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Pollen analysis of 15th century cesspits from the palace of the dukes of Burgundy in Bruges (Belgium): evidence for the use of honey from the western Mediterranean

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ABSTRACT

Pollen analysis of two late medieval cesspits from the palace of the dukes of Burgundy in Bruges (Belgium) revealed the presence of pollen from several food plants and their associated weeds. Also a large amount of exotic taxa was found, most of which are not commonly used as food plants. This last group of taxa shows 4 common characteristics: (1) their distribution is restricted to the Mediterranean region, (2) no macrobotanical remains from these taxa have been found (3) they are insect-pollinated and (4) most of these taxa are important elements in pollen assemblages from modern honeys from SW-Spain and S-Portugal. The presence of these pollen types can therefore most probably be attributed to the use of honey originating from this region. The consequences for the palynological analysis and interpretation of pollen assemblages of medieval and post-medieval cesspits and other types of waste deposits are discussed.

1. Introduction

Cesspits, latrines, sewers and other kinds of waste deposits containing faecal remains are an important source of information about former plant use, especially in diet and medicinal practices. Such archaeological contexts are therefore routinely analysed for botanical macro remains. However, pollen analyses from cesspits are only rarely applied (Greig, 1994). This is mainly because the taxonomic level of identification is generally lower for pollen than for botanical macro remains. Additionally, the identification of the source from which the pollen originates in such waste deposits is less straightforward than for macro remains, which makes the interpretation of the pollen assemblage more difficult. However, the few existing pollen analyses of such contexts do provide a lot of additional information on former plant use, which could mostly not have been obtained through the study of botanical macro remains (see for example De Clercq et al., 2007; Greig, 1981, 1982b, 1994; Horrocks and Best, 2004; Knights et al., 1983; Kuijper and Turner, 1992; van Den Brink, 1988, 1989; van Haaster, 2008). This is not surprising as several useful plants, especially herbs and spices can only be recovered in the form of pollen because these plants are harvested before they produce seeds, or because only vegetative parts of the plants are used.

The use of honey also leaves no macro botanical trace but can be demonstrated by pollen analysis. In this way, residues of honey or products containing honey have been demonstrated from residues recovered from vessels from various archaeological sites and periods. This was for example the case for mead residues recovered from Bronze Age (Dickson, 1978; Glob, 1974), Iron Age (Goppelsröder and Rösch, 2002; Körber-Grohne, 1985; Rösch, 1999, 2005) and early medieval (Jacob, 1979) grave gifts from Europe. Honey was also demonstrated by pollen analysis of a grave gift associated with a mummy from 1350 BC (Zander, 1941) and from the residue of a Coptic wine amphora dating to the early medieval period (Rösch, 2005), both from Egypt. At a site in southern Georgia, residues from probably pure honey were recovered from Bronze Age vessels as demonstrated by pollen analysis (Kvavadse et al., 2007).

The study presented here shows that the past use of honey is also reflected in the pollen assemblages from cesspits. The geographical origin of the honey is determined and the implications for the interpretation of pollen assemblages from cesspits and other kinds of waste deposits are discussed.

2. Site and methods

Pollen from two cesspits from the former palace of the Dukes of Burgundy in Bruges, north-western Belgium has been analysed

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(Fig. 1). The two rectangular shaped brick-lined cesspits were situated next to the bathhouse of the palace. The fill of the cesspits can be dated in the late 14th or 15th century based on the ceramics (Deforce et al., 2007b). During this period, the site was one of the main residences of the Dukes of Burgundy (De Jonge, 2007).

Four samples (±1 cm^3), two from each cesspit were processed following standard techniques for pollen analysis (Moore et al., 1991). Identifications are based on Moore et al. (1991), Beug (2004), Valdés et al. (1987), Reille (1992, 1994), Punt et al. (1976–2003), and a reference collection of modern pollen and spores, stored at the Flemish Heritage Institute (Brussels). A minimum of 500 pollen and spores were identified and counted for each sample. Percentages are based on the sum of all pollen types (ΣP). Spores and intestinal parasite ova are excluded from this sum.

