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ORIGINAL ARTICLE

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The introduction of Old World crops (wheat, barley and peach) in Andean Argentina during the 16th century A.D.: archaeobotanical and ethnohistorical evidence

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Abstract It was believed for a long time that the first Old World crops were introduced to the northwest of Argentina in A.D. 1550 during the foundation of Barco, and that the indigenous people incorporated them into their subsistence almost passively. However, since wheat, barley, and peach have been recovered from El Shincal, an Inka (Inca) administrative centre, new questions have arisen about who first brought these crops to the study region, as well as about where they were grown for the first time and which routes they followed after that. This paper will try to solve these questions during a period ranging from the 16th to the 18th century. This time span, although arbitrary, is consistent with the major damage to the original social structure caused by the Spaniards to the local indigenous populations. Our approach includes the comparison of ethnohistorical with archaeobotanical evidence. It is concluded that the first Old World crops were brought from Chile to Santiago del Estero by Spanish soldiers in A.D. 1556, and to Londres in A.D. 1558. These crops were taken up by local indigenous people during the period of the *encomenderos* and used to carry out a *pachamanca* ceremony at El Shincal during a Diaguita rebellion.

Keywords Archaeobotany. Wheat routes. Argentina. Colonial period. Inka

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Introduction

Crops are the most important subsistence element that has allowed the development and evolution of social complexity. Since the origin of agriculture they have spread to the most important civilizations. Rice in the Far East, wheat and barley in the Middle and Near East, millet and sorghum in Africa, maize, beans and squash in Central and Andean America, among others, are some examples.

The contact between Old and New World after Columbus' voyages allowed the exchange of many domesticated plants. American maize, tomato, potato and quinoa have had an enormous impact on the Old World (Crosby 1972). Simultaneously there has been a diffusion of plants and animals from the Old World to America. It is well known that the diffusion of cultivated plants represents changes in economic, social, political and even religious aspects of the local societies where new plants are introduced (see for example Plotnicov 1999). In the case of the Spanish colonies in South America this diffusion was connected with strong processes of change of the existing social structure, all of them caused through the exploitation, appropriation of the lands and the annihilation of indigenous populations by the Spanish conquistadores. Indigenous people were then induced to abandon some practises for others more convenient for the invaders (from being hunter-gatherers to being agriculturalists in some cases), or they produced Old World crops more than the local ones in order to supply the Spanish cuisine. But the political situation was not the only important factor in the process of plant diffusion, but also the perceptions of the people who received the new plants, a variable that depended on the socio-historical context, as well as on the meaning and function given to a plant within each local cosmogony.

It is well known that the first Spaniard who arrived in what is now the northwest of Argentina was Captain Diego de Almagro, who incorporated this territory for the Spanish Crown in A.D. 1535–36. He left Cuzco with a contingent of around 250 Spanish soldiers plus 2000 indigenous people, and 200 horses. The expedition crossed the Argentinean Calchaquíes valleys and the Andes and went to the Chilean Copiapó, returning to Cuzco 15 or 18 months later. The provisions for that journey consisted of horses and pigs that were carried alive, as well as maize

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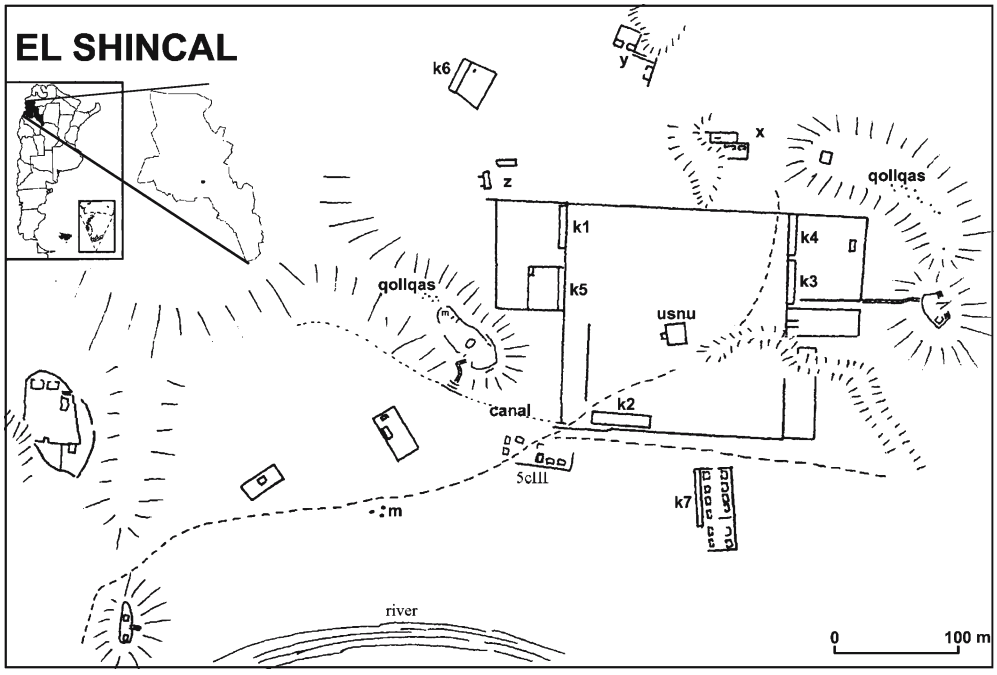

Fig. 1 Map of the Inka site of El Shincal showing the location of the *Ushno*, the unique activity area where Old World remains were recovered. (Modified from Farrington 1999)

from the Inka settlements on the way. *Prosopis* sp. (Algarrobo) was also eaten in times of famine. No Old World plant foods were eaten during this expedition (Raffino 1995, 2004a). Something similar happened during the next expedition to the Argentinean northwest carried out by Diego de Rojas in A.D. 1542–46 (Raffino 1973). After that, there was a time during which Spaniards settled in Peru, on the one side of the Andes, and in Chile on the other side, competed between each other, and fought with the local indigenous people to dominate the Argentinean territory. Later on, the following first three villages were founded in the northwest: (1)- Barco (A.D. 1550), in the modern province of Tucumán; (2)- Santiago del Estero (A.D. 1553), in the modern province of Santiago del Estero and Londres de Quimivil (A.D. 1558) in the modern province of Catamarca. The former was founded by Núñez del Prado, a Spaniard from Perú, and the latter two by Spaniards from Chile, Francisco de Aguirre and Juan Pérez de Zurita respectively. A Tucumán government (from an historical perspective) was created to join these cities and others founded later. It was a political region which included the present-day Argentinean provinces of Jujuy, Salta, Tucumán, Santiago del Estero, Catamarca, La Rioja and Córdoba. All of them, except the last one, constitute the present northwest Argentinean archaeological area (NW) (González and Pérez 1985).

It was believed for a long time that the first Old World crops were introduced to the northwest in A.D. 1550 during the foundation of Barco, and that the indigenous people incorporated them into their subsistence almost passively (Báez 1947). However, since the discovery of wheat, barley and peach from El Shincal (an Inka administrative centre) confirms the effective presence of these crops during the 17th century in the Argentinean northwest, new questions have arisen on this subject. This paper has two main objectives, first to understand the reasons for the presence of these crops in the *ushno* (ceremonial site) of El Shincal (Figs. 1, 2) and to establish which local people grew them and how. Second, the evidence allows us to ask who among first conquistadores (the Spanish conquerors of central and south America) brought these first crops to the study region, as well as where they were grown for the first time and where they spread to after the initial introduction. The former question will be addressed by means of the archaeobotanical analysis, while the latter will be elucidated by ethnohistorical research that allows us to test previous hypotheses such as that proposed by Báez (1947). The period studied here is from the 16th to the 18th century. This, although arbitrary, is consistent with the time during which major damage was inflicted by the Spaniards on the local social structure of the indigenous populations (Lorandi 1988).

