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Supplementary Materials for

Archaeological findings show the extent of primitive characteristics of maize in South America

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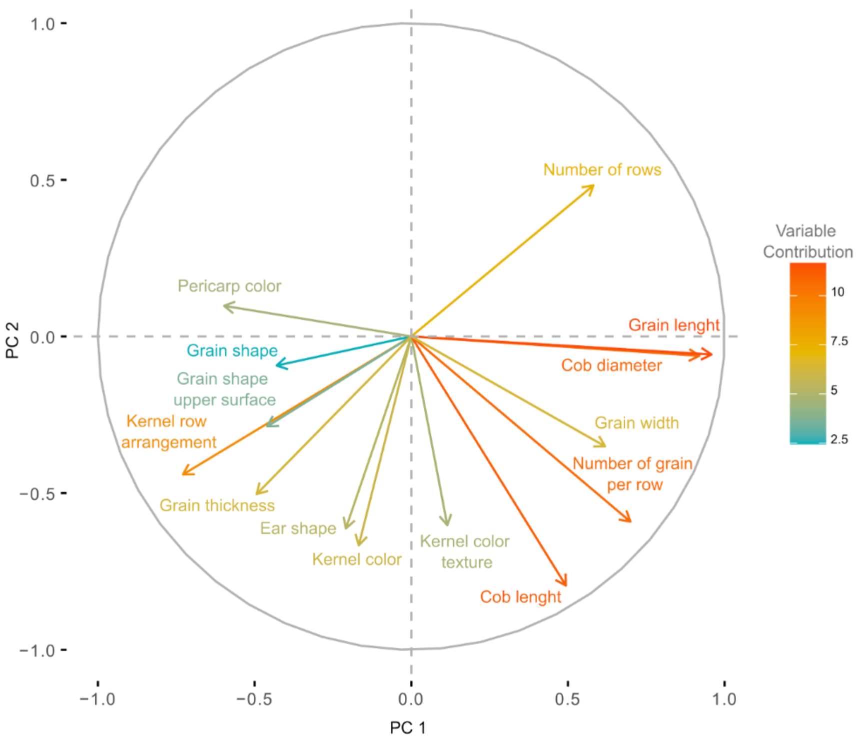
Fig. S1.

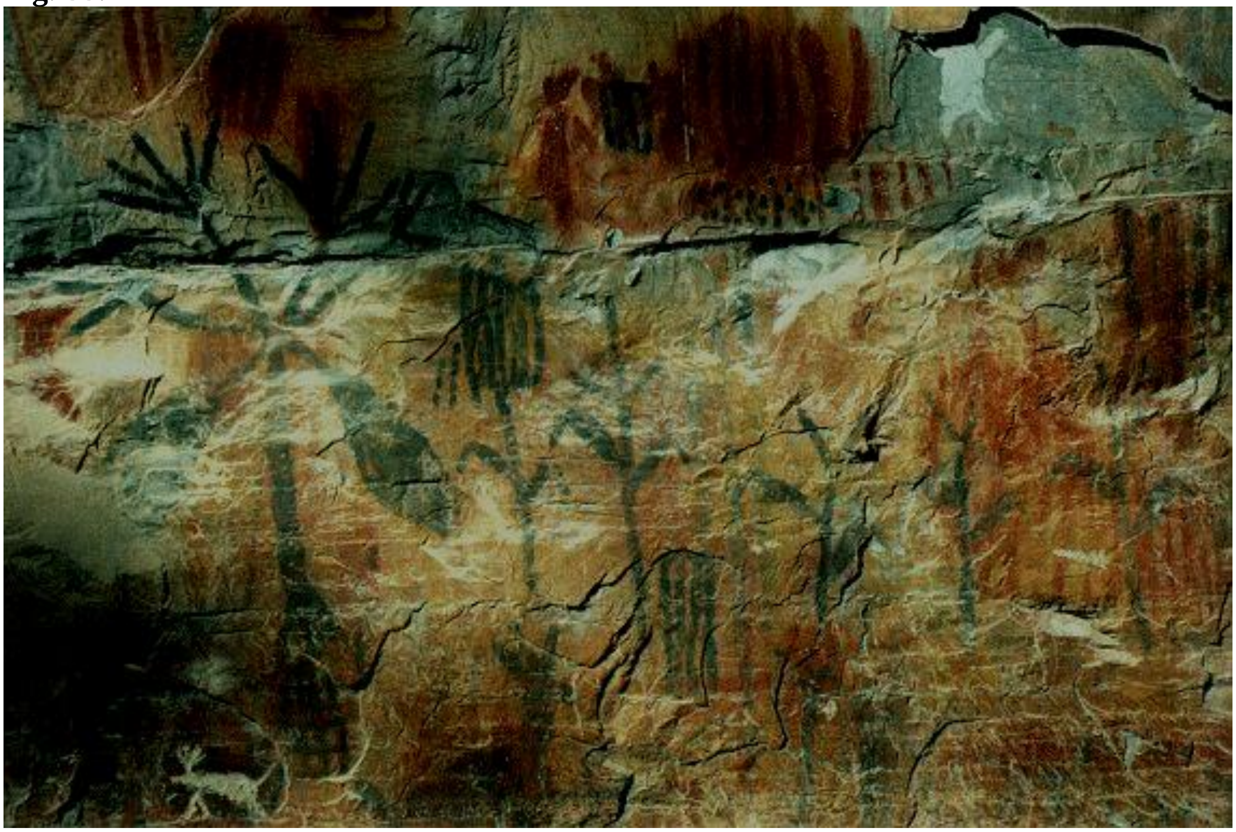


Contribution of the variables in the principal component analysis of 22 maize accessions, performed using morphometric descriptors of the maize races. PC 1, first principal component; PC 2, second principal component.