Next to pollen, also botanical macroremains (van Haaster, 2006; Deforce et al., 2007b), animal bones (including a large number of fish bones) and ceramics have been studied (Deforce et al., 2007b).

3. Results and discussion

3.1. Food plants

The results of the pollen analysis are presented in Table 1. Cerealia (cereals) is the most abundant pollen type in all investigated samples. *Secale cereale* (rye), the only species that was distinguished from the other Cerealia, occurs only in small percentages.

High numbers of Cerealia pollen is very common in (post)medieval cesspits and is explained by the consumption of cereal-based food such as bread or porridge. As most cereals are autogamous, a large number of pollen remains in the hulls. Pollen analysis of recent ears and mature seeds of cereals showed not only high amounts of Cerealia pollen but also lower numbers of pollen from the surrounding vegetation, especially arable weeds (Jankovská and Kratochvílová, 1988; Joosten and van den Brink, 1992; Robinson and Hubbard, 1977). Part of this pollen ends up in cereal based food products after cereal processing and food preparation.

Another explanation for the high percentage of Cerealia pollen would be straw or threshing debris that has been thrown into the cesspit (Greig, 1981). However, as no large amounts of chaff have been found, this seems not to be the case (van Haaster, 2006).

Other taxa that most probably also reflect the diet of the former occupants of the palace are *Borago officinalis*, *Vitis vinifera*,

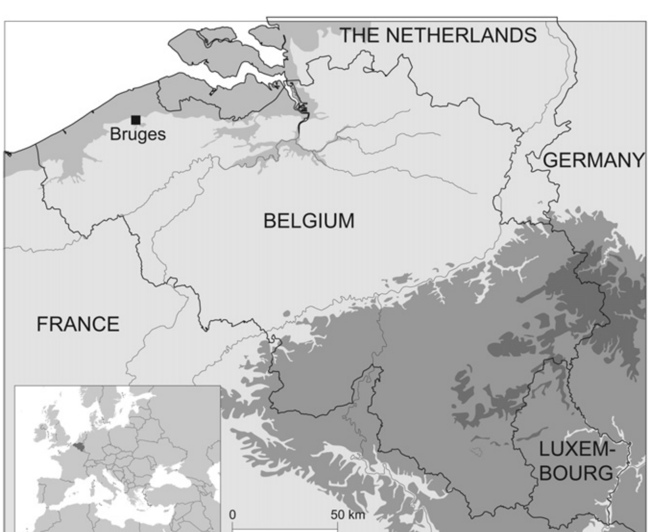

Fig. 1. Map showing the location of the site.

Table 1
Pollen assemblages from the two cesspits.

Feature	XIV/113		XV/68		e	m
Sample	1	2	3	4		
Cultivated plants						
Anthriscus cerefolium	0.9	1.2	0.2	0.2	x	
Borago officinalis	0.9	0.9	1.5	2.2	x	
Bifora radians type	0.3	0.7	0.2	0.4	x	
Cannabis type	0.2		0.4	0.2		
Capparis spinosa				0.2	x	
Castanea sativa		0.3	0.4	0.7	x	
Cerealia undiff.	24.7	24.1	34.5	35.9		
Secale cereale			0.8	0.2		
Juglans regia			0.6	0.7		
Olea europea	0.2	0.2	1.0	0.4		x
Pisum sativum				0.2	x	
Ribes uva-crispa	0.2				x	
Myrtaceae	0.5	0.7	0.8	0.4	x	
Vicia faba		0.5			x	
Vitis vinifera	0.3	0.2	0.6			
Wild plants						
Trees and shrubs						
Alnus	5.3	8.3	2.9	2.2		
Arbutus unedo	0.3	0.3	0.2	0.2	x	x
Betula	2.2	4.7	0.2	0.9		
Carpinus betulus		0.2	0.2			
Cistus albidus type	0.9	0.3	0.8	0.2	x	x
Cistus ladanifer	1.2	1.2	2.3	1.5	x	x
Cistaceae undiff.	0.7	0.9	0.2	1.3	x	x
Cytisus type		0.3			x	
Corylus avellana	4.4	4.5	2.9	2.2		
Erica umbellata	1.7	0.9	3.4	2.0	x	x
Fagus sylvatica	0.2					
Fraxinus excelcior	0.2	0.2				
Hedera helix	0.2	0.3	0.2		x	
Ilex aquifolium	0.2				x	
Pinus	1.7	2.8		0.2		
Phillyrea			0.2	0.2	x	x
Prunus type	0.2				x	
Quercus	1.9	1.7	1.1	0.4		
Rhamnus			0.2		x	
Salix	0.3	0.2		0.4	x	
Sambucus nigra type	0.5		0.2		x	
Securinega tinctoria	0.2				x	x
Tilia	0.2	0.2			x	
Ulmus	0.5	0.5	0.2			
Herbaceous taxa						
Agrostemma githago				0.2	x	
Anthemis type	2.4	1.0	1.9	2.0	x	
Apiaceae undiff.	2.0	2.4	1.7	2.4	x	
Artemisia	0.2	0.5	0.4	0.2	x	
Aster type	1.0	0.5	0.6	0.6	x	
Asteraceae Liguliflorae	0.5		0.2	0.7	x	
Brassicaceae	1.0	1.0	1.7	0.4	x	
Campanulaceae	1.9	2.9	1.0	1.3	x	
Caryophyllaceae		0.2			x	
Centaurea cyanus	1.0	1.9	1.7	2.0	x	
Centaurea nigra type	0.5	0.2	0.2	0.2	x	
Chenopodiaceae-Amaranthaceae	0.3	0.2	0.2	3.5		
Cirsium			1.1		x	
Cyperaceae	0.9	0.5	1.0	0.2		
Echium	10.4	7.4	3.4	5.8	x	
Ericaceae undiff.	4.8	5.3	3.6	3.4	x	
Callunua vulgaris	3.6	1.7	1.7	1.1	x	
Erodium cicutarium type	0.2				x	
Fabaceae undiff.	0.5	0.5	2.1	2.8	x	
Filipendula			0.4		x	
Galium type			0.6	0.2	x	
Genista type			0.2		x	
Helianthemum	0.3	0.2			x	x
Lamiaceae undiff.	0.3	0.7		0.6	x	
Lathyrus type	0.9	0.5			x	
Lavandula stoechas type	0.3	0.5	0.8	0.2	x	x
Lilliaceae			0.2		x	
Lotus type	1.4	1.0	0.8	0.2	x	
Mentha type		0.3	1.3	0.6	x	

Table 1 (*continued*)

Feature	XIV/113		XV/68		e	m
Sample	1	2	3	4		
Orlaya grandiflora	0.2				x	
Ornithopus		0.2			x	
Oxytropis type	0.3	0.3			x	
Papaver rhoeas type	0.2	0.3	0.2	0.2	x	
Plantago lancealata	0.2	0.7	1.1		x	
Plantago major/media			0.4			
Poaceae	9.6	10	11.6	14.3		
Polygonum aviculare type		0.2	0.2		x	
Polygonum convolvulus type	0.2				x	
Polygonum persicaria type			0.2		x	
Potentilla type	0.2	0.3			x	
Prunella type			0.2		x	
Ranunculus acris type	0.2		0.2		x	
Rosa	0.2				x	
Rosaceae undiff.	0.2	0.3	0.4	0.2	x	
Rubus	0.3	0.3			x	
Rumex acetosa type	0.5	0.2	1.1	1.5		
Trifolium pratensis type			0.2	0.2	x	
Trifolium repens type	1.7	0.7	1.0	1.3	x	
Viccia type	0.3	0.3	0.2	0.2	x	
Lythrum	0.2	0.2	0.4	0.2	x	
Sparganium emersum type	0.2					
ΣP	586	580	524	537		
Ferns and mosses						
Filicales undiff.	0.9	1.7	0.2			
Pteridium aquilinium			0.2			
Fungi						
Thecaphora			0.2			
Nematoda (intestinal parasites)						
Ascaris	6.1	23.3	33.0	19.2		
Trichuris	54.1	72.9	50.2	62.6		
Indeterminata	4.1	4.1	4.4	3.2		

e: entomophilous m: Mediterranean distribution.

Anthriscus cerefolium, *Bifora radians* type, *Capparis spinosa*, *Pisum sativum*, *Vicia faba*, *Ribes uva-crispa* and Myrtaceae.

Borago officinalis (borage), originating from the western Mediterranean region, was introduced to the Low Countries in the Middle Ages where it was cultivated as a kitchen herb and vegetable (van Haaster, 1997). As particularly the flowers of this plant are eaten, it is not surprising that its pollen are frequently found in medieval and post medieval cesspits (van Haaster, 2008; Greig, 1981; De Clercq et al., 2007).

Vitis vinifera (grape) is not native to Belgium either but was widely cultivated here during the Middle Ages (Lievois, 1990). The presence of *Vitis* pollen might result from the consumption of imported raisins or wine or locally grown grapes or its products, as all these can contain considerable amounts of pollen (Greig, 1982a; Rösch, 2005).

The Myrtaceae (myrtle family) pollen can most probably be attributed to cloves, the dried flower buds of *Syzygium aromaticum* as this was a popular, though expensive spice in medieval times (Collet, 1992). *Bifora radians* type comprises *B. radians* (wild bishop) and *Coriandrum sativum* (coriander) (Punt, 1984). As *Bifora radians* is not native to Western Europe, but only casually naturalized, it is likely that the pollen of *Bifora radians* type belongs to *Coriandrum sativum*. This is supported by the numerous seeds of *C. sativum* that have been found in the cesspits (van Haaster, 2006). Like coriander, *Anthriscus cerefolium* (garden chervil) must have been a popular herb in medieval cooking as its pollen is regularly recovered from medieval and post medieval cesspits (e.g. De Clercq et al., 2007; Deforce, 2006; van Den Brink, 1988, 1989; van Haaster, 2003).

The presence of pollen of *Capparis* can most probably be attributed to the use of capers, the pickled flower buds of *Capparis spinosa*, although the fruits of this plant are used for human consumption as well. As no macrobotanical remains of *Capparis* have been found in the investigated cesspits, the first option is the most likely. Moreover, just as for cloves, the use of the flower buds of *Capparis* results in an important input of pollen of this plant. Seeds of *Capparis spinosa* have been found in several other late medieval contexts from Bruges (Cooremans, 1999).

The presence of pollen from *Pisum sativum* (pea) and *Vicia faba* (broad bean) can most probably be attributed to the consumption of these plants. For *Pisum*, this is supported by the presence of seeds in the same cesspit (van Haaster, 2006). The use of *Ribes uva-crispa* (gooseberry) has only been attested by its pollen.

3.2. Arable weeds

Several taxa from the pollen assemblage like *Agrostemma githago* (corn cockle), *Centaurea cyanus* (cornflower) and *Orlaya grandiflora* (white lace flower) occur almost exclusively as weeds in arable fields. They are nowadays severely decimated or have even disappeared in N Belgium due to the use of herbicides and seed cleaning (Van Landuyt et al., 2006). However, they must have been abundant during medieval times given the high percentage of both their pollen and macro remains. Most of these pollen types most probably have the same origin as the Cerealia pollen, i.e. they have been harvested and processed together with the Cerealia and got incorporated in porridge or bread. This is supported by the presence of seed fragments from these taxa in the cesspits as well (van Haaster, 2006).

Other pollen types which include possible arable weeds are Asteraceae-Liguliflorae, Brassicaceae, *Papaver rhoeas* type, *Polygonum aviculare* type, *Polygonum persicaria* type, *Rumex acetosa* type, Caryophyllaceae and Chenopodiaceae (Behre, 1981). These pollen types also include taxa that grow in other habitats as well however like fallow land, meadows and pastures.

3.3. Peat

The presence of spores of *Sphagnum* and probably also *Calluna* pollen is attributed to peat and/or peat ashes most probably used for covering the surface of the cesspit to reduce unpleasant smells and to avoid the attraction of flies. Peat was widely used as fuel in Northern Belgium during the middle ages (Deforce et al., 2007a). Its ashes were, probably together with fragments of uncharred peat used to cover the surface of the cesspit (De Groote et al., 2009). This helps to desiccate the manure and raise the pH, which effectively kills pathogens (Doelle, 2001) and acts as an insecticide (Hakbijl, 2002). This practice is also evidenced by the presence of macroremains of *Erica tetralix*, *Eriophorum* and *Rynchospora* in the investigated cesspits (van Haaster, 2006).

3.4. Atmospheric pollen rain

A certain percentage of the pollen assemblage might originate from atmospheric pollen rain, either deposited directly from the air onto the surface of the cesspit, or attached to rubbish that has been thrown into the cesspits, or indirectly, through inhalation (Wilson et al., 1973) by the occupants of the site, via their digestive tract, and subsequent defecation.

3.5. Honey

A large number of the pollen types found in the investigated cesspits are not native to the local flora and their presence can not easily be explained by the use of these plants for food, medicine or any other purpose. These are *Arbutus unedo* (strawberry tree), *Securinega tinctoria* (tamujo), *Cistus albidus* type (white-leaved rock rose type), *Cistus ladanifer* (crimson spot rock rose), Cistaceae undiff. (rock rose family), *Erica umbellata* (dwarf Spanish heath), *Lavandula stoechas* type (French lavender type), *Phillyrea* (mock privet) and *Helianthemum* (sun rose). All these taxa have four common characteristics:

(1) They show a typical Mediterranean distribution, although *Arbutus unedo* occurs also in NW Europe, extending northwards locally to NW Ireland, and *Cistus albidus* and a few species of *Helianthemum* occur also north of the Mediterranean region (Tutin et al., 1964–1980). Only *H. nummularium* occurs as far north as northern Belgium (Lambinon et al., 1998). *Cistus ladanifer* grows in the western Mediterranean. *Phillyrea* occurs in the Western and Central Mediterranean region. *Lavandula stoechas* type comprises *L. multifida*, *L. stoechas* and *L. viridis* (Valdés et al., 1987). *L. stoechas* occurs in most of the Mediterranean region, *L. multifida* only in the western part and the distribution of *L. viridis* is restricted to SW Spain and S Portugal. *Erica umbellata* and *Securinega tinctoria* are restricted respectively to the west and the southwest of the Iberian peninsula (Tutin et al., 1964–1980).
(2) All these taxa have only been attested by pollen analysis. No macrobotanical remains of these taxa have been found in the cesspits investigated (van Haaster, 2006) nor in other medieval archaeological contexts from the Low Countries (RADAR 2005 (Van Haaster and Brinkkemper, 1995); Cooremans pers.comm.). In contrast, most food plants of which pollen has been found have also been found as botanical macroremains in these two cesspits (e.g. Cerealia, *Vitis vinifera*, *Coriander*, *Pisum sativum*) or at least in contemporaineous cesspits or other archaeological structures in the Low Countries (e.g. *Capparis spinosa*).
(3) All these taxa are insect pollinated (entomophilous). In contrast with anemophilous taxa, insect pollinated plants have a lower pollen production and their pollen is generally only dispersed by one or a few specific insect species (Dafni, 1992). Entomophilous plants are therefore generally rare in pollen assemblages from both natural and archaeological deposits, compared to anemophilous plants (Adams et al., 1978).
(4) From multiple melissiopalynological studies of modern honeys from the western Mediterranean, these taxa are known to be important elements in the pollen spectra of honeys from this region (e.g. Bonvehi and Coll, 1993; D'Albore, 1998; Gomez Ferreras and Sáenz de Rivas, 1980; Terrab et al., 2004; Valencia-Barrera et al., 2000). *Arbutus unedo*, *Erica umbellata* and *Lavandula stoechas* are even known to give unifloral honeys (Persano Oddo et al., 2004).

The Mediterranean distribution and entomophilous character of these taxa makes it extremely unlikely that their presence can be attributed to the atmospheric pollen rain, directly or indirectly through inhalation and defecation. It makes it also unlikely that they have been attached to other plant material like mosses, peat, straw, … which might have been thrown in the cesspits. As no macro remains of these taxa have been found in the cesspits, nor in other medieval archaeological contexts in the Low Countries, it is also very unlikely that their presence is the consequence of the use of these plants for food, medicine or any other use which involves macrobotanical parts. In fact, of these taxa, only *Arbutus unedo* produces edible fruits (López González, 2002).

The most obvious explanation for the presence of these pollen types would be the use of honey, or products containing honey, from the Mediterranean, especially as these taxa are known to be important elements of modern honeys from this region. Moreover, honey was very popular in the medieval cuisine as it was the only widely available sweetener, sugar being rare and expensive (Galloway, 2000). Given the geographic distribution of the exotic taxa found, especially *S. tinctoria* and *Erica umbellata*, and the good correlation with pollen assemblages from modern honeys from SW Spain (Gomes Ferreras and Sáenz de Rivas, 1980) and S. Portugal (Maia et al., 2005), this honey must originate from the south-western part of the Iberian peninsula. Whether it has been brought in as pure honey or as an ingredient of another food product, like the sweetened and spiced medieval wine claree, or medicine, can not bee defined.

Probably many more of the observed pollen types result from the use of honey. 76.7% of all pollen types and 59.4% of the total amount of pollen counted (Cerealia excluded) from the cesspits investigated is entomophilous which are indeed very high percentages for pollen assemblages from outside the tropics (Adams et al., 1978). The use of Mediterranean honey would not only explain the presence of the above mentioned pollen types but also the high percentages of *Echium* (up to 10.4 %) and the occurrence of *Cytisus*, both seldomly found in pollen analysis from NW European contexts but characteristic pollen types in honeys from the Mediterranean (Bonvehi and Coll, 1993; D'Albore, 1998; Maia et al., 2005; Persano Oddo et al., 2004; Terrab et al., 2004; Valencia-Barrera et al., 2000). It is also likely that the *Olea europea* pollen has the same origin; although *Olea* is an anemophilous plant, its pollen is often observed in pollen spectra from Mediterranean honeys (e.g. Bonvehi and Coll, 1993; Terrab et al., 2004). *Olea* pollen might result from the consumption of olives or olive oil but these are rather rare in the 14th and 15th century cuisine of the Low Countries (Adamson, 2004). Also no macroremains of olives have been found in the cesspits investigated (van Haaster, 2006).

3.6. Floral composition of the honey

Pollen analysis is not only useful for the detection of the use of honey in the past but also for determining its floral composition (Sawyer, 1988; Herrero et al., 2002). In the case of Bruges, however, it is not possible to reconstruct the complete floral composition of the used honey as could be done with more 'pure' archaeological finds of honey residues (Kvavadse et al., 2007; Rösch, 1999; Zander, 1941). Only the pollen types that do not belong to the local flora and that are not likely to have been used as food plants, or in any other type of plant use, can be attributed with certainty to the use of honey. Several other of the identified pollen types include taxa that could originate from Mediterranean honey but could be of local origin as well. These are mainly taxa with a large geographical distribution (like for example *Trifolium repens* type) or with a low identification level (for example Asteraceae-Liguliflorae, Fabaceae undiff., Lamiaceae undiff.).

3.7. Implications for the interpretation of pollen assemblages from cesspits

Honey generally contains very high amounts of pollen (Bryant, 2001; Sawyer, 1988), and therefore the use of honey in food and medicine will have an important impact on the pollen assemblage from coprolites, cesspits, latrines and sewers. Honey has been suggested before as a source for part of the pollen assemblages from human coprolites (Hadron, 1994) and cesspits (De Groote et al., 2004; Gauthier, 2006; Greig, 1994; Jankovská, 1987; van den Brink, 1989) based on high percentages of pollen from insect pollinated plants. However, as there are several other possible sources for these taxa, like food plants, arable weeds or the local atmospheric pollen deposition, this is very hard to prove. In the case presented here, it is possible to attribute part of the pollen assemblage to the use of honey as it originates from another region, representing a flora that differs from the local one. As a consequence, other possible sources for these pollen types can be ruled out. Also other finds of Mediterranean pollen types in medieval cesspits in NW Europe might be attributed to the use of honey (Deforce, 2006).