It is considered that the recovery of *Triticum* (wheat), *Hordeum* (barley) and *Prunus persica* (peach) from El Shincal is an important contribution because of the following four reasons: 1.—they provide the first archaeological evidence of these Old World crops in Argentina, 2.—the site is closely related to one of the first three villages founded by Spaniards in northwest Argentina (Londres de Quimivil, A.D. 1558), 3.—the archaeological record of El Shincal links the Inca with the Hispanic-Indigenous period through the persistent use of the *ushno* as a ceremonial place, and 4.—the context of these remains is dated in a range corresponding to the period of indigenous rebellions which took place between A.D. 1600–1670.

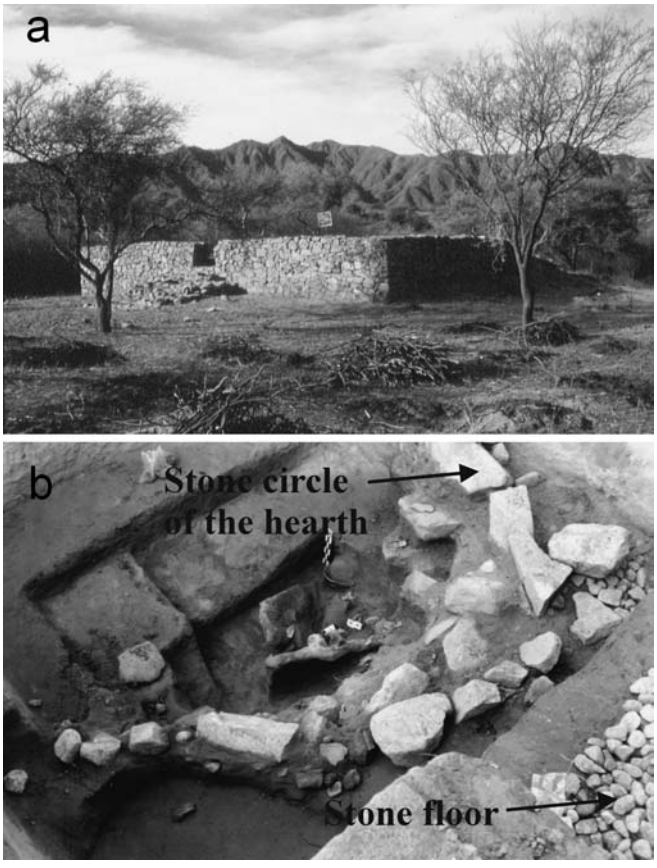

Fig. 2 The *Ushno* ceremonial site of El Shincal; **a** External view; **b** the excavation of the hearth. (Modified from Raffino et al. 2004)

Brief description of the evolution of the northwest Argentinean cultures

The northwestern Argentina is a very rich archaeological region. The oldest sites were occupied by hunter-gatherers around 10000–7400 B.P. (Aschero 2000; Núñez and Santoro 1990). After that, different stages of cultural changes can be distinguished (*sensu* González 1976). Gradually people started to domesticate plants and animals, and by 2000 B.P. the cultivation of *Zea* (maize), *Cucurbita* (squash), *Arachis* (peanut) and *Phaseolus* (beans) were well-established. In this way, the inhabitants of the northwest started to live in sedentary settlements, while preserving their trading routes with groups in Chile, Bolivia and the lower lands of the east.

The period between A.D. 900 and 1471 is called the "Regional Development Period" and it is characterized by an increase in the population density, an improvement in agriculture with new varieties of crops, and larger settlements considered as cities with populations in the thousands. By this period several regional organizations emerged connecting different settlements under complex socio-economic systems. Conflicts between local communities also increased, as shown by the presence of *pukaras,* defensive settlements located on the very tops of the hills.

The quest for metal was the main motivation which led to the Inka expansion into the Argentinean northwest during the 15th century (Gonzalez 1980). This was associated with an intensification of crop production. Local communities were very important to the Inka for maintaining food regulation through both higher levels of maize production (see for example Hastorf 1990) and the exploitation of local food resources (Earls 1976). This intensification was first believed by researchers to have occurred only in the largest administrative centres of Perú and Bolivia (D'Altroy 1992). However, modern studies have demonstrated that the same occurred in the *Kollasuyu*—the southernmost of the four regions into which the Inka state was divided—and that this part of the state was not as marginal as previously thought (Williams and D'Altroy 1998). Inkas built and modified several local settlements of which nearly 160 are known in Argentina. Only 10 of these sites, including El Shincal, are distinguished from the others because of their refined construction and distribution of architectural structures. These 10 sites have been defined as Inka Administrative Centres and were located at logistically selected places (Raffino et al. 1981). El Shincal can also be considered symbolically as a "New Cuzco" (Farrington 1999).

Regional setting of northwest Argentina in general and of El Shincal in particular

It is possible to recognize two major types of landscape determined by the topography of northwestern Argentina (Fig. 3): a plain homogeneous area of the Andes from 3000 m asl upwards called Puna, with a mean annual precipitation of 0 to 300 mm, and a heterogeneous area extending along the longitudinal valleys of the pre-Andean mountains from 500 to 3000 m (Quargnolo 1974). These two areas are associated with two interconnected different kinds of modern human subsistence systems respectively, pastoral and agricultural. The wide distribution of the Puna from a topographical perspective is restricted to a smaller area when considering the phytogeography (sensu Cabrera 1971). In this sense the Puna Province refers to the shrubby or grassy steppes between 3000 to 4400 m, while the Altoandina Province comprises the grassy steppes located from 4400 m upwards, where snow is usual. On the other hand, different kinds of vegetation can be observed in the valleys region depending on the geographical coordinates and altitude. Thus closed forests are common in the Yungas, a narrow and large area extending from Bolivia to central Argentina by the eastern part of the pre-Andean mountains with a mean annual precipitation ranging between 900 to 2500 mm. Open forests, steppes and grasslands belonging to the Monte Phytogeographical Region are observed in the rest of the valleys (Fig. 3).

The site of El Shincal (27°41′14″ S and 67°10′31″ W), 6 km from the modern village of Londres de Quimivil, is situated in the northwestern extreme of the Pipanaco basin at an elevation of 1300 m (Fig. 1). It extends along the

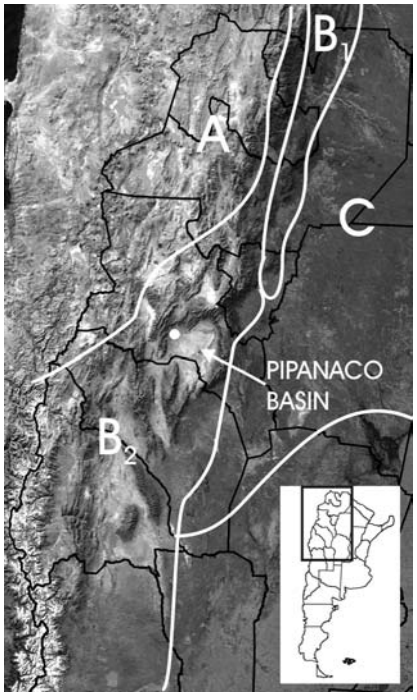

Fig. 3 The Argentinean northwest and the location of El Shincal (white point). Topographical areas: A—Puna; B—longitudinal valleys; C—Chaco; phytogeographical provinces: A—Puna, Altoandina; B_1—Yungas; B_2—Monte; C—Chaco

south eastern-facing foothills of the pre-Andean Belen mountains, at the bottom of the Hualfin, a longitudinal valley that has a subtropical climate with an estimated mean annual precipitation of 150–400 mm, more or less evenly distributed throughout the summer. Precipitation is mainly torrential, concentrated in short rainstorms. The mean annual temperature is 18°C. Phytogeographically the area belongs to the "Monte" Province of the Neotropical Region (Fig. 3), which is characterised there by steppes of *Larrea* sp. However, when water conditions are favourable open forests of *Prosopis* sp., characteristic of the Chaco Province, are also frequent.

It is thought that El Shincal played an important role in relation to the traffic of goods between several Inka sites all around the region (Raffino 2004b; Williams and D'Altroy 1998). This archaeological site extends over 0.33 km^2 (Fig. 1). Different kinds of structures (*kallankas, sinchiwasi, ushno*) including processing areas, mainly areas with mortars for grinding, are distributed around a central square (*aukaipata*). A ceremonial structure or *ushno* is placed in the centre of the square, and a large storage area extends on the very top of a hill (Fig. 2; for more detail see Raffino et al. 1982; Raffino 2004b).

The *ushno* of El Shincal is a magnificent platform constructed of roughly shaped stones settled in a mud mortar. A wide stairway allows access to this platform, which has a stone *tiana* or bench on its top (Fig. 2a). For Inka people, the *ushno* was associated with the gnomon—generally a shaped rock—which acted as an *axis mundi* linking earthly ancestors and *huacas*—any sacred thing such as places, objects or persons—with the deities of the cosmos (Zuidema, in Meddens 1997). Several chronicles describe the activities that were carried out within the *ushno*, which have been considered separately as political or religious ones. However, these two aspects were not separated in the Inka state, but on the contrary, they constituted different aspects of the same phenomena which were the basis of its organization. Anyway, the division between politics and religious activities might help to understand the historical records. On the one hand, it is recorded that Inkas carried out military parades in the *ushno*, and that it was the place where new governments assumed their positions (Cieza de León 1967 [1553]; Guaman Poma de Ayala 1936 [1613]). On the other hand, the *ushno* was seen as an oracle where religious ceremonies took place. These included *capacochas* (offers) of *chicha* (a drink made from maize), coca (*Erithroxylum* sp.), animals, and also human sacrifices (Molina 1943 [1573]; Cieza de León 1967 [1553]; Jesuit Anonymous 1879 [1594]). The *ushno* is also distinguished as the place where astronomical and meteorological studies were carried out (Jesuit Anonymous 1879 [1594]). After analysing all these records, Meddens (1997) concluded that for the Inka the *ushno* meant an important part of the rulers' control over water, particularly that for agriculture.

Materials and methods

This analysis was made by taking into account archaeobotanical and ethnohistorical evidence. For the archaeobotanical analysis, a total of 861 l of sediment was processed by the water flotation technique, using a powered machine, described in Capparelli and Raffino (1997). Column samples from 20×20 cm, covering depths from 40 to 90 cm (thickness of the Inka floor) were taken from 23 different places on the main architectural structures of the site: *qollqas*—a storage area-, 5cIII—a cooking area-, K1 and K3—processing areas-, K7—living area- and *aukaipata* (see Fig. 1). A control sample was taken outside each structure. Both light and heavy floated fractions were sieved at the laboratory with a 2 mm and a 0.4 mm mesh. The fractions >2 mm were sorted by eye, while those <2 mm were totally scanned under a stereoscopic microscope (Iroscope Model M2-14T N° 962329). Material from screening and manual recovery was also taken into consideration. General preservation of the remains was good. The identifications were initially made under a stereo microscope and for more detail a reflected light microscope was used (Leica DM/LM N° 933797). A first approximation to wheat and barley identification was made by the authors. However, G. Hillman provided the final confirmation.

The ethnohistorical part of the project was carried out by means of the revision of four types of complementary evidence. The first type was historical original documents, such as *jucios de residencia* (resident judgments), *cartas de funcionarios reales* (Real Functionary's letters), and *probanzas de mérito* (merit proofs), compiled by Levillier (1918, 1919–20), Larrouy (1915) and Berberián (1987). The second kind of evidence consisted of published records such as Vazquez de Espinosa (1992 [1628]). The third kind of evidence was that of papers written by ethnohistorians (Lorandi 1988; Boixados 2002) where historical processes were analysed from an anthropological perspective. The fourth kind of evidence was from papers written by historians (Lizondo Borda 1928; Baudot 1995; Farberman 2002; Doucet 1986). It is worth to note that the common names used in these sources for wheat (*trigo*), barley (*cebada*) and peach (*durazno*) are the same as those that were being used in the original records, and doubtless refer to the

Table 1 List of the taxa present in the structures sampled at El Shincal and their relative total frequencies calculated by fragment count

Taxon\Structure	Qollqas	5cIII	K1	K3	K7	Aukaipata	Ushno	Total	Total%
Prosopis sp.	29	22	58	10	371	10	521	1,021	42.50
Geoffroea decorticans	–	6	–	1	52	–	44	103	4.29
Zizyphus mistol	–	–	–	–	–	–	3	3	0.13
Rhamnaceae/ Capparidaceae	–	–	–	–	–	–	1	1	0.04
Gossypium sp.	–	–	–	–	3	–	38	41	1.71
Juncus sp.	–	1	–	–	3	1	1	6	0.25
Solanum 1	–	15	–	–	1	–	6	22	0.92
Solanum 2	–	6	24	–	–	–	–	30	1.25
Prosopanche sp.	242	–	–	–	–	–	–	242	10.08
Zea mays	–	45	62	1	25	–	388	521	21.70
Phaseolus lunatus	–	–	–	–	–	–	17	17	0.71
Phaseolus vulgaris	–	13	4	–	3	–	147	167	0.07
Cucurbita sp.	–	7	–	–	–	–	2	9	0.38
cf. *Chenopodium*	–	–	–	–	1	–	–	1	0.04
*Triticu*m sp.	–	–	–	–	–	–	73	73	3.04
*Hordeu*m sp.	–	–	–	–	–	–	7	7	0.29
Prunus persica	–	–	–	–	–	–	41	41	1.71
Possible flour	–	–	–	–	–	–	37	37	1.54
Indeterminata	1	10	31	–	–	–	18	60	2.50
Total	272	125	179	12	459	11	1,344	2,402	100

genera *Triticum*, *Hordeum* and *Prunus* respectively. In other cases (maize, beans, squash) chronicles used words very similar to the present ones, for example mayz or maiz for maíz, frisoles for frijoles (beans), and çapallo for zapallo (squash). Less specific phrases are "frutas de España" (Spanish fruits), "todo lo de Castilla" (everything from Castille, that is, Spain), "plantas de Castilla" (plants from Castille), "otras cosas de Castilla" (other things from Castille), or "otros arboles frutales de Castilla" (other fruit trees from Castille), which may include peaches, plums, pomegranates, apples, lemons, oranges, among others. In this sense these categories will be used in this paper as possible evidence of cultivation of the mentioned trees, where peaches might have been included. However, just one source was used as a direct evidence of peach presence, that in which "*durazno*" (peach) is mentioned specifically.