Fig. S2.

Lapa do Boquete, in the Peruaçu Valley, Minas Gerais (MG), Brazil. This is the archaeological site where the largest number of samples was found, including the archeologically characterized ears of maize used for the classification of races in this study. Photos Credit: Fábio de Oliveira Freitas, Embrapa Recursos Genéticos e Biotecnologia.

Fig. S3.



Cave paintings in Peruaçu Valley, Minas Gerais (MG), Brazil. In the images, maize and palm (Buriti, *Mauritia flexuosa*) are shown. Photos Credit: Fábio de Oliveira Freitas, Embrapa Recursos Genéticos e Biotecnologia.

Table S1.

	Archaeological maize			Teosinte		
Keyword	Minimum	Average	Maximum	Minimum	Average	Maximum
Cob length (cm)	1.8	6	17	4.5	6.6	11
Base diameter (mm)	0.76	11	32	5.76	11.88	17.7
No. rows	4	12	18	2	4	8
No. grains/row	4	13	40	6	12	27

Minimum, average, and maximum *cob length*, *cob base diameter*, *row number*, and *number of grains per row* characterized from 282 archaeological samples of maize ear/cob fragments from Peruaçu Valley, Minas Gerais (MG), and 22 samples of modern teosinte preserved at the Peabody Museum of Archeology and Ethnology, Harvard University.

Table S2.

	Archaeological maize								Teosinte			
Fragment shape	Integer		Apical		Medium		Basal		Integer		Apical	
	N°	%	N°	%	N°	%	N°	%	N°	%	N°	%
Conical	25	71.43	32	65.31	5	6.41	4	5.33	1	5	1	100
Conical-cylindrical	8	22.86	15	30.61	35	44.87	48	64	9	41	-	-
Cylindrical	2	5.71	2	4.08	38	48.72	23	30.67	12	55	-	-
Total	35	100	49	100	78	100	75	100	22	100	1	100

Frequency of *shapes* estimated from the characterization of 282 archaeological samples of maize ear/cob fragments from Peruaçu Valley, Minas Gerais (MG), and 22 samples of modern teosinte preserved at the Peabody Museum of Archeology and Ethnology, Harvard University. (-): not applicable.

Table S3.

Fragment shape	*Major diameter/Apical diameter*
Cylindrical	0.75 a 1.25
Conical	2 ou +
Conical-cylindrical	1.25 a 2

Ear/cob shape estimated for the fragments of archaeological samples of maize from Peruaçu Valley, Minas Gerais (MG), and modern teosinte preserved at the Peabody Museum of Archeology and Ethnology, Harvard University, considering preestablished parameters (*43, 64*).

Table S4.

	Qualitative characteristic	Method	Quantitative characteristic	Method
Cob	*Kernel color texture (crown)*	Nondestructive	*Number of grains per row*	Nondestructive
	Kernel crown color	Nondestructive	*Cob length (cm)*	Nondestructive
	Ear shape	Nondestructive	*Cob diameter (cm)*	Nondestructive
	Kernel row arrangement	Nondestructive	*Number of rows*	Nondestructive
	Grain type (endosperm)	Destructive [A representative grain was used to evaluate the endosperm]*		
Grain (kernel)	*Pericarp color*	Nondestructive	*Grain length (mm)*	Proposed [A representative grain was used for measurement]*
	Grain shape	Destructive [A representative grain was used for measurement]*	*Grain width (mm)*	Destructive [A representative grain was used for measurement]*
	Grain shape of the upper surface	Nondestructive	*Grain thickness (mm)*	Destructive [A representative grain was used for measurement]*

Morphological descriptors used for the characterization of cob and grains and information on the characterization method used for the preservation of archaeological samples from Peruaçu Valley, Minas Gerais (MG). *The detached grains were deposited in an appropriate container, which was duly identified, for conservation along with the original samples.

Table S5.

