 2006). Much scepticism surrounded the consumption of both tomato and potato due to their similarity to the poisonous mandrake fruits and roots respectively (Janick, 2011). However, they both soon became substantial parts of the Mediterranean diet.

Among the animals, the most important is the turkey. This bird was likely imported to Spain in 1511 and from there it rapidly spread all over Europe (De Grossi Mazzorin and Epifani, 2015 and references therein). As far as Italy is concerned, the earliest possible evidence are the stuccoes in the Vatican Loggias made by Giovanni da Udine and Perin del Vaga between the end of 1517 and the beginning of 1519, but their identification as turkeys or peacocks is debated. Other clearer images are found in the paintings of Palazzo Madama by Giovanni da Udine dated to 1522–23. Although in the beginning turkeys were only considered as exotic animals to be exhibited by wealthy people, within a few decades they became popular as high-status food as evidenced, for example, by recipes in the *Singolare dottrina* by Domenico Romoli (1560) and the *Opera* by Bartolomeo Scappi (1570). Turkey bone remains are much rarer and less securely dated (De Grossi Mazzorin and Epifani, 2015): the earliest identified specimen having been found in a silo at Muro Leccese referred to the end of the 16th–beginning of 17th century; other remains referred to the 16th–17th century are from the Prösels/Presule castle in Alto Adige and from the Gonzaga Palace at Volta Mantovana in Lombardy. In Rome turkey remains were recovered at Caput Africae (17th–18th century) and at the Crypta Balbi (18th century); other specimens dated to the 17th and 18th cent. were identified in the Nuovo Mercato di Testaccio (Rome), possibly indicating that by this time the species was no longer only the prerogative of the high classes.

Relevant for our site and for its relations with the Americas is a letter, dated to 1519 or 1520 (Oliva, 1993) by Alessandro Geraldini, first resident bishop in Santo Domingo, to Lorenzo Pucci (Arrighi, 2016), then cardinal with the titulus of the Santi Quattro Coronati and supervisor for the Church of the Indies in the Consistory, in which turkeys, referred to as a *gallus* and a white *gallina* from the "*sub Aequinoctiali plaga*", were mentioned as a gift sent to the cardinal together with parrots (*psittacos*) and some gods worshipped by local indigenous populations.

The analysis of archaeobotanical and archaeozoological data is fundamental for the reconstruction of the history and the introduction of New World species in the European context. These complement written sources and illustrations in terms of the identification of the geographical spread of American flora and fauna in the Old World, also taking into consideration factors such as climate and social status. To this purpose the chance to study bioarchaeological samples from Early Modern age confined contexts of the Santi Quattro Coronati in Rome is of great importance.

2. The investigated site

The Santi Quattro Coronati is an architectural complex comprised of several blocks constructed between the 4th century AD and modern times. It is located in Rome (Italy) on the Caelian Hill between the Lateran and the Colosseum (Figure 1). Starting from 1138 AD and for the following four centuries, the history of the monastery was strictly correlated to that of the Umbrian Abbey of Sassovivo, of which it represented the most important filiation, as it was the seat of the attorney of the Roman diocesan administration and

Figure 1. Rome, Italy. Location map of Santi Quattro Coronati (circled in white), between the Colosseum and the Lateran Basilica.

the temporary residence of the Pope's guests (Barelli and Pugliese, 2012). In the 13th century, a portion of the complex became part of a vast palace, meant to host the cardinal titular of the basilica. In 1564 the complex was assigned to host the Conservatory of the Orphan Girls, run by Augustinian Nuns, who still guard the complex.

The complex was subjected to a series of restorations that, through different archaeological campaigns, have brought to light structures attributable to the Renaissance. These include a closed staircase, used as a discard pit and some layers excavated within a former arched porch (Barelli and Pugliese, 2012).

3. Materials and methods

For the current research, two specific contexts of this large complex have been taken into consideration (Figure 2). One is a discard pit excavated in 1996, under the supervision of the architects Lia Barelli and Monica Morbidelli and the archaeologist Raffaele Pugliese. The pit occupied the bottom part of the staircase of the façade-tower of a vast titular complex rebuilt under Pope Leo IV (847–855). The closure of a door on the ground floor of the tower is attributed to the restoration works ordered by Cardinal Carrillo (cardinal between 1424 and 1434). This allowed for the stairwell to be filled by waste of a varied nature in the following decades. Such use, as highlighted by ceramics, appears to be dated towards the end of the 15th century. The closure of the pit is dated at the middle of the following century, possibly in concomitance with the settlement of the Augustinian nuns in 1564.

The entire fill of the bell tower has been collected and preserved. For the current study the stratigraphic units US 3 and US 4 have been selected. Archaeobotanical remains were separated through dry sieving, using a series of three sieves with 5-, 2- and 1-mm meshes. A total of 28 l of material was sieved. Each fraction was then hand-picked. Macro-remains were counted, observed under a Leica M205C stereo microscope (magnification up to 100×) and photographed using a Leica IC80 HD camera. Combined pictures and 3D models were obtained using Helicon Focus (version 6.6.1 Pro). Morphological identification was performed by comparing the samples against several atlases (Cappers, Neef and Bekker, 2009; Neef *et al.*, 2012; Cappers and Bekker, 2013) and modern reference samples.

The second context was investigated during the most recent excavations, carried out in 2011–2012 (Barelli and Pugliese, 2012; Masi, Sadori and Pugliese, 2012) in a former porch (Asciutti, 2012) located in the west side of the garden of the complex. Among the investigated layers, a surface made of mortar (US 521) referenced to the beginning of the 17th century mixed with ceramic materials dated to the end of the 16th century, yielded a small faunal assemblage whose content is relevant for the present research. Traditionally, in archaeozoological analyses the volume of the excavated material is unknown; the remains were therefore simply picked out from the entire filling of each layer.

The faunal assemblage – separated from the same buckets as the plant materials as well as another small sample handpicked during the excavation from the same discard pit, but lacking precise stratigraphic provenience – have been analysed. Furthermore, as mentioned before, US 521 from the 2011–12 excavations of the former porch has also been

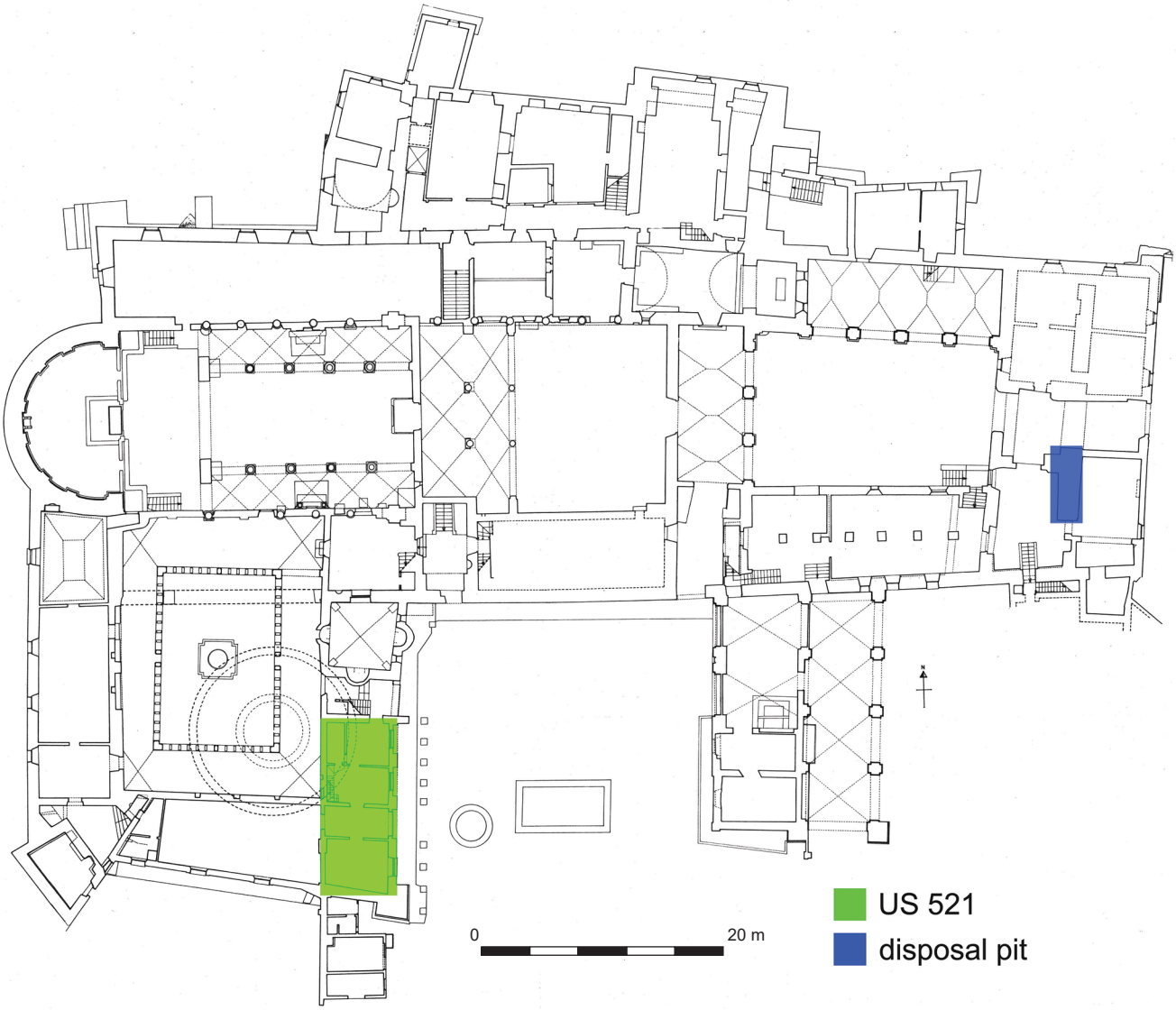

Figure 2. Plan of the architectural complex of Santi Quattro Coronati. The two contexts of retrieval are highlighted.

investigated. Although the specimens are very fragmented, the preservation condition of bone surfaces is good and has allowed the observation and identification of human, animal and other natural traces; all specimens, including the unidentifiable ones, were inspected for any such modifications. The age of single individuals of domestic species was calculated based on the archaeozoological literature (Silver, 1969; Payne, 1973; Barone, 1981; Bull and Payne, 1982; Grigson, 1982; Barone, 1995). Given the fragmented state of the bone specimens, it was possible to estimate only the withers height of a horse (May, 1985).

4. Results

The infill of the discard pit from US 3 and US 4 is mostly constituted of hay, which represents the bulk of the finding in which the carpological and zoological remains were dispersed. Approximately 6,000 well-preserved fragments of seeds and fruits, belonging to 35 taxa, mostly identified at species level and attributed to 18 different plant families were identified (Table 1, Figure 3). Scientific nomenclature follows Flora d'Italia (Pignatti, 1982) and Mabberley's Plant Book (Mabberley, 2008). The favourable thermo-hygrometric conditions present in the pit allowed the mummification of plant remains by desiccation, although few wood remains were found charred. Even the most fragile mummified parts of plants, such as lemmas and paleas of spikelets are preserved.

Besides the few wild and ornamental plants, the botanical assemblages included food remains. For this study, these will be classified as cereals, pulses, fruit plants and vegetables/spices. Cereals include oat (*Avena fatua*/*sterilis*), broomcorn millet (*Panicum miliaceum*) and bread wheat (*Triticum* cf. *aestivum*). Concerning barley (*Hordeum vulgare*), only rachises were found. In terms of pulses, faba (or broad) bean (*Vicia faba* major) is the most numerous finding, although pea (*Pisum sativum*) is also present. Remains of faba beans are

Table 1. List of identified plant and the number of remains retrieved in the pit of Santi Quattro Coronati, where * represents the fruits estimated based on the number of retrieved fragments.

Carpological remains		**US 3**		**US 4**	
		N	**%**	**N**	**%**
Allium cepa L.	tunic	3	*0.13*	3	*0.09*
Allium cepa/sativum	basal plate	10	*0.44*	22	*0.67*
Allium sativum L.	tunic	25	*1.09*	8	*0.24*
Avena fatua/sterilis	spikelet	0	*0*	10	*0.30*
Cannabis sativa L.	achene	2	*0.09*	12	*0.36*
Castanea sativa Mill.	pericarp	63	*2.75*	130	*3.93*
Citrus sp.	pericarp	14	*0.61*	26	*0.79*
Coriandrum sativum L.	mericarp	6	*0.26*	1	*0.03*
Corylus avellana L.	pericarp	5*	*0.22*	5*	*0.15*
Cucumis melo L.	seed	41	*1.79*	76	*2.30*
Cucurbita maxima/moschata	seed	8	*0.35*	27	*0.82*
Cucurbita pepo L.	seed	2	*0.09*	6	*0.18*
Cupressus sempervirens L.	cone	1	*0.04*	0	*0*
Ficus carica L.	achene	4	*0.17*	0	*0*
Foeniculum vulgare Mill.	mericarp	3	*0.13*	14	*0.42*
Hordeum vulgare L.	rachis	19	*0.83*	9	*0.27*
Juglans regia L.	pericarp	10*	*0.44*	17*	*0.51*
Lagenaria siceraria Standl	seed	5	*0.22*	0	*0*
Malus sp.	seed	1	*0.04*	1	*0.03*
Medicago sp.	legume	49	*2.14*	177	*5.36*
Olea europea L.	endocarp	54	*2.35*	96	*2.90*
Panicum miliaceum L.	floret	17	*0.74*	33	*1.00*
Panicum sp.	floret	44	*1.92*	188	*5.69*
	caryopsis	0	*0*	1	*0.03*
Pastinaca sativa L.	mericarp	380	*16.56*	526	*15.92*
Piper nigrum L.	drupe	8	*0.35*	4	*0.12*
Pisum sativum L.	seed	5	*0.22*	11	*0.33*
Prunus avium/cerasus	endocarp	28	*1.22*	47	*1.42*
Prunus domestica L.	endocarp	26	*1.13*	14	*0.42*
Prunus persica (L.) Batsch	endocarp	3	*0.13*	5	*0.15*
Punica granatum L.	seed	26	*1.13*	83	*2.51*
	exocarp	13	*0.57*	15	*0.45*
Ranunculus repens L.	achene	4	*0.17*	21	*0.64*
Rubus fruticosus aggr.	endocarp	1	*0.04*	3	*0.09*
Torilis arvensis (Huds) Link	mericarp	0	*0*	4	*0.12*
Triticum cf. *aestivum* L.	caryopsis	2	*0.09*	0	*0*
	rachis	425	*18.53*	623	*18.85*
Vicia faba L. major	seedcoat	385	*16.78*	63	*1.91*
Vitis vinifera L.	pip	187	*8.15*	377	*11.41*
	pedicel	389	*16.96*	617	*18.67*
	tendril	22	*0.96*	20	*0.61*
Apiaceae undiff.	mericarp	4	*0.17*	10	*0.30*
Total		**2294**	***100***	**3305**	***100***

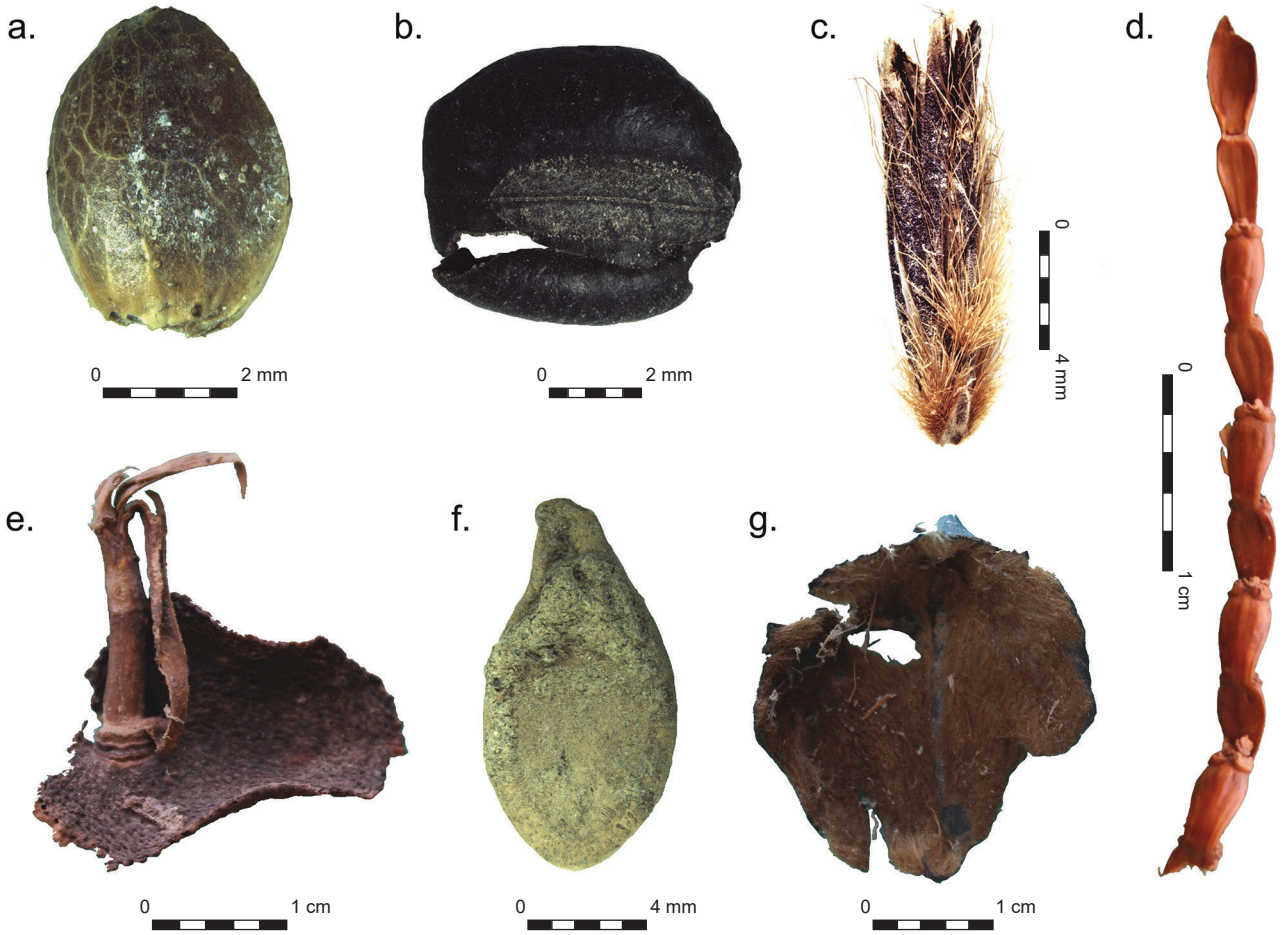

Figure 3. Santi Quattro Coronati (Rome): plant macro remains. a. *Cannabis sativa*, fruit; b. *Vicia faba*, seedcoat with hilum; c. *Avena fatua/sterilis*, spikelet; d. *Triticum* cf. *aestivum*, rachis; e. *Citrus* sp., pericarp; f. *Cucurbita pepo*, seed; g. *Castanea sativa*, pericarp.

present only in the form of teguments. A wide variety of fruit plants, used also as vegetables, was retrieved. These include olives (*Olea europaea*), cherries (*Prunus avium/cerasus*), plums (*Prunus domestica*), peaches (*Prunus persica*), blackberries, *Rubus fruticosus*, grapes (*Vitis vinifera*), pomegranate (*Punica granatum*), citrus fruits (*Citrus* sp.), pumpkins (*Cucurbita maxima/moschata* and *C. pepo*), melon (*Cucumis melo*), calabash (*Lagenaria siceraria*), apples (*Malus* sp.), figs (*Ficus carica*), hazelnuts (*Corylus avellana*), chestnuts (*Castanea sativa*) and walnuts (*Juglans regia*). Finally, also various plants used as vegetables or spices were attested in the examined sediments. These include parsnip (*Pastinaca sativa*), garlic (*Allium sativum*), onion (*Allium cepa*), coriander (*Coriandrum sativum*), fennel (*Foeniculum vulgare*), black pepper (*Piper nigrum*) and hemp (*Cannabis sativa*). Additionally, the weeds spreading hedgeparsley (*Torilis arvensis*), creeping buttercup (*Ranunculus repens*) and alfalfa (*Medicago* sp.) were found. Cypress (*Cupressus sempervirens*), an ornamental species, was also attested (with a cone) in the Santi Quattro Coronati pit.

Cucurbita seeds are very similar among species, but they also present a vast range of intraspecific variations. However, *C. maxima* is more distinctive (Moffett, 1995). Unfortunately, due both to the conservation state of Apiaceae seeds and the similarities among different species, it was not possible to identify all Apiaceae remains. For this reason, the presence of other Apiaceae, such as dill and parsley cannot be excluded.

The faunal assemblage from the discard pit includes a total of 582 specimens mostly from US 3 and US 4 (Table 2). Land gastropods consist mainly of Helicidae, especially the chocolate-band snail (*Eobania vermiculata*) and the garden snail (*Cornu aspersum*). Marine bivalves are represented mostly by the wedge clam (*Donax trunculus*) and a few remains of common cockle (*Cerastoderma edule*). Fragments of crustacean exoskeleton were recovered in both layers and fish remains, still under study, are very common.

Among the birds, only chicken (*Gallus gallus*) and pigeon (*Columba livia/oenas*) have been surely identified; in addition, eggshell fragments have also been recovered.

In the microfauna there are mainly remains of rodents (*e.g. Rattus rattus*) as well as some small reptiles (Lacertilia). Besides the bone specimens reported in Table 2, two mummified “rats” were recovered in US 3.

Table 2. Faunal remains recovered in the discard pit (NISP=Number of Identified Specimens; for taxa with * "1" indicates just presence; N/A materials from the pit lacking precise US information).

Species	US 3		US 4		N/A		TOTAL	
	NISP	%	NISP	%	NISP	%	NISP	%
Land gastropods	16	*6.8*	14	*4.5*	4	*11.1*	34	*5.8*
Marine bivalves	26	*11.0*	31	*10.0*	2	*5.6*	59	*10.1*
Crustacea*	1	*0.4*	1	*0.3*			2	*0.3*
Pisces	41	*17.3*	44	*14.2*			85	*14.6*
Aves	18	*7.6*	15	*4.9*			33	*5.7*
Aves eggshell*	1	*0.4*			1	*2.8*	2	*0.3*
Gallus gallus L.	6	*2.5*			2	*5.6*	8	*1.4*
Columba livia/oenas			1	*0.3*			1	*0.2*
Microfauna	15	*6.3*	16	*5.2*	1	*2.8*	32	*5.5*
Lagomorpha					1	*2.8*	1	*0.2*
Felis catus L.	1	*0.4*					1	*0.2*
Equus caballus L.					1	*2.8*	1	*0.2*
Sus domesticus Erxleben	8	*3.4*	18	*5.8*	15	*41.7*	41	*7.0*
Ovis vel Capra	12	*5.1*	16	*5.2*	6	*16.7*	34	*5.8*
Bos taurus L.	1	*0.4*			3	*8.3*	4	*0.7*
Small mammal	1	*0.4*					1	*0.2*
Medium mammal	23	*9.7*	42	*13.6*			65	*11.2*
Large mammal	3	*1.3*	9	*2.9*			12	*2.1*
Unidentifiable	64	*27.0*	102	*33.0*			166	*28.5*
Total	**237**	***100***	**309**	***100***	**36**	***100***	**582**	***100***

Lagomorphs are represented by a mandible fragment belonging to a young individual. A single *Felis catus* phalanx was recovered in US 3, but the same layer also yielded the complete mummy of a cat. The only horse remains is a complete left metatarsal belonging to an individual about 149 cm tall at the withers.

Among the three main domestic mammals the domestic pig *Sus domesticus* is the dominant species with a minimum number of 10 individuals ranging from very young ones (0–6 months) to over 4 years old, but more than half of them are less than 18 months old. There are at least two males and two females. Ovicaprines are the second domestic *taxon* as number of specimens, referable to a minimum of 9 individuals most of them adult and even senile. Cattle is very rare, represented by a minimum of 3 individuals, one of them 6–12 months old while the other two are adults.

The proportions of skeletal fragments attributed to size groups reflects the abundance in the identified species. In this research "small mammal" would comprise lagomorphs, cat, and other animals of similar size; sheep, goat, and pig, are considered "medium-sized mammal"; cattle and horse, are "large mammal". All the rest of the specimens were completely unidentifiable.

The faunal assemblage from US 521 (Table 3) includes many intrusive small gastropods (*e.g. Pomatia elegans*, *Rumina decollata*) and very few Helicidae which may have the same origin, although their exploitation as food cannot be excluded. The domestic species recognized are mainly pig and ovicaprines, each represented by a single prime adult individual; because of fragmentation, it has been possible to assign larger animals only to size group and not to species. A single cat calcaneum attests to the presence of this feline.

Finally, the assemblage included also an almost complete left pelvis (Figure 4) attributed to guinea pig (*Cavia porcellus*).

Table 3. Faunal remains recovered in US 521 (NISP=Number of Identified Specimens).

Species	US 521	
	NISP	%
Land gastropods	23	21.1
Pisces	1	0.9
Aves	1	0.9
Cavia porcellus Pallas	1	0.9
Felis catus L.	1	0.9
Sus domesticus Erxleben	7	6.4
Ovis vel Capra	4	3.7
Medium mammal	19	17.4
Large mammal	3	2.8
Unidentifiable	49	45.0
Total	109	100

Figure 4. Santi Quattro Coronati (Rome): the *Cavia porcellus* pelvis from US 521.

The specimen was identified on the basis of morphology, presenting among the other features a characteristic notch on the neck of the ischium, (Ijzereef, 1978; Pigiére *et al.*, 2012). Measurements too (SH 4.3 mm, LAR 6.0 mm, following von den Driesch, 1976) are comparable to data from archaeological and reference specimens (Pigiére *et al.*, 2012; Van Neer, pers. comm.)

5. Discussion

Archaeobotanical and archaeozoological studies of Late Medieval/Early Modern Age contexts are quite rare in central Italy. A great help in the survey of plant remains is provided by BRAIN (Botanical Records of Archaeobotany Italian Network: https://brainplants.unimore.it/; Mercuri *et al.,* 2015), an interactive database including archaeological sites with microscopic and macroscopic remains, which allowed the authors to gain awareness of five Medieval-Renaissance sites in central Italy where carpological analyses were performed.

In the studied pit, without considering the hay, the plant and animal remains (seeds, fruits, eggs, shells, teeth, and bones) mostly consist of a series of edible species, likely belonging to the diet of the inhabitants of the Santi Quattro Coronati complex. Ornamental and wild plants, such as cypress and alfalfa, are present as well. The plant and animal assemblages provide an overview of the eating habits in a cardinal's residence of the 16th century in Rome.

The archaeobotanical remains did not present prominent differences in qualitative or quantitative terms. Only five species (*Torilis arvensis*, *Lagenaria siceraria*, *Cupressus sempervirens*, *Avena fatua/sterilis* and *Ficus carica*) were found in one depositional layer but were absent in the other.

The number of refuse items of cereals and pulses is higher than in many other contemporaneous deposits (*e.g.* Moffet, 1992; Bandini Mazzanti *et al.*, 2005; Bosi *et al.*, 2009) (Table 1). This richness deserves particular attention. A noticeable part of the Poaceae remains is from the hay and consists of non-edible parts (Table 1) such as rachises, leaves, and culms. Hay could have been used either as *palliasse* (bedding material) or to dampen bad odours and preserve foods (Barelli and Pugliese, 1996). Nonetheless, the hay assemblage provides information regarding the food plants available in the area. A clear example is provided by barley, for which only rachises are present. It is worth mentioning that two main clusters of millets were found in the pit. One, characterised by a rounder shape, was identified as *Panicum miliaceum*. The other one, which included more elongated florets was not identified at a species level and will be the subject of further studies.