Results

Archaeological evidence from El Shincal *ushno*

In previous papers Raffino et al. (1997) recognized two different occupational phases at the *ushno* of El Shincal based on other non-archaeobotanical remains: an Inka one (A.D. 1471–1535), and another occurring during the Hispanic-Indigenous period (A.D. 1535–1660). This author proposed that there was a first Inka event from 70 to 90 cm depth. Part of the stone floor (named *cocha*) of the Inka *ushno* still persisted at 0.70 cm depth (Fig. 2b), over which the Inkas must have carried out offerings and sacrifices according to several chronicles which mention this kind of activity at the *ushno* of central areas in Perú. This event is supported by radiocarbon dated charcoal belonging to stratified unit 8 of 550±50 B.P., 1 sigma calibrated date range from A.D. 1444–1403; 2 sigma range from A.D. 1478–1310 (LP-735). However, the Inka stone floor appears to have been disrupted because of a large hole that was made during the Hispanic-Indigenous period, penetrating 1.5 m beneath the stone floor, which includes several hearths. This hole was surrounded by large stones, which still persist. The presence of a Hispanic-Indigenous event is supported not only by a radiocarbon date of the stratified unit 17 of 310±40 B.P. (LP-699, 1 sigma calibrated date range from A.D. 1529—present; 2 sigma range from A.D. 1485—present, but also by other significant remains. For example, cow, sheep and horse bones, some of them with signs of consumption (Silveira, pers. comm.), fragments of Panamá Polícromo and Talavera de la Reina pottery (first half of 17th century), glass, iron artefacts such as nails, a Jew's harp (*birimbao*), a bronze bell and needle, Hispanic-Indigenous pottery (Caspinchango), and fragments of glazed clay artefacts made on a potter's wheel. However, the digging and reuse of the deep hole, where several hearths may have been made to carry out more than one ceremonial activity, resulted in a mixture between both Inka and Hispanic-Indigenous events. Therefore, American as well as Old World botanical remains were recovered from nearly all the stratified units, from 0.70 to 2 m depth. As a result of that, the stratigraphical disposition of these remains was not useful for distinguishing both events. Despite this, the identification of these events was supported by the presence of several diagnostic elements for both, as mentioned before.

A comparative analysis of the main archaeobotanical taxa identified from the 2402 fragments recovered from the different structures excavated at El Shincal was made in previous publications (Capparelli and Raffino 1997; Capparelli et al. 2004). Table 1 summarizes the 2402 fragments analysed excluding control samples. This paper will take into account the 1344 botanical remains recovered from the *ushno*, because, as shown in Table 1, Old World crops were present just at this structure, and are the first archaeological remains of this kind recovered in Argentina.

Table 2 List of the taxa present in the *ushno* ceremonial assemblage and their relative frequencies calculated by fragment count and weight

Taxon/Structure	Ushno			
	Absolute fragment count	%	Absolute fragment weight gm	%
Prosopis sp.	521	38.77	7.92	5.94
Geoffroea decorticans	44	3.27	9.49	7.12
Zizyphus mistol	3	0.22	0.54	0.41
Rhamnaceae/Capparidaceae	1	0.07	0.12	0.09
Gossypium sp.	38	2.83	0.59	0.44
Juncus sp.	1	0.07	0.02	0.02
Solanum 1	6	0.45	0.54	0.41
Zea mays	388	28.87	41.18	30.90
Phaseolus lunatus	17	1.27	2.21	1.66
Phaseolus vulgaris	147	10.94	11.27	8.46
Cucurbita sp.	2	0.15	0.26	0.20
Triticum sp.	73	5.43	0.94	0.71
Hordeum sp.	7	0.52	0.13	0.10
Prunus persica	41	3.05	43.68	32.78
Possible flour	37	2.75	13.82	10.37
Indeterminata	18	1.34	0.55	0.41
Total	1,344	100	133.26	100

Taxa exclusively from the *ushno* were very diverse (see Table 2), including wild and cultivated plants, both native and exotic taxa. Exotic cultivated plants were grains of *Hordeum vulgare* (6-rowed hulled barley, cebada) (Fig. 4A), grains of *Triticum aestivum* s.l. (free threshing wheat, trigo) (Fig. 4B), as well as endocarps of *Prunus persica* (peach, durazno) (Fig. 4C). Native wild plants recovered were seeds of *Prosopis* sp. (el árbol, algarrobo), endocarps of *Geoffroea decorticans* (chañar), *Zizyphus mistol* (mistol) and a Rhamnaceae/Capparidaceae, stems of *Scirpus* sp. (junco), and fruits of *Solanum elaegnifolium* (pocoto) (Fig. 4D). Native cultivated plants were kernels and cobs of *Zea mays* (maize, maíz), cotyledons of *Phaseolus lunatus* (butter bean, poroto pallar) and *Phaseolus vulgaris* (kidney bean, poroto común) and peduncles and seeds of *Cucurbita* sp. (squash, zapallo) (Fig. 4D). In addition, large fragments of possible charred meal prepared with *Capsicum* and *Phaseolus* mixed up in a floury matrix was also recovered. All of these remains were carbonised except *Prunus persica* fruitstones that were not only carbonised but also roasted or dried.

It is thought that the Old World archaeobotanical remains represent a primary deposit because many articulated items were present. This hypothesis is further supported by the fact that wheat, barley and most of peach endocarps were charred, an indicator which is usually used to associate botanical remains with human activities (Buxó 1997, p 23). Also, Old World crops were recovered only from the *ushno* and were associated with other European remains, such as 17th century Talavera pottery and charred European cattle bones. Thirdly, radiocarbon dated charcoal belonging to stratified unit 17 gave a result of 310±40 B.P. (LP-699). In addition, there is no evidence of human occupation after the 17th century at the *ushno*, which was apparently abandoned. Finally, all these charred remains were found related to several hearths identified by ceremonial indicators as being ritual contexts from the Hispanic-Indigenous period (for more detail see Capparelli et. al. in press).

Ethnohistorical data

Ethnohistorical results are presented as electronic supplementary material (ESM). Table 3 summarises the list of taxa introduced to Perú and different settlements in the Argentinean area, with their chronology of arrival (for more details see discussion).

Discussion

The ushno after the conquistadores: its reuse as a ceremonial place

In the case of El Shincal there are strong indicators to interpret the *ushno* record as a ceremonial or ritual one, more than a rubbish context. According to Renfrew and Bahn (1998), it is possible to define indicators of archaeological ritual. First of all these authors proposed that rituals were usually carried out in specific places, which could be ceremonial buildings or artificially delimited natural places. These represented places where the spiritual and the material worlds met. The symbolic meaning of the *ushno* as a ritual Inka place must then be considered here. It is well known that Earth has an important meaning among Andean indigenous people, receiving the name of *Pachamama*. During ritual festivities in the Argentinean northwest now, people communicate with the Earth by means of the *corpachada*, the action of opening the ground by digging a hole one span deep. During these rituals, food, drink and objects are thrown onto a fire inside the hole (García and Rolandi 2000), which is usually surrounded by stones (Bin 1998), and can be considered as a way of marking out a sacred space. Secondly, deity presence is also necessary during a ritual ceremony and it can be represented by a material object or by a simple symbol (Renfrew and Bahn 1998). In the case of El Shincal, the marked out and opened Earth could be interpreted as the deity (*Pachamama*). Offerings were another important part of rituals. These could be meals, drinks or other votive material objects (Renfrew and Bahn 1998) as we have seen for the *Pachamama* ceremonies. The different botanical taxa recovered from the *ushno*, the fragments of charred meals, the European cattle bones with signs of consumption, as well as the material objects mentioned above constituted the offerings at El Shincal. It is important to note that Old World remains were only recovered from the *ushno*, while native plant remains were recovered from almost all the excavated domestic

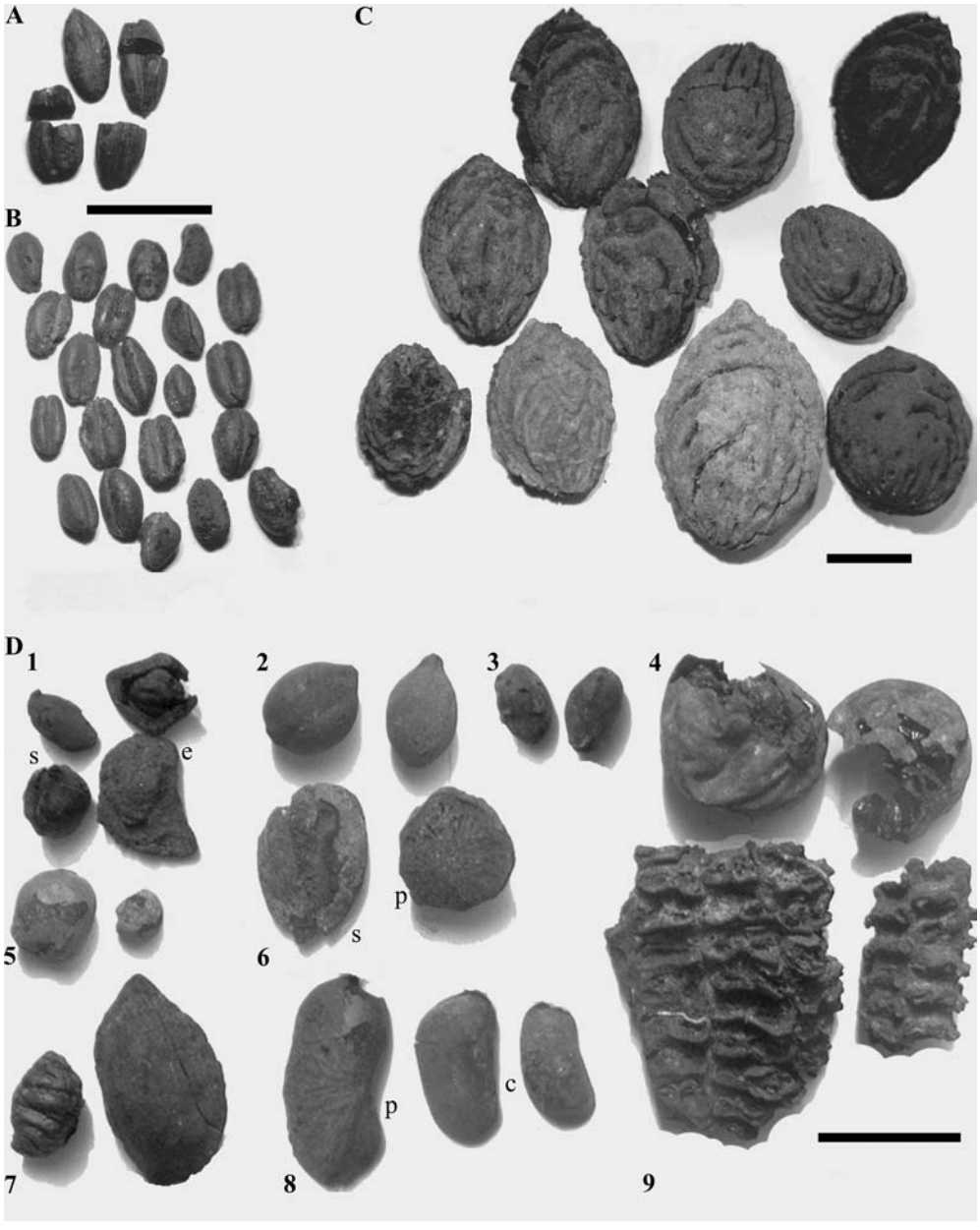

Fig. 4 Archaeobotanical evidence from the *Ushno* ceremonial site of El Shincal (all charred except some roasted peach fruitstones); **A** *Hordeum vulgare* (6-rowed hulled barley, grains); **B** *Triticum aestivum/compactum* (wheat, grains); **C** *Prunus persica* (peach, fruitstones); **D** native plants; wild: 1—*Prosopis* sp. (s—seeds, e—endocarps), 2—*Zizyphus mistol* (endocarps), 4—*Solanum elaegnifolium* (fruits), 7—*Geoffroea decorticans* (striated seed and endocarp); cultivated: 3—*Gossypium* sp. (seeds), 5/9—*Zea mays* (5—grains, 9—cobs), 6—*Cucurbita* sp. (p—peduncle, s—seeds), 8—*Phaseolus* (cotyledons), p—*P. lunatus* (butter bean), c—*P. vulgaris* (kidney bean); scale bar: 1 cm

Table 3 First mentions of the presence of European crops in Andean Argentina, Perú and Chile from documentary evidence

Settlement	Crop			Source
	Wheat	Barley	Peach	
Sancti Spiritu	1527			Báez (1949)
Perú	1537			Miatello (1921)
Buenos Aires	1538			Lladó et al. (1992)
Santiago de Chile	1542			Baudot (1995)
Santiago del Estero	1556	1556	1582 approx	Levillier (1918)
Mendoza	before 1561	before 1561		Báez (1948)
Calchaquí valleys	1582 approx	1582 approx		Berberián (1987)
Londres de Quimivil	1582 approx	1582 approx	between 1608–1622?	Berberián (1987) Vazquez de Espinosa (1992 [1628])
Córdoba	between 1608–1622?		between 1608–1622?	Vazquez de Espinosa (1992 [1628])

and administrative units. This leads us to think that wheat, barley and peach were not used for daily consumption in this archaeological site. There was no evidence of processing the wheat and barley grains, which were recovered entire, without any sign of grinding, fermentation or pericarp extraction for making *mote* (a food like porridge or hominy), which support this hypothesis. Finally, all the re-used hearths known during the Hispanic-Indigenous period might be related to a repetition of ceremonies throughout the time, another important characteristic of rituals (*sensu* Renfrew and Bahn 1998). This event may have been associated to the period of local rebellions (wars between indigenous people and Spaniards) in which the chief (cacique) called Chelemín may have occupied El Shincal (Raffino et al. 1997). It could be concluded that after being a strategic Inka Administrative Centre, El Shincal continued being an important point of meeting for local indigenous people during the colonial period.

Ethnohistorical evidence: routes of introduction of Old World crops to the Argentinean northwest

It is well known that after contact between Spaniards and indigenous people, the former rejected many native customs, trying by all possible means to introduce their own European culture to the American territories. They did not only reorganize the agrarian and livestock economy of the region according to their conceptions, favouring for example cultivation on the plains instead of on the slopes as was done by the indigenous people, but also tried with tenacity to introduce many crops from Europe. However, it is worth mentioning that documentary evidence gives more information about wheat than about barley or peaches. There are at least three possible routes of introduction of Old World crops to what is now northwest Argentina, from the Atlantic Ocean, from Perú or from Chile.

The earliest route of introduction via the South Atlantic Ocean was in the second half of the 16th century when Spaniards attempted to found settlements around the La Plata river basin. There is solid documentary evidence that when Sancti Spiritu (the first Spanish settlement in present-day Argentina) was established by Caboto in A.D. 1527, its population could obtain at least one wheat harvest. Sebastian Caboto's writings affirm that fifty two seeds of wheat were found on the ships and that they were sown in June and harvested in December of the same year of the foundation, with excellent results (Báez 1949) (Fig. 5A). Because of different problems with indigenous people, this village had to move to San Salvador, in A.D. 1529, situated on the opposite bank of La Plata, in what is now Uruguay (Fig. 5B). Wheat was cultivated for a short time there until the village was destroyed by attacks from indigenous people.

After the failure of this first attempt, a new Spanish colonising expedition arrived in the same region. Pedro de Mendoza first founded the village called Santa María del Buen Ayre in A.D. 1538 (Fig. 5C), which was abandoned

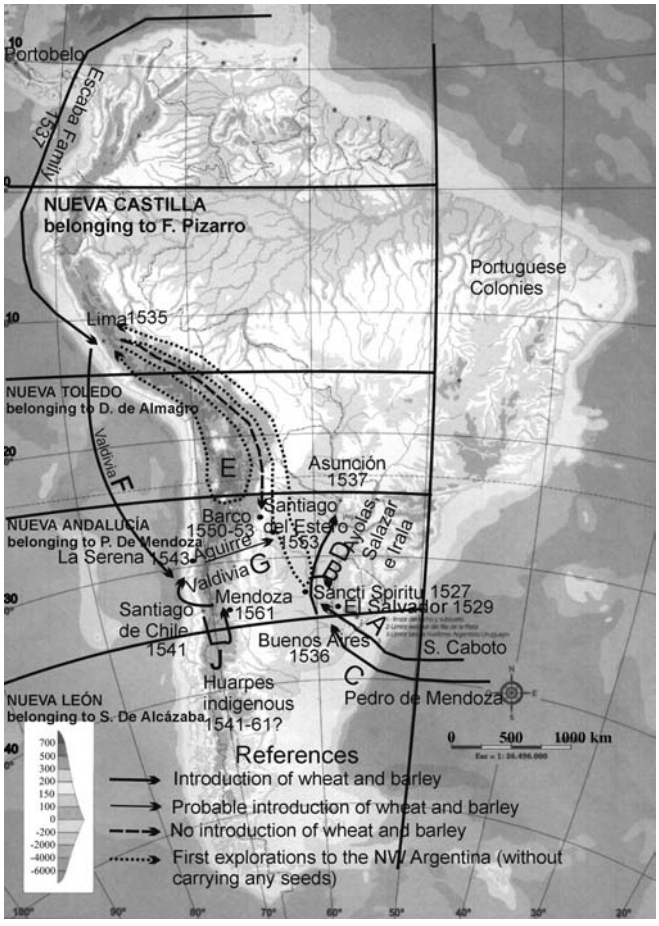

Fig. 5 Map showing migrations of wheat and barley (*arrows*) from A.D. 1537 to 1553

in A.D. 1541, and its population moved to Asunción under the command of Martínez de Irala (Fig. 5D). When the village was abandoned, Irala left a sign recording the moving of the people, and saying that if anybody would like to settle there they must sow maize from the beginning of September to its end, and wheat from May to July (Lladó et al. 1992, see appendix [1]). This demonstrates a possible previous attempt to cultivate wheat in Buenos Aires, but no explicit references were left about this action.

The second foundation of Buenos Aires by Juan de Garay in 1580 was the one that finally established a permanent Spanish settlement in the region. There, different kinds of crops prospered until it became the main production centre of the area in the 17th century, producing a large surplus which found a market in other Spanish colonies. Despite being the first attempts to grow Old World crops in Argentina, it is very improbable that these attempts could have been the point of origin of the later spread of these crops to the Argentinean northwest, because there was no real connection between northwest and northeast Argentina until Córdoba and Santa Fe were founded in A.D. 1573.

Now, it is worth analysing the other routes of introduction to northwest Argentina. The first foundation in the Tucumán region was the village called Barco de Ybatín in A.D. 1550, which lasted only a year. This was founded by an expedition from Perú under the command of Núñez del Prado (Fig. 5E). It must be remembered that in Lima (Perú) the Escaba family sowed wheat for the first time around the year A.D. 1537 (Miatello 1921). Taking into account the ideas previously addressed, we can expect that in this first village, Old World crops would had been grown, as proposed by Báez (1947). But due to the scarcity of evidence presented by this author, more and new information was searched for, resulting in the finding of a fundamental document very useful for this question. It is Núñez del Prado's merit proof, an official document that he had to present when Barco passed from the authority of the Perú government to that of Chile. In this document, written in the city of Barco during the year A.D. 1551, Núñez del Prado had to defend himself against Villagrán's (Pedro de Valdivia's lieutenant) accusations, manifesting all his good actions related to the sustenance of the village under his command (Levillier 1919–20, see appendix, [2]). In one of the questions a witness had to tell if wheat was brought by Núñez del Prado to Barco in A.D. 1550. Despite the mention of wheat in the statement in reply to this question, none of the witnesses mentioned harvested wheat at that moment. They enumerated all the crops harvested during the existence of the settlement, but mentioning only native species such as maize, squash, quinoa and beans. It is doubtful that in an official document where Nuñez del Prado was trying to defend himself from the accusations against his performance as headman of the mentioned defenceless and helpless village, he would not have mentioned crops such as wheat or barley, which were so important for Spaniards. So there are two possibilities: either no Old World cereals or fruit trees were brought there when Barco was founded, or these crops were not grown successfully, and that is why they were not mentioned in the document.

Despite the negative evidence from Barco, there is consistent proof that the introduction of foreign cereals and fruits may have taken place during the foundation of Santiago del Estero, in A.D. 1553 by Francisco de Aguirre. Wheat from Perú had already been cultivated in Chile since the foundations of La Serena and Santiago de Chile, from A.D. 1542 onwards (Fig. 5F). Its production was so successful that after A.D. 1542 these villages exported wheat to Perú where it was in short supply because of the demands from the mining works (Baudot 1995). Pedro de Valdivia, General Captain of Chile, states in his writings that these lands were so fertile for this kind of crop that after the foundation of Santiago in A.D. 1542, Spaniards sowed wheat in September and harvested from 10,000–12,000 *fanegas* of grain three months later (Báez 1948, see appendix [3]). A *fanega* as a volume measure corresponds more or less to 58 l, while as a surface measure it is the area in which one *fanega* of grains could be sown, which is 0.4 ha (taken from Hemming 1982). It is highly probable that Francisco de Aguirre, who came from Chile, brought barley, wheat and/or other Old World fruit trees when founding Santiago del Estero (Fig. 5G). The historian Paul Groussac (1914, in Lizondo Borda 1928) states that when Aguirre arrived in the Tucumán territories he noticed the great defencelessness of the population and he immediately sent an expedition to Chile that returned in May A.D. 1553 with seeds, plants, farmers and tools. However, this statement lacks precision about the date and place of the source from where he obtained the information, so there are too many doubts about its authenticity, and besides this he does not specify the species introduced then. More relevant is the testimony written from A.D. 1585 to 1589 by the procurer of the Cabildo of Santiago del Estero, Alonso de Abad, which meant to show how helpless that city was during the discovery and conquest of Tucumán (Levillier 1918). There, it says that after the foundation of Santiago del Estero, Francisco de Aguirre returned to Chile the following year leaving Gregorio de Bazán in charge of the village. Because of the helpless situation of this town, due mostly to the resistance of the indigenous people, food and basic elements for subsistence started to become scarce. That is why Bazán sent five soldiers, Rodrigo de Quiroga, Bartolomé Mansilla, Nicolás de Garnica, Pedro de Cáceres and Hernán Mejía de Miraval, to Chile at the end of A.D. 1555 in order to look for basic resources and a priest.

All of them came back in the beginning of A.D. 1556 bringing with them a priest, Juan Cidrón, and some wheat and barley grains, together with "things from Castille", cotton, fig-trees and vines that were planted in the village (Levillier 1918, see appendix [4]) (Fig. 6H). The next testimony that follows Abad's writings asks some witnesses about how the indigenous people responded to the recently arrived priest Cidrón. All of these witnesses agreed that the people were very happy with the priest and that the seeds brought from Chile were sown and harvested successfully, and continued in production during the following years (Levillier 1918, see appendix [5]). After some years Santiago del Estero became a production centre of relative importance for the region, and several expeditions relied on it for the foundation of other Spanish villages.

Another reference for the introduction of wheat in the territory of Tucumán is given by Bartolomé de Las Casas (in Capparelli and Raffino 1997). This friar states that Pérez de Zurita carried wheat grains with him when he left La Serena to go to Santiago del Estero with the objective of founding new settlements such as Londres (A.D. 1558), Cañete (A.D. 1558) and Córdoba de Calchaquí (A.D. 1558) (Fig. 6I).

From the above, it is clear that Chile had an important role in the production and distribution of Old World crops such as wheat, barley and fruit trees to Argentina.

However, in the area corresponding to the modern province of Mendoza, the situation was completely different to the ones already mentioned. Here, the Spaniards were not the only ones who introduced foreign crops. There are references indicating that the Huarpes indige-

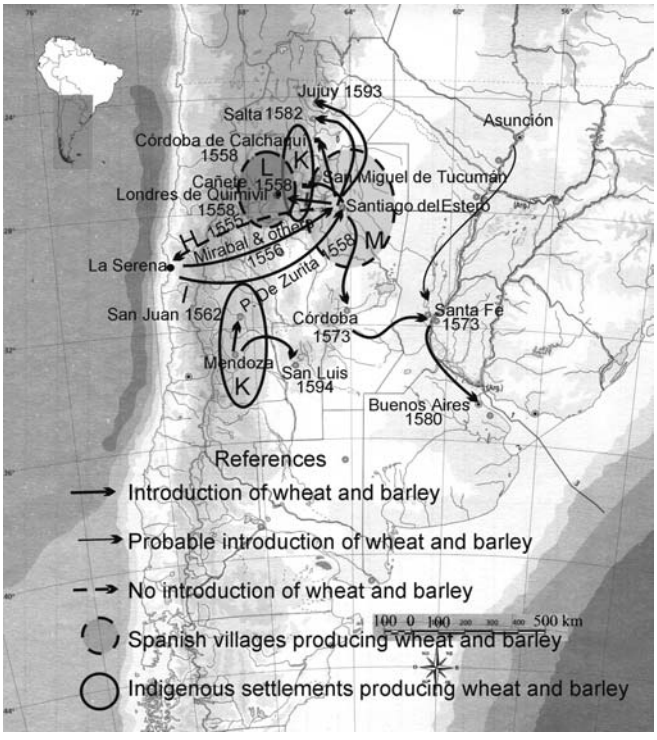

Fig. 6 Map showing migrations of wheat and barley (*arrows*) from A.D. 1553 to 1600

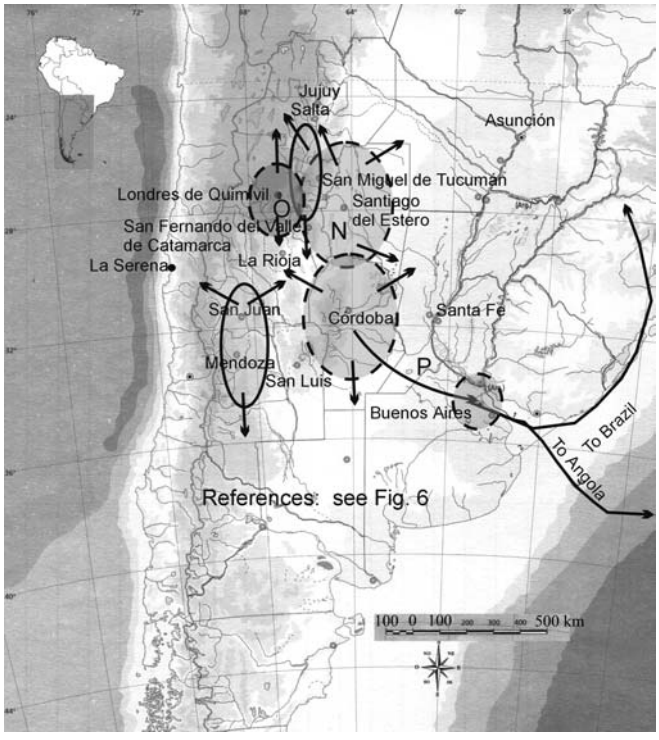

Fig. 7 Map showing migrations of wheat and barley (*arrows*) from A.D. 1600 to the 18th century

nous people already cultivated wheat and barley at the moment of the arrival of the expedition headed by Pedro del Castillo which founded Mendoza in A.D. 1561 (Fig. 5J). It is considered, and documents say so, that natives obtained these crops by exchange with Spaniards settled in Chile during Valdivia's government (Báez 1948). This is not an unusual situation if it is considered that the existence of trade routes for goods, as well as a circulation of people between both sides of the Andes, had been an ancestral characteristic of all the cultural development of the area for a long time. An analogous situation also existed in a great territorial extension, in the Calchaquíes valleys, where indigenous people were not subjected to the Spanish regime until A.D. 1666 (Fig. 6K). Sotelo de Narváez, a chronicler transcribed by Berberián (1987), wrote a testimony to the Sir Cepeda, President of the Real Audiencia La Plata around A.D. 1582, about some agricultural customs of the natives of the region of Tucumán. He wrote that these people cultivated many varieties of crops including both native and exotic species, potatoes, maize, beans, squash, quinoa, legumes, algarrobo, chañar, wheat and barley (Berberián 1987, see appendix, [6]). These events in both the Mendoza and the Calchaquíes valleys demonstrate that diffusion of Old World crops could precede effective Spanish presence in some regions. Lorandi (1988) confirms this information but she dismiss the idea that these new plants had a significant impact on the native cultures, at least in the period during which they did not yet fall under Spanish domination.

For the region corresponding to the modern province of Catamarca, specifically for Londres de Quimivil, Pedro Sotelo de Nárvaez again provides interesting information about the prosperity of Old World crops. He reaffirms the production of wheat and barley at the end of the 16th century together with other American crops (maize and beans) and "everything from Castille" (Berberián 1987, see appendix [7]) (Fig. 6L).

Sotelo de Narváez also details all kinds of fruit trees which grew by that time in Santiago del Estero, vineyards, peaches, prickly pears, melons, quinces, apples, pomegranates, pear and plum trees, limes and oranges (Berberián 1987, see appendix [8]).This is the first specific reference to the cultivation of peaches in the Tucumán region, but we notice that previous references which mentioned Castille's fruits in general (Alonso de Abad, for example) could have included peaches in this general category, so the first specific mention of this fruit could have been later than its first cultivation in this area (Fig. 6M).

The production of wheat, barley, fruit and other Old World crops continued to increase during the 17th century. Vázquez de Espinoza, a priest who travelled through the West Indies between A.D. 1608 and 1622, makes reference again to Londres noticing the fertility of this region which had wonderful weather, where wheat, maize and European fruits such as vines were very abundant (Vazquez de Espinosa 1992 [1628], see appendix [9]) (Fig. 7O).

Many villages founded in the Argentinean centre and northwest received support from Santiago del Estero be-

cause this was the oldest Spanish settlement and the centre of the regional administration. Thus, several settlers from this village participated in the foundation of Córdoba de Calchaquí (A.D. 1558), Londres de Quimivil (A.D. 1558), Nuestra Señora de Talavera (A.D. 1566) and Córdoba de la Nueva Andalucía (A.D. 1573) among others. Several documents (see for example Levillier 1918) point out that Santiago del Estero provided the new villages with important items such as cattle, weapons, munitions and horses. Despite the lack of specific information about the transport of Old World crops from this city to these new localities, it is possible to conjecture that among all those items given by Santiago del Estero there could have been grains of wheat and barley, or European fruit trees. This hypothesis is supported by the fact that these kinds of crops grew successfully in that village since its foundation so that after its foundation and until the first decades of the 17th century Córdoba de la Nueva Andalucía became a specialized zone for the production of cereals (Fig. 7N). After A.D. 1580 Córdoba's production of wheat was very high, which allowed the export of flour to Brazil and Angola until A.D. 1625 (Torres 1984) (Fig. 7P). This situation is recorded in Vázquez de Espinoza's chronicles in which he says that the land of Córdoba had plenty of wheat and Spanish fruits such as pears, peaches, apricots, quinces, pomegranates, prickly pears, sweet cherries, oranges and lemons (Vazquez de Espinosa 1992 [1628], see appendix [9]).

Use of Old World crops by local indigenous people

Social and economic organization from the 16th to the 17th century in the Spanish colonies was done through the *encomiendas* (tribute paying) system. Each *encomienda* consisted of a parcel of land plus a variable number of indigenous people, all of whom were given by Real Merced to the *encomendero* (Spaniard who served the Crown during the conquest). Indigenous people from the *encomiendas* were sometimes lent by the *encomendero* to do different kinds of obligatory public works which were called *mita de plaza*. At the same time there existed the *pueblos de indios* (indigenous villages) which were created by the Crown to preserve indigenous people from exploitation. There, indigenous people were owners of their land, but they had to pay a tribute to the *encomenderos*. Finally, there were also free indigenous people such as those whom the Spaniards were not able to submit under the *encomiendas* system. They were called *indios de guerra* (warlike indigenous people) (Farberman 2002). As we have seen, this was the situation of the native communities in the Calchaqui valley until 1666.

It has been explained above how in the Tucumán region the Spaniards obtained and spread Old World crops there. But the Hispanic-Indigenous event at the *ushno* was due to the activities of local indigenous people, so we need to know how they could have used Old World crops. In the case of indigenous people in the *encomienda* system, there are three possible ways:

1. Indigenous people could have received wheat or barley as a payment after a *mita*. There is an example in the Quilpo *encomienda* (in Córdoba de la Nueva Andalucia) where the administrator Luis de Abreu said that ten *fanegas* of wheat were distributed among the indigenous people for their harvesting work at the Chibaja farm during the years A.D. 1595–98 (Doucet 1986, see appendix [11]).
2. Indigenous people could have been fed by the *encomendero* with wheat. In this way the Acuerdos del Cabildo (Cabildo's agreements document) compiled by Larrouy (1915), and dated to October 23rd, A.D. 1690, about the restoration of the Catamarca church, is useful. It says that the curates would give meat and wheat for the subsistence of the indigenous people who worked at the *mita* (Larrouy 1915, see appendix [12])
3. Indigenous people could cultivate these crops in their lands at the *pueblos de indios* under the control of the *encomendero*. Generally in these cases the *encomendero* kept for himself all the wheat harvested (Boixados 2002).

On the other hand, in the case of communities settled on free territory, the use of exotic crops could have happened by means of exchanges with Spaniards or by attacks on their villages. Attacks were very usual mostly during the Hispanic-Indigenous period and were carried out not only by *indios de guerra* but also by indigenous people who worked at the *encomiendas* and wanted to relieve the oppressive situation. Many villages were attacked by natives and then abandoned or moved to other places, as was the case of Londres de Quimivil after A.D. 1558 (see for example Iácona and Raffino 2004).

Conclusions

It is possible to synthesize the history of the arrival and spread of Old World crops such as wheat, barley and fruit trees to Argentinean lands, pointing out some of the main facts that help us to understand the path they followed. Wheat was introduced to Argentina for the first time during the foundation of Sancti Spiritu by Sebastián Caboto in A.D. 1527, but this village was moved and abandoned two years later. This crop could have been sown during the first Buenos Aires foundation in A.D. 1536, but there is no strong evidence to prove it. Due to the fact that during the 16th century the routes of contact between the eastern Atlantic region and the northwest regions of Argentina were not yet established, it is improbable that the first seeds sown in the northwestern region had come from this eastern source. It is more feasible to consider an introduction from the north or the west. Documentary evidence is conclusive in demonstrating that no wheat nor barley were harvested in the short life of Barco de Ybatín (1550), the first village in the northwestern territory. Instead, it is possible to affirm that the migrations from Chile, and not from Perú such as that of Núñez del Prado, were responsible for the introductions of these Old World

crops to northwestern Argentina. Chile cultivated wheat, barley and other Old World crops from A.D. 1542 onwards without interruptions. Huarpes indigenous people seem to have been the first to have obtained wheat by their own means and to have cultivated it on their lands in the Argentinean central-west between A.D. 1542 (the introduction of wheat in Chile) and A.D. 1561 (the foundation of Mendoza). Santiago del Estero was the first Spanish village in the northwest where barley, fruit trees and wheat from Chile were brought there and cultivated successfully from A.D. 1556 onwards. This village became the disperser centre of all the necessary supplies which were needed in the following foundations of new Spanish villages. But the hands which really sowed, harvested and processed these crops were indigenous people under the *encomienda* system, in all the colonial territory. This people grew these plants according to the categories, decisions and conveniences of the Spanish *encomenderos*. It is not possible to say whether the natives assimilated these kinds of crops in their ordinary meals (El Shincal gives a negative evidence about this), but it is confirmed, according to colonial documents, that they grew and harvested them under the conquistadores' impositions. As mentioned before, a different situation occurred in other parts of the northwestern territories where *encomiendas* were not yet established and where indigenous people might have sown wheat by their own means.

The historical and ethnohistorical evidence, although very rich, is not conclusive about the social place that indigenous people gave to these kinds of crops, so it is clear from this paper that the archaeological record in general provides very useful evidence. Moreover, it is thought that the archaeological record of the *ushno* of El Shincal in particular, as the only evidence in the area, has a fundamental importance. It is interesting noticing that the *ushno* is the only structure of all those that were excavated in El Shincal where this kind of evidence has appeared. More meaningful is the ceremonial context where the seeds were found because it opens a new perspective about the role of these plants in the native cosmogony during the time of early contact, a moment of great cultural change. The rebellions of Diaguita represented the rejection of the new conquerors and these archaeological remains confirmed that objects representing this situation (among which were the Old World crops) formed part of the native rituals that indigenous people were carrying out at that moment.

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