The use of imported honey or products containing honey from the western Mediterranean in medieval NW Europe has important consequences for the study and interpretation of pollen assemblages from coprolites, cesspits, latrines and sewers from this period. Not only for the identification of the pollen types: the geographical region and thus the flora to be considered might be a lot larger that initially assumed, an observation which has its consequences for the identification keys and reference collections to be used. But there are also serious implications for the interpretation of the results. The presence of pollen types that are generally believed to represent used food plants like *Vitis vinifera*, *Borago officinalis*, *Capparis spinosa*, *Pisum sativum* might be the result of the use of honey instead of the use of these plants for food. Most of these plants are indeed insect-pollinated and grow in SW Europe. Especially some of these taxa, like *Borago officinalis*, can be important elements in pollen assemblages from honeys from S Europe (Persano Oddo et al., 2004). The occurrence of botanical macro remains of these plants might indicate that they have effectively been used by the occupants of the investigated site. On the other hand, the absence of macroremains is for some taxa like *Borago*, *Syzygium* and *Capparis* not indicative for the contrary, as basically the flowers or flower buds of these plants are eaten. The use of Mediterranean honey also implicates that within some pollen types, other species have to be considered. For the Myrtaceae family for example, not only *Syzygium aromaticum* (cloves) is a likely candidate but also *Myrtus communis* (myrtle), a Mediterranean shrub which is also an important honey plant (Persano Oddo et al., 2004) as it is not possible to distinguish *S. aromaticum* pollen from *Myrtus communis* (Jankovská, 1995), the only species of this family native to (southern) Europe. *Bifora radians* type pollen is in NW Europe generally attributed to *Corandrum sativum* as *Bifora radians* is not a native of Western Europe, but only casually naturalized (van Haaster, 2008). However *Bifora radians* does grow in the Mediterranean and can thus not be excluded in this case. Another example is *Carthamus tinctorius* (safflower) from which pollen is sometimes recovered from NW Europe; its presence is normally explained by its use as a substitute for *Crocus sativus* (saffron) (e.g. van Haaster, 2003). If Mediterranean honey has been used, its pollen might originate from that source as well but it might in fact also be confused with other *Carthamus* species which belong to the same pollen type like *C. lanatus* (Valdés et al., 1987).

Not only several potential food plants but also most of the arable weeds like *Centaurea cyanus*, *Orlaya grandiflora* and *Agrostemma githago*, are entomophilous and might originate from the use of honey rather than from cereals based food preparations. High percentages of *Centaurea cyanus* pollen in combination with high numbers of *Calluna vulgaris* and Brassicaceae in a cesspit from Prague (Czech Republic) for example, have been explained by the use of honey (Jankovská, 1987).

3.8. Conclusions

The archaeobotanical analysis of cesspits is in most cases restricted to the study of seeds, though several food plants like herbs and spices are harvested and used before they produce seeds and thus remain invisible. However their past use can be demonstrated by pollen analysis (Greig, 1994). This study adds honey to the list of food types that can be demonstrated by pollen analysis of cesspits. Moreover, based on the geographical distribution of some of the taxa that can be attributed to this honey, it is concluded that honey, or food products containing honey, from the SW of the Iberian peninsula arrived on the Flemish markets. Whether this was an extraordinary luxury for the late 14th and 15th century and thus an indication for high status, international relations or high spending power of the former occupants of the investigated site remains unclear. There is very little other palynological research on similar contexts to compare with, which makes it difficult to draw conclusions on a larger scale. There are some other finds of Mediterranean pollen types in Belgium which might be attributed to the same origin, dating to the 15th and 16th century, from far less elitist sites which might indicate the contrary (Deforce, 2006).

The fact that 'exotic' honey has been used in medieval NW Europe and that this use has an important impact on the pollen assemblage from archaeological cesspit remains has serious consequences for the interpretation of pollen data from such archaeological contexts.

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