Date (years BP)	Region of origin	Type of sample	Reference
~ 9.000	Balsas Valley, Southern Mexico	Starch and phytoliths	(*5*)
~ 7.150	Las Vegas, Ecuador (Pacific Coast)	Phytoliths	(*65*, *66*)
~ 7.000	Panama (Pacific Coast)	Starch	(*67*)
~ 6.850	Llanos de Moxos, Bolivia (Southwestern Amazonia)	Phytoliths	(*25*)
~ 6.700	Llanos de Moxos, Bolivia (Southwestern Amazonia)	Phytoliths	(*25*)
~ 6.700	Paredones and Huaca Prieta, Peru (Pacific Coast)	Ear, grain and straw	(*68*)
~ 6.500	Rogaguado Lake, Bolivia (Southwestern Amazonia)	Pollen	(*26*)
~ 6.320	Lake Sauce, Peru (Peruvian Amazonia)	Pollen	(29)
~ 6.000	Ayauch Lake, Ecuador (Western Amazonia)	Pollen and phytoliths	(*27*)
~ 5.760	Pará, Brazil (Northern Amazonia)	Pollen and phytoliths	(*30*)
~ 5.300	Ayauch Lake, Ecuador (Western Amazonia)	Phytoliths	(*33*)
~ 5.300	Upper Madeira River, Rondônia, Brazil (Southwestern Amazonia)	Phytoliths	(*31*)
~ 4.690 ± 40	Peña Roja and Abejas, Colombia (Western Amazonia)	Pollen	(*30*)
~ 4.645 ± 40	Araracuara, Colombia (Western Amazonia)	Pollen	(*69*)
~ 4.190 ± 40	Los Ajos, Rocha, Uruguay (Southeastern Uruguay)	Phytoliths and starch	(*34*)
~ 3.350	Pará, Brazil (Northern Amazonia)	Pollen	(*28*)
~ 3.000 to ~ 1.500	Upper Madeira River (Southwestern Amazonia)	Phytoliths and starch	(*32*)
~ 1.390 ± 40	São Francisco do Sul, Santa Catarina, Brazil (Southern Brazil)	Starch	(*35*)
~ 1010 ± 60 ~ 860 ± 60 ~ 630 ± 60 ~ 570 ± 60	Peruaçu Valley, Northern Minas Gerais, Brazil (Southeastern Brazil)	Ear, grain and cob	Samples characterized in this study

Date (years before present, BP), region and type of sample in the archaeological records of maize described in the literature for the Americas.

Table S6.

ID	Date (years BP)	*Fragment type*	*Fragment shape*	*No. rows*	*No. grains/row*	*Cob length (cm)*
B51	570 ± 60	Integer	Cylindrical	4	8	5.5
B57	570 ± 60	Integer	Conical	4	11	5.3
B1	570 ± 60	Integer	Conical	6	10	4
B31	630 ± 60	Apical fragment	Conical-cylindrical	6	6	3.6
D14	860 ± 60	Apical fragment	Conical	6	6	3
G1	No info.	Apical fragment	Conical	6	10	4.3
H1	No info.	Apical fragment	Conical-cylindrical	6	6	2.3
I4	No info.	Apical fragment	Conical	6	6	2.7
B22	570 ± 60	Middle fragment	Cylindrical	6	7	4.5
J2	No info.	Middle fragment	Conical-cylindrical	6	12	6
E8	1010 ± 80	Basal fragment	Conical-cylindrical	6	8	4.5
I5	No info.	Basal fragment	Conical-cylindrical	6	14	5.3
I6	No info.	Basal fragment	Conical-cylindrical	6	6	2.8
I7	No info.	Basal fragment	Cylindrical	6	4	1.8

Date (years before the present, BP), *fragment type*, *fragment shape*, *number of rows*, *number of grains/row*, and *length of ear/cob fragments* with primitive characteristics from archaeological maize samples from Peruaçu Valley, Minas Gerais (MG). A *number of rows* less than 8 was considered a "primitive" trait.

Table S7.

	Qualitative descriptors		Qualitative descriptors	
Ear	*Grain type (endosperm):*	Floury	*Number of rows:*	8/10*
	Ear shape:	Conical/Cylindrical	*Number of grains per row:*	12
	Kernel row arrangement:	Interlocked/Spiral	*Ear length (cm):*	7.25
	Kernel color texture (crown):	Plain	*Ear diameter (cm):*	1.95
	Kernel crown color:	Orange/ Brown		
	Cob color:	Yellow		
Kernel (grain)	*Kernel shape:*	Flat Oval (38%)/ Orbicular (31%)/ Obovate (15%)/ Trapezoidal (15%)	*Kernel length (mm):*	5.98
	Kernel shape of the upper surface:	Rounded	*Kernel width (mm):*	6.53
	Pericarp color:	Brown (69%)/ Dark Brown (23%)/ Orange (8%)	*Kernel thickness (mm):*	5.21
	Grain color (endosperm):	White		

Qualitative and quantitative morphological descriptors obtained from the characterization of two ears and 12 grains of archaeological maize samples from Peruaçu Valley, Minas Gerais (MG). For the qualitative descriptors, all the variations identified are presented in the table, and for the quantitative descriptors, the average (except for the *number of rows*) is presented. * *Number of rows*: all the identified variations are presented.

Data S1.

Identification code, date (years before present - BP), qualitative and quantitative descriptors for morphological characterization of 282 archaeological samples of maize cob/ear fragments from the Peruaçