Tradiciones & transformaciones en Etnobotánica

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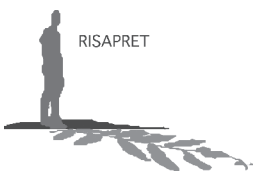

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CULTIVATION, PRODUCTION AND DOMESTICATION: EVALUATING THE ARCHAEOLOGICAL VISIBILITY OF INTERACTIONS BETWEEN HUMAN SOCIETIES AND PLANT POPULATIONS IN THE PAST

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ABSTRACT

Lema, V. S. 2010. Cultivation, production and domestication: reflections about the archaeological visibility of interactions between human societies and vegetal populations in the past. In this paper we analyze *C. maxima* ssp. *maxima* evolution under domestication in South America with the aim to identify if the earliest archaeological seed remains of this specie belong to different landraces, if they are the result of populations subject to different husbandry practices, or correspond to a single crop population. Archaeological remains were recovered in two early archaeological sites: Cerro Lampay (Central Andes, Archaic period) and Pampa Grande (Argentinean Northwest, Formative period). Anatomical descriptors in seeds testa were analysed in samples of modern landraces and crop populations resulting from husbandry practices. These seeds were obtained during ethnobotanical studies with an ethnoarchaeological application in the Argentinean Northwest. Results obtained after analysing and comparing quantitative parameters between modern and ancient seeds suggest that a *C. maxima* ssp *maxima* homogeneous morphotype was present in both archaeological sites, probably representing a single landrace on each archaeobotanical assemblage.

Keywords: domestication, landrace, archaeobotany, husbandry

RESUMEN

Lema, V. S. 2010. Cultivar, producir, domesticar: reflexiones sobre la visibilidad arqueológica de las interacciones entre sociedades humanas y poblaciones vegetales en el pasado. En este trabajo se analiza la evolución de *C. maxima* ssp. *maxima* bajo domesticación en Sudamérica con el objetivo de identificar si las semillas arqueológicas más tempranas de esta especie pertenecen a diferentes cultivares, si son el resultado de poblaciones sujetas a diferentes prácticas de manejo o corresponden a una única población bajo cultivo. Los restos arqueológicos fueron recuperados en dos sitos arqueológicos tempranos: Cerro Lampay (Andes Centrales, período arcaico) y Pampa Grande (Noroeste argentino, período formativo). Se analizaron descriptores anatómicos en cubiertas seminales de conjuntos de semillas correspondientes a cultivares modernos y poblaciones resultantes de prácticas de manejo bajo cultivo. Estas semillas fueron obtenidas durante estudios etnobotánicos con una aplicación etnoarqueológica desarrollados en el Noroeste de Argentina. Los resultados obtenidos tras analizar y comparar parámetros cuantitativos en semillas actuales y arqueológicas sugieren que un morfotipo homogéneo de *C. maxima* ssp *maxima* estaba presente en ambos sitios arqueológicos, representando probablemente un único cultivar en cada conjunto arqueobotánico.

Palabras clave: domesticación, cultivar, arqueobotánica, prácticas de manejo.

INTRODUCTION

Domestication of wild species has been the most studied process among those involving changes in the relationships between human societies and plant populations. As all evolutionary process, domestication is not static in time and modifications of taxa subject to cultural selection continue until today, emerging different landraces as human practices change after the initial point of domestication of a crop. Despite advances in understanding pro-

cesses of plant domestication in South America, the reconstruction of the particular history of certain taxa since they entered in contact with human populations is still unclear. This is the case of *Cucurbita maxima* (Duch) domestication in the South- Central Andean Area, from which analysis that helps us to understand the relationships between ancient people and wild populations of this species are lacking. As a consequence, understanding how Man-plant interactions developed after the initial domestication from wild populations turns into a difficult task. *Cucurbita* is an American genus with three South American domesticated taxa (*C. ficifolia* Bouché, *C. moschata* Duch ex Lam and *C. maxima* ssp. *maxima* Duch. ex Lam.) and two non-cultivated or spontaneous taxa (*C. ecuadorensis* Cutler & Whitaker and *C. maxima* Duch. ex Lam. ssp. *andreana* (Naudin) Filov) (Cutler & Whitaker, 1961). Sensu Nee (1990) *C. maxima* ssp. *maxima* was domesticated from *C. maxima* ssp. *andreana*, being modern populations of the last one weedy or hybrid specimens since these two *C. maxima* sub-species are sympatric and inter-fertile (Lema, 2009a). Wilson et al. (1992 in Piperno & Pearsall, 1998) believe that both subspecies derived from an hypothetical common ancestor. The earliest archaeobotanical macro remains of both taxa have been recovered in contexts belonging to societies of the Late Archaic (3000 AC) in Central Andes and of the Early Formative (260-430 DC) in Southern Andes (Argentinean Northwest) (Lema, 2009a). Their identification has been possible because anatomical and biometrical characters of *Cucurbita* seeds testa were proved to be useful for both species and subspecies recognition in modern and archaeobotanical dry or charred seeds (Lema et al., 2008). Some contexts of the mentioned archaeological periods presented remains of the spontaneous and the domesticated subspecies mixed together. A similar situation was observed in the case of remains of *Phaseolus vulgaris* L. var *vulgaris* (domestic) and var. *aborigineus* (Burk.) Baudet (wild) recovered from the Argentinean Northwest in sites of Formative period (Lema, 2009a). The two *Cucurbita maxima* subspecies were also present in a same context together with *Cucurbita maxima* rinds with intermediate characteristics ranging in-between the spontaneous and the domesticated taxa (Lema, 2009a). Therefore, from the archaeological record we cannot clearly separate a first stage of exploitation of wild populations from a clear second stage of domestication of the subspecies *maxima*. In the case of those early archaeological seeds identified as *C. maxima* ssp. *maxima* or *affine* to it, we wander if they belong to different landraces, are the result of populations subject to different husbandry practices, or correspond to a single crop population. Therefore, the aim of this paper is to evaluate the presence/absence of different *C. maxima* ssp. *maxima* landraces or populations subject to different husbandry practices among the earliest seed remains of this specie in the South-Central Andean area, considering two early archaeological sites: Cerro Lampay (Central Andes) and Pampa Grande (Argentinean Northwest). Seeds were selected for this study since their morphology is the less affected by environmental factors compared with other plant organs (i.e. fruits) (Cutler & Whitaker, 1961; Decker & Wilson, 1986).

In a former paper, archaeological indicators of management practices associated to *C. maxima* ssp. *maxima* populations were recognized through ethnobotanical work with an ethnoarchaeological application, carried on in two rural communities of Argentinean Northwest (Lema, 2009b). Those studies had the aim to evaluate if local *C. maxima* ssp. *maxima* landraces and specimens subject to different husbandry or management practices (ie. cultivated systematically in gardens with irrigation *vs.* cultivated occasionally in open areas without irrigation) clustered or not in different seed morphotypes. Macroscopical and micromorphological (anatomical) descriptors (both qualitative and quantitative or biometrical) were analysed, concluding that only the anatomical ones - both qualitative (large vs. short epidermal cells at the marginal bulge, presence of submarginal bulges) and quantitative (epidermis cells length in major faces and hypodermis thickness) are useful to recognize local landraces and to differentiate populations subject to different management practices (Lema, 2009b). Considering that low coefficient of variation (CV) values indicate morphological homogeneity in populations with a few morphotypes, while high CV values are common when hybrid plant types and different husbandry practices or landraces are present in a cultivated stand (King, 1985; Cowan & Smith, 1993; Newsom

et. al, 1993), we decided to evaluate if the CV, and other quantitative parameters such as range of values and standard deviation (SD), behave in the same way when anatomical descriptors are considered, allowing the identification of landraces, or populations resulting from different husbandry practices as well, in archaeological *C. maxima* ssp *maxima* seeds. In order to achieve this goal micromorphological studies were carried on in seeds belonging to modern crop populations obtained during ethnobotanical field work, increasing the size of the sample respect to the former paper (Lema, 2009b) in order to make quantitative approaches more reliable.

MATERIALS AND METHODOLOGY

Modern *C. maxima* ssp. *maxima* samples consisted in 11 seeds from a fruit belonging to a landrace from Salta province (LQM3) and 5 seeds from a population cultivated occasionally in open areas without irrigation (DSR2) in a rural community from Catamarca, considered as a population subject to a husbandry practice of low impact, but not as a formal landrace, as the person who owned the seeds stated (Lema, 2009a & b). Qualitative (large vs. short epidermal cells at the marginal bulge, presence of submarginal bulges) and quantitative (epidermal cells length and width, thickness of hypodermal tissue and length and width of sclereids) anatomical characters (considered as morphological descriptors) were analyzed. Quantitative features in each seed were calculated from ten measurements of each morphological descriptor. These measurements of seed coat cells were taken from images recorded with a Motic Image Plus 2.0 web camera –attached to the light microscope– and its measuring software (Lema et al., 2008).

Archaeological seeds were recovered from two archaeological sites:

• **Cerro Lampay:** (Fortaleza Valley, 220 km north of Lima, Peru, dry costal area) architectural complex situated in a dry ravine composed of three terraces. The site is conformed by a mound, a square courtyard area with a circular sunken court, a possible domestic zone and an open area. *Cucurbita* dry seeds (N=5) were recovered from this last area, except for one founded in the mound's excavations (Vega Centeno, 2005). Micromorphological testa characters, macroscopical qualitative (marginal bulge and funicular attachment form) and biometrical data (length and width of the seeds) point to the presence of three groups: *C. maxima* ssp. *maxima* (N=2), *C. aff maxima* ssp. *maxima* or *moschata* (N=2) and *C. maxima aff.* ssp. *andreana* (N=1) (Lema 2009a). Also remains of *Inga feuillei* DC., *Prosopis pallida* (H. et Bonpl. ex Willd.) H.B.K, *P. vulgaris* L., *Gossypium barbadense* L., *Psidum guajava* L., *Capsicum* sp. and *Sapindus saponaria* L. were identified (Vega Centeno, 2005).

• **Pampa Grande:** (Guachipas, Salta province, Argentina, grassland and forests of Andean piedmont) complex of seven caves with different dimensions situated in gorges over fluvial terraces, having evidence of residential and funerary occupations. Archaeobotanical evidence points to a high diversity of domesticated (*Zea mays* L., *Phaseolus lunatus* L., *P. vulgaris*), cultivated (*Lagenaria siceraria* ssp. *siceraria* (Kobiak.) Heiser, *Arachis* sp., *Phaseolus* sp., *Smallanthus sonchifolium* (P. & E.) Rob.) and local wild resources (*Prosopis* sp., *Geoffroea decorticans* (Gillies ex Hook. & Arn) Burkart., *Zyzyphus mistol* Griseb.) (Pochettino,1985). Palynological analysis shows evidence of weeds such as *Plantago* sp. (D'Antoni, 2008). Dry remains of *Cucurbita* rind fragments (N=95), peduncles (N=11) and seeds (N=11) were recovered from the shelters (Lema, 2009a). Taking into account micromorphological testa characters, qualitative and biometrical macroscopical data all the seeds were identified as *C. maxima* ssp. *maxima*, except one identified as *C. aff. maxima* ssp. *maxima or moschata*. Despite length and width of the seeds correspond to the domesticate taxa, CV values of both measurements (lenght: 13,15; width: 13,46) are in an intermediate position between values registered in modern populations of the spontaneous (lenght: 9,66; width: 10,09) and domesticated (lenght: 23,56; width: 19,15) subspecies of *C. maxima* (Lema 2009a). Five rind fragments were identified as *C. maxima* ssp. *andreana*. All the archaeobotanical remains suggest a very diverse *Cucurbita* assemblage with the presence of "intermediate plant forms" which are represented by

rind remains who meet several characters present in both modern *C. maxima* subspecies; this intermediate forms were also registered in *P. vulgaris* remains from this site (Lema, 2009a).

Seeds from both sites, identified as *C. maxima* ssp. *maxima*, and as *C. aff. maxima* ssp. *maxima* or *moschata*, were selected for the present analysis. The same procedures as the described for modern samples were followed except in those cases were bad preservation didn't allow taking ten measurements of each anatomical descriptor. Statistical methods were not applied due to problems related to the scarcity of seeds recovered from the archaeological sites in the region, even after extensive excavations. Only the range of measurements, their SD and CV were considered. The CV is a useful analytical tool since it allows comparing samples of different size, even small ones, as the archaeobotanical samples analysed in this paper (King, 1985) and it is also used to evaluate variability in samples due to the presence or absence of landraces or different management practices, as we stated in the previous section. In this paper we follow Newson et al. (1993), considering a low CV when values range between 1 and 6, medium when it range from 6 to 10 and high when values are equal or major than 10.

RESULTS

Epidermis and hypodermis were generally badly preserved in archaeological seeds. Epidermis was usually absent, remaining only part of the cell walls in the basal area, hence epidermal cells length can not be considered in archaeological samples and epidermal cells width is a descriptor with a few measurements on each ancient seed. Hypodermic cells were more or less collapsed, making this tissue thickness a doubtful descriptor since measurements made in archaeological testa could not reflect the original thickness in the seeds. Taking this into account, this last descriptor was also discarded. On the contrary, sclereids were well preserved and both descriptors (length and width) are considered in the analysis of archaeobotanical remains.

Analysis of modern samples

CV values for all the anatomical descriptor (considering both, values obtained on each seed after ten measurements and the general result for LQM3 and DSR2) were always high, except in the case of sclereids (Table 1). General values of CV for sclereids length were medium in both samples (LQM3 and DSR2), being the values obtained for each seed high, medium or low. General values of CV for scle-

Table 1. CV and SD values for anatomical (micromorphological) descriptors analysed in modern *C. maxima* ssp. *maxima* seeds testa; N indicates number of measurements taken for each descriptor.

SAMPLE	SEED	ANATOMICAL DESCRIPTORS											
		Ep. cells width			Hypodermis thickness			Sclereids length			Sclereidswidth		
		N	CV	SD	N	CV	SD	N	CV	SD	N	CV	SD
LQM3	S1	10	35.40	7.77	10	13.64	2.93	10	9.85	8.81	10	14.97	10.12
	S2	10	15.05	6.74	10	39.17	14.73	10	6.33	5.46	10	7.23	4.53
	S3	10	25.30	8.55	10	27.96	8.34	10	5.69	4.97	10	17.62	10.17
	S4	10	17.98	7.81	10	81.32	40.91	10	11.45	9.75	10	19.34	10.27
	S5	10	20.59	7.55	10	22.09	5.78	10	5.66	4.71	10	15.94	9.73
	S6	10	26.05	9.13	10	29.49	8.79	10	13.25	10.63	10	14.03	9.58
	S7	10	15.36	5.00	10	21.02	6.17	10	8.72	7.84	10	9.08	5.65
	S8	10	27.89	8.34	10	17.07	4.19	10	9.60	7.83	10	11.69	6.99
	S9	10	18.24	6.42	10	22.58	6.04	10	6.02	5.00	10	6.63	3.35
	S10	10	25.81	8.07	10	20.67	4.70	10	8.50	7.28	10	11.90	7.47
	S11	10	26.60	7.93	10	32.80	8.48	10	7.57	6.13	10	9.54	5.55
	GENERAL	**101**	**27,90**	**9,49**	**110**	**53,41**	**15,75**	**110**	**9,11**	**7,73**	**110**	**15,22**	**9,18**
DSR2	S1	10	10,98	4,70	10	16,75	7,41	10	5,88	4,56	10	7,73	4,51
	S2	10	20.28	9.24	10	20.94	9.65	10	7.12	5.74	10	12.66	7.52
	S3	10	12.95	5.62	10	18.15	8.29	10	11.43	9.87	10	14.80	10.03
	S4	10	18.48	7.58	10	18.20	7.40	10	5.95	5.14	10	10.08	6.16
	S5	10	11.04	5.22	10	16.61	8.84	10	5.99	5.55	10	10.97	7.71
	GENERAL	**50**	**15,40**	**6,78**	**50**	**19,63**	**9,02**	**50**	**9,61**	**8,14**	**50**	**13,53**	**8,57**

reids width were high in both LQM3 and DSR2, being the values obtained for each seed also high or medium. After grouping all the seeds of both samples together we obtained exactly the same results. We also compared CV and SD values for each descriptor obtained on each seed with the general value obtained for the samples, in both cases values of the seeds were always lower or combined lower values with higher or equal ones according to the descriptors considered.

Range of values for sclereids length and width was compared among LQM3 seeds, DSR2 seeds and considering seeds of both together, obtaining a clear overlapping among measurements in all the cases (Table 2).

Analysis of archaeobotanical samples

Cerro Lampay: qualitative micromorphological descriptors were equal in all the seeds, with long epidermal cells surrounding shorter ones in the marginal bulges (both kinds of cells absent in major faces) and presence of submarginal bulges.

General CV values for all the descriptors were always high and values of CV for each descriptor considering individual seeds were also mostly high, with two cases of low and medium CV (Table 3). CV and SD values for all the descriptor registered on each seed were always lower respect to the general CV and SD value obtained for the anatomical trait in general.

Table 2. Range of values and mean for sclereids length and width in modern (DSR2 and LQM3) and archaeological (Pampa Grande and Cerro Lampay) samples. All measurements are in microns. *Min*: minimum values; *Max*: maximum values.

Samples	Seed	Sclereid length			Sclereids width		
		Max	Min	Mean	Max	Min	Mean
DSR2	Seed Nº1	87,10	70,20	77,59	63,90	50,80	58,38
	Seed Nº2	91,87	74,21	80,59	69,54	49,90	59,38
	Seed Nº3	100,69	75,69	86,33	83,63	51,69	67,77
	Seed Nº4	93,35	77,78	86,52	70,24	51,59	61,07
	Seed Nº5	100,99	84,52	92,69	84,52	56,05	70,24
LQM3	Seed Nº1	100,90	75,20	89,49	82,30	54,70	67,58
	Seed Nº2	96,64	80,51	86,33	70,84	56,51	62,63
	Seed Nº3	95,10	78,17	87,32	74,90	44,59	57,73
	Seed Nº4	102,10	74,30	85,18	69,60	39,90	53,10
	Seed Nº5	91,10	74,40	83,23	76,90	49,70	61,01
	Seed Nº6	91,33	53,98	80,24	88,55	54,78	68,26
	Seed Nº7	103,19	79,68	89,93	70,22	52,99	62,28
	Seed Nº8	93,82	73,41	81,55	69,31	48,41	59,81
	Seed Nº9	89,06	74,09	83,04	55,17	44,43	50,46
	Seed Nº10	95,86	75,96	85,70	71,92	51,03	62,79
	Seed Nº11	92,83	72,51	80,93	69,32	51,59	58,21
Pampa Grande	*085	99,31	81,13	88,13	71,19	48,44	57,26
	S5	71,74	64,37	66,84	42,60	37,19	39,93
	S4	84,93	73,90	80,23	42,76	30,04	37,16
	S3	79,32	60,79	71,42	59,97	36,10	45,72
	S2	90,63	62,50	76,53	54,31	36,38	46,97
	S1	62,73	52,33	57,33	47,35	32,10	35,70
	QD	69,51	52,43	63,04	54,87	35,36	45,00
	QC	80,13	65,50	72,39	72,50	46,13	63,91
	QB	48,78	68,29	58,53	46,34	30,48	36,85
	QA	78,69	59,13	67,22	57,38	43,81	50,84
	Q1	82,19	62,31	68,83	55,25	33,50	42,30
Cerro Lampay	17-1248	81,63	67,56	72,29	60,94	41,13	52,13
	18-1235A	98,44	78,94	87,31	81,06	46,13	63,11
	18-1235B	49,88	30,88	44,88	34,81	28,00	31,59
	1059	46,22	38,35	43,01	31,77	18,02	23,83

Table 3. CV and SD values for anatomical (micromorphological) descriptors analysed in archaeological seeds testa identified as *C. maxima* ssp. *maxima* (S1 to S5, Q1, QA to QD, 17_1248 and 18_1235A) and *C.* aff *maxima* ssp *maxima* or *moschata* (085, 18_1235B and 1059, in italics); N indicates number of measurements taken for each descriptor.

SITE	SEED	ANATOMICAL DESCRIPTORS											
		Ep. cells width			Hypodermis thickness			Sclereids length			Sclereids width		
		N	CV	SD	N	CV	SD	N	CV	SD	N	CV	SD
PAMPA GRANDE	**S1**	-	-	-	10	15,61	3,41	10	6,8	3,9	10	11,95	4,27
	S2	1	-	-	10	13,47	4,71	10	9,52	7,28	10	14,08	6,61
	S3	-	-	-	10	21,01	8,86	10	8,18	5,84	10	13,85	6,33
	S4	-	-	-	5	15,11	2,56	9	5,09	4,09	4	14,25	5,3
	S5	-	-	-	10	18,93	5,41	10	3,5	2,34	10	4,76	1,9
	Q1	-	-	-	10	20,86	9,41	10	8,35	5,75	10	19,5	8,25
	QA	-	-	-	6	27,87	6,83	9	9,72	6,53	4	10,92	5,55
	QB	4	33,19	8,9	10	15,97	4,21	7	10,76	6,3	9	14,12	5,2
	QC	1	-	-	6	7,34	3,62	10	5,44	3,94	8	14,14	9,04
	QD	1	-	-	10	18,05	4,62	10	9,48	5,98	10	12,74	5,73
	085	5	14,92	7,79	4	3,95	7,8	6	7,28	6,41	5	16,7	9,56
	GENERAL	**11**	**39,17**	**15,1**	**91**	**91,57**	**35,87**	**101**	**13,81**	**9,61**	**90**	**22,44**	**10,07**
CERRO LAMPAY	**17_1248**	1	-	-	4	11,63	3,79	10	5,84	4,22	10	12,77	6,66
	18_1235A	9	29,27	10,52	10	17,52	5,87	10	6,42	5,6	9	17,57	11,09
	18_1235B	4	12,35	9,9	10	12,21	3,27	10	12,48	5,6	10	6,52	2,06
	1059	9	19,63	5,21	10	27,8	5,19	10	6,67	2,87	9	15,52	3,7
	GENERAL	**23**	**53,76**	**21,19**	**34**	**28,34**	**7,66**	**40**	**31,49**	**19,48**	**38**	**39,72**	**16,93**

The analysis of range of values for sclereids length and width showed that seeds identified as *C. maxima* ssp. *maxima* overlap, but are separated (not overlap) respect to those seeds identified as *C.* aff *maxima* ssp *maxima* or *moschata* which do overlap between them (Table 2).

Pampa Grande samples: deficient preservation of epidermal cells didn't allow studying the relationship between short and long cells in the marginal bulges, except in one seed. Four seeds had submarginal bulges. Analysis of CV and SD for anatomical testa descriptors on each seed were always minor than general CV and SD values, as in the case of Cerro Lampay samples. Also in this site samples, general CV values for the descriptors were always high and values of CV for each descriptor considering individual seeds were high, low or medium (Table 3).

Range of values for sclereids width and length overlap among all seeds (Table 2).

No differences were registered between a local *C. maxima* ssp *maxima* landrace (LQM3) and a population subject to low impact management practices (DSR2) considering CV, SD or range of values of quantitative anatomical descriptor for seeds testa. Results for these descriptors behave in a similar way in both archaeological samples, with high general values of CV for all the anatomical traits, being the SD and CV values calculated on each seed always minor than general ones. Despite differences among modern and ancient seed samples, the results obtained for the last ones are similar (but not the same) as in the former ones. When analysing general CV values both modern and ancient seeds show high values, expect for sclereids length in modern testa. When analysing individual CV and SD values for all descriptors on each archaeological seed, they are always minor than the general value obtained for the descriptor in archaeobotanical samples of the site as a whole; modern seeds can also have minor values, but with some seeds showing minor values combined with equal or higher ones, depending on the descriptor analysed. Comparison of the ranges of values for sclereids length and width showed a clear overlap in modern seeds, with the same results for Cerro Lampay *C. maxima* ssp. *maxima* seeds and all Pampa Grande seeds, including those identified as *C. maxima* ssp. *maxima* and the one identified as *C. aff maxima* ssp *maxima* or *moschata*. The fact that those seeds identified as *C. aff maxima* ssp *maxima* or *moschata* in Cerro Lampay do not overlap with the ones identified as *C. maxima* ssp. *maxima* recov-

ered in the same archaeological context could indicate that actually the former seeds correspond to *C. moschata* and not to *C. maxima* ssp *maxima*. In the case of Pampa Grande site seed 085 fix with the ones identified as *C. maxima* ssp. *maxima* and therefore could correspond to this specie.

CONCLUSIONS

Micromorphological analysis of seed testa developed in this paper suggest that modern landraces and populations subject to husbrandry practices of *C. maxima* ssp *maxima* have highly variable anatomical traits, as the CV values obtained for the descriptors indicate. This high variability was also registered in Pampa Grande and Cerro Lampay samples. The fact that all the seeds that conform each archaeological set have CV and SD values lower than general ones for each descriptor as opposed to the fact that in modern samples individual values of seeds are not always lower, could indicate that ancient seeds belonged to a more uniform cultivar than the modern ones used as reference in this paper. This proposal is reinforced in the case of Pampa Grande seeds and Cerro Lampay *C. maxima* ssp *maxima* seeds were measures of sclereids quantitative traits overlap, as in modern seeds.

In both sites remains of *C. maxima* ssp *andreana* or *affine* to it were recovered from the same archaeological context as domesticated ones, plus intermediate forms in the case of Pampa Grande. The results obtained in this paper for *C. maxima* ssp *maxima* seeds suggest the absence of interbreeding and hybrid forms, since both site samples are quite uniform representing homogeneous morphotypes, probably a single landrace.

More investigation is needed in order to fully understand cultivation and management practices developed during Archaic and Formative periods in the South-Central Andean Area. Scarcity of plant remains is a constraint to be considered in order to develop methodological tools that will help us to characterize Man-plant interaction in the past. This paper is a first step in a new and long path to achieve this goal.

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