Parsnip mericarps represent the main finding of the present study. The presence of fruit remains for a plant whose roots are eaten, finds an easy explanation. Parsnip roots were in fact used as a cooked vegetable and as animal fodder starting from Roman times (Zohary, Hopf and Weiss, 2012). They are usually harvested after a frost, which results in an increase in sweetness (Cain *et al.*, 2010). As with carrots, parsnip roots are harvested and often stored along with their stem and leaves (Gray, Steckel and Ward, 1985). The presence of the fruit (ripening in autumn) is evidence of a late harvest. This factor allows for the documentation of a plant which could have otherwise been neglected.

The Fabaceae assemblage represents ca. 16% of the botanical carpological remains, including also alfalfa, a plant not directly related to food consumption. It was either part of the hay or represents the remains of fodder. Faba beans and peas were also abundant. Seed coats of the former (Figure 3b) represent a significant finding: also in terms of dietary habits. Being sourer than the rest of the seed, it appears as if they were being discarded on purpose, as it is also commonly done in modern times. The "Mirror Pit" in northern Italy (Bandini Mazzanti *et al.*, 2005) has registered the presence, even if very low, of both legumes.

Grape represents one of the main findings analogous to other contemporaneous pits in Italy (*e.g.* Ferrara-Emilia Romagna: Bandini Mazzanti *et al.*, 2005; Bandini Mazzanti and Bosi, 2007; Bosi *et al.*, 2009; Latium: Clark *et al.*, 2009) and in England (*e.g.* London: Giorgi, 1997). Fresh fruit consumption is hypothesised for the find in Rome, where more pedicels than pips were found. A similar consideration can be made for the olive endocarps, which are found intact and do not show signs of pressing, suggesting their use as table food.

The very low concentration of fig achenes and of blackberry stones, generally among the most numerous

findings in contemporaneous deposits (Giorgi, 1997; Bandini Mazzanti *et al.*, 2005; Bandini Mazzanti and Bosi, 2007; Karg, 2007; Bosi, Mercuri and Bandini Mazzanti, 2009; Sadori *et al.*, 2013; Mariotti Lippi *et al.*, 2015), finds a parallel in the "Ducal Pit" (Bosi *et al.*, 2009), characterised as a deposit of table waste, rather than a latrine. Analogously to most pits contemporaneous (Giorgi, 1997) to the current case study, Rosaceae remains are a finding worthy of note in the Santi Quattro Coronati pit, with a prevalence of the genus *Prunus*, represented mostly by plums, sour or sweet cherries, together with peaches. Remains of apples here are few (Table 1), while these were found to be more common at other sites (Bandini Mazzanti *et al.*, 2005; Bosi *et al.*, 2009; Badura *et al.*, 2015).

Melon seeds were also found in the Roman complex. These constituted a common finding in the pits of the Ferrara area in Italy (Bandini Mazzanti *et al.*, 2005; Bosi *et al.*, 2009) and were also retrieved in two Early Modern cesspits in Prague (Beneš *et al.*, 2012), representing an exception for central European sites. The use of melon in Sardinia, Italy, has been documented since the Late Bronze Age (Sabato *et al.*, 2017).

Remains of Rutaceae peels were also found but were identifiable only to the genus level. *Citrus* remains were rare in other contemporaneous deposits, being retrieved in the form of seeds and a leaf in the 16th–17th century infilling of the Vladislav Hall of Prague Castle, where they appear to be clearly associated to social status (Beneš *et al.*, 2012). *Citrus* seeds were also found in deposits in early modern London on rare occasions (Giorgi, 1997). The peels found in the Santi Quattro Coronati pit represent a unique find, as such parts usually undergo a fast process of degradation. *Citrus* remains are in fact generally scarce and consist mostly of seeds. Furthermore, *Citrus* taxa are hard to distinguish among each other due to a sexual compatibility within the members of the genus, which favours natural hybridisation (Pagnoux *et al.*, 2013).

The finding of pomegranate at the Santi Quattro Coronati complex is relevant and it is constituted by both seeds and exocarps. Access to luxury foods and exotics can be key elements to the identification of the social status of the inhabitants of the complex, being found only in middle to upper-class deposits (Bandini Mazzanti and Bosi, 2007; Bosi *et al.*, 2009).

Nuts represent a significant finding in the Santi Quattro Coronati pit. Walnuts, chestnuts and hazelnuts represent a large part of the dietary remains. Among these, the most striking finds are represented by chestnut (Figure 3g), with an exceptional preservation of the hairy episperm.

Walnuts and chestnuts were found in most Late Medieval/Renaissance pits of Emilia Romagna (Bandini Mazzanti and Bosi, 2007). Hazelnuts, probably collected from the wild, were also found in England (Moffet, 1992; Giorgi, 1997).

The extensive use of garlic dates back to ancient Roman times, when this plant was used in a wide number of food preparations and for healing purposes (Tattelman, 2005). Charlemagne ordered the cultivation of garlic and onions in all royal gardens (Castelletti, Castiglioni and Rottoli, 2001).

The assemblage of Apiaceae, used mostly as food flavourings, corresponds to that of other parallel cases. Fennel and coriander were found in Ferrara (Bandini Mazzanti *et al.*, 2005; Bosi *et al.* 2009), in the Hanseatic towns of northern Europe (Karg, 2007) and in Dudley, England (Moffet, 1992). Fennel could have been collected wild, although it is possible that it was cultivated for convenience. In contrast, coriander was necessarily cultivated (Moffet, 1992).

Despite its usual association to textile production, the presence of hemp is most probably correlated to its use in Late Medieval and Early modern recipes (Korber-Grohne, 1987; Beneš *et al.*, 2002). Hemp seeds are still used in many recipes nowadays, but also because of their excellent content of omega-3 and omega-6 fatty acids (Rodriguez-Leyva and Pierce, 2010). Hemp has been retrieved in other pits in Ferrara (Bandini Mazzanti *et al.*, 2005; Bosi *et al.*, 2009), in England (Moffet, 1992), in a wooden sewage Renaissance tunnel in Prague (Beneš *et al.*, 2012) and in several Middle Age and Early modern drains and drainage channels, ditches, pits and wells in Denmark (Karg, 2007).

The composition of the faunal assemblage of the two layers (US 3 and US 4) in the discard pit is very similar. Land gastropods, including mainly Helicidae, may represent either intrusive species or items of food refuse, but even in the latter case they were not a significant part of the diet. Fish is abundant as would be expected in a religious context, although in Rome alimentary rules also affected lay people (D'Amelia, 1975); crustaceans, as well as marine molluscs, are probably part of the same meatless diet. The remains of birds together with eggshell fragments, indicate the exploitation of this class of animals as well as of their products.

The microfauna, small rodents and reptiles, can be considered as intrusive elements or pests discarded in the pit together with the other waste products. The cat was often used not just as a pet, but mainly for pest control and, apparently, after death its carcass was considered as "common" garbage.

The horse specimen shows some scrape marks along the shaft, possibly traces from manufacturing, suggesting that craftwork activities were also performed at the site. Many of the domestic mammals show cuts and chop marks indicating, as expected, that they represent food debris. Only a few remains are burnt, but such modification appears accidental and not directly related to cooking activities because the combustion is not localized, but present over the whole specimen. This may suggest that boiling or stewing rather than roasting were probably the main cooking procedures. Carnivore traces on the bones are more abundant than anthropic modifications and were produced mainly by small predators, such as cats, suggesting a close relationship between humans and felines.

The faunal assemblage from the discard pit represents a mixture of food debris and other waste (*e.g.* cats and rats) and does not show peculiarities in the taxonomic composition and/or any identified modifications which may clearly suggest a high-status residence (*e.g.* presence of more abundant or peculiar wild species or of many very young

individuals for most domestic *taxa*). This is in contrast to the indication provided by the plant remains; however, the faunal assemblage may give some hints about the diet not only of the cardinal and his entourage, but also of the servants working in the palace.

Other Italian late medieval-early modern contexts, such as the Castello di Manzano (Cherasco, Cuneo – Bedini, 1995), Castello di Rafenstein (San Genesio, Bolzano – Eccher and Tecchiati, 2014), Palazzo Vitelleschi (Tarquinia, Viterbo – Clark *et al.*, 1989), Castello di Santa Severa (Santa Marinella, Roma – Cerilli Fatucci, 2016), Castello Baglioni (Graffignano, Viterbo – Alhaique *et al.*, in press), and the Palazzo del Principe (Muro Leccese, Lecce – De Grossi Mazzorin and Nocera, 2005), show more clear evidence for luxury elements also in the fauna, possibly because such contexts are not strictly related to religious communities.

Except for the presence of the guinea pig, the faunal sample retrieved in US 521 does not show peculiarities and includes both food debris and intrusive elements such as small land gastropods. Chop and cut marks were detected on the remains of the main domestic animals, as well as on specimens attributed only to one size group. Very few remains are burnt or display traces of carnivore activity.

5.1 New World species at the Santi Quattro Coronati complex

The Santi Quattro Coronati complex is characterised by the presence of New World species, both in terms of flora (*Cucurbita* sp.) and fauna (*Cavia porcellus*).

As far as plant species are concerned, the genus *Cucurbita*, native of South America and imported to Europe only after the discovery of America in 1492 (Teppner, 2004), was retrieved. They got so well established in the Old World, that it was not until the 20th century that botanists realised that they were in fact original of the New World (Whitaker, 1947).

The genus *Cucurbita* includes five cultivated species: *Cucurbita ficifolia* Bouchè, *C. maxima* Duchesne, *C. moschata* Duchesne, *C. argyrospema* Huber and *C. pepo* L. (Moffett, 1995). In the pit, seeds of *C. maxima/moschata* and *C. pepo*, the most popular in Europe, were found. Many doubts are placed regarding the route through which these species reached Europe during the 16th century. It was thought that *C. pepo* was introduced to Asia before arriving in Europe (Moffett, 1995), although both iconographical and archaeobotanical evidence seems to reveal otherwise. The plant iconography of a prayer book traces back the introduction of *Cucurbita* species in Europe to at least 1503–1508 (Paris *et al.*, 2006). Most archaeobotanical studies carried out on *Cucurbita* were performed on American material (Smith, 1968). Seeds constitute the most common type of macro-remains found and they are usually preserved through desiccation, charring or waterlogging (*e.g.* Decker and Newsom, 1988; Smith, 1997; Lema, Capparelli and Pochettino, 2008). In terms of micro-remains, phytoliths prevail (*e.g.* Piperno, Andres and Stothert, 2000; Hart, Thompson and Brumbach, 2003; Piperno and Stothert, 2003; Hart, Brumbach and Lusteck, R., 2007).

The archaeobotanical evidence is, however, quite limited and presents a wide dispersion in area over Europe and northern Africa starting from the 16th century. The Santi Quattro Coronati find helps to confirm such an early introduction to Italy, heretofore hypothesized only looking at the festoons of the Loggia of Cupid and Psyche in Rome (Caneva, 1992). *Cucurbita* seeds have been retrieved mostly in post-Medieval castles and urban sites, not necessarily associated with high status (Moffett, 1995). Despite being exotic, they soon became particularly valuable to people who did not have access to a wide variety of fresh food (Parkinson, 1904), due to their good preservation qualities. The earliest finds of *Cucurbita moschata*/*C. maxima* in northern Italy appear in Argenta (15th–16th century – Barbi *et al.*, 1998) and in Volta Mantovana (16th–17th century – Bosi, Buldrini and Rinaldi, 2015). The presence of *Cucurbita* sp. was attested in the 17th century in Libya at the ancient town of Garama (Pelling, 2003). Seeds of *C. pepo* were retrieved in Germany in a pit from the 16th–17th century in Lüneburg (Wiethold, 2003) and in a deposit in Rhineland (Knörzer and Pflanzenspuren, 1999), and in Belgium in a 17thcentury cesspit at the Arme Klaren site (Speleer and Van der Valk, 2017). In the Czech Republic, in Prague, *C. pepo* seeds were found in the infill of the vault of Prague Castle's Vladislav Hall, which is dated between the 16th and 17th century, and in two cesspits framed within the same period (Beneš *et al.*, 2012). One seed and a half of *C. pepo* were also retrieved from a pit in Dudley Castle, central England, which was used between 1642 and 1647 (Moffet, 1992). Other European findings of the same species include 17th century latrine deposits from Amsterdam in the Netherlands (Paap, 1984), Bratislava in Slovakia (Hajnalová, 1985) and Arnstadt, Germany (Lappe, 1978).

Among the animal remains from the discard pit of the tower, no New World species were recovered, but the faunal sample from US 521 in the excavations of the former porch yielded a pelvis attributed to *Cavia porcellus*. The whole specimen appears slightly burnt, but given its uniform distribution over the bone surface, such modification is probably not related to cooking. Although no cut marks were detected on the specimen, it is not possible to exclude *a priori* that this animal was used as food because coeval recipes using this species are known (*e.g.* Scappi, 1570).

The guinea pig was likely imported to Europe within the first half of the 16th century. The Swiss naturalist Conrad Gessner describes and depicts this species, calling it *Cuniculo vel Porcello Indico,* in his *Historia Animalium* published between 1551 and 1558, based on individuals he received as gifts from France and from Germany. Depictions of this animal appear in early 17th century paintings such as the Garden of Eden and the Entry of Animals into Noah's Ark by the Flemish artist Jan Brueghel the Elder. Skeletal remains of this species are very rare in archaeological sites and early specimens have so far been identified only in England in a manor at Hill Hall (Essex) within a context dated to 1574–75 (Hamilton-Dyer, 2009), in a middle-class residence referable to the late 16th–early 17th century at

Mons in Belgium (Pigiére *et al.*, 2012), and in a farmstead at Middleburg (Netherlands) from layers of the late 17th–early 18th century (Van Dijk and Silkens, 2012). In Europe, guinea pigs were initially considered only as prestigious exotic pets, but relatively soon they also became part of the human diet, as suggested by recipes in the *Opera* by Bartolomeo Scappi (1570), where he also mentions that, although the best season to eat the *coniglio d'India* was between October and February, it was available in Rome and in other places in Italy all year round.

6. Conclusion

The botanical and faunal assemblage of the disposal pit has allowed much information to be gathered regarding the diet and daily habits of the inhabitants of the Santi Quattro Coronati complex during the Early Modern period. The bulk of the biological remains were made up of hay and the plant assemblage, and poor in remains that are indicators of latrines, such as fig achenes and blackberry endocarps, allowing us to characterise the pit as a disposal for residues of food preparation and meals. The table and kitchen waste comprised remains of cereals, legumes, vegetables, fruits, nuts, spices, molluscs, fish, birds, and mammals.

Three New World species, two pumpkins from the pit, and the guinea pig from the former porch, complement the Old World species assemblage.

The *C. pepo* and *C. maxima/moschata* seeds found in the pit of Santi Quattro Coronati represent one of the oldest retrievals of such species, if not the oldest, in Europe. While *C. pepo* represents the oldest find, *C. moschata/maxima* has also been found in Northern Italy in a cesspit ascribed to the 15th–16th century (Barbi *et al.*, 1998). In the absence of a more precise dating it is not possible to ascertain which one would be the oldest find.

The guinea pig specimen, referable to the end of the 16th or beginning of the 17th century, represents the first evidence of this species in Italy and one of the earliest in Europe.

These early introductions could be justified by the fact that the Cardinal's palace, a very prestigious and wealthy landmark, was one of the first stops along the trading routes that emanated from the New World, leading to the rapid availability of new plant and animal species. This may possibly also be related to the role of Cardinal Lorenzo Pucci, titular of the Santi Quattro between 1513 and 1524, as supervisor for the Church of the Indies in the Consistory. The high social status of the inhabitants of the complex can be further affirmed by the presence of pomegranate remains, associated with fertility, hope for immortality, and resurrection.

The Santi Quattro Coronati complex represents a unique case study in the context of Early Modern archaeobotany and archaeozoology, and even more so due to the outstanding state of conservation of the mummified remains. It allows another piece of the puzzle to be added to the picture of New World species being imported to Europe.

The present study also demonstrates the wide potential of scientific research in relation to the Modern Age, a historical period to which it has yet to be applied for this specific context. Furthermore, it represents a work carried out in full harmony between the Academy, involving different areas of study and specialization, and the Superintendence, the national body officially in charge for the conservation of cultural heritage, obtaining relevant results in a common framework and the shared goal of scientific research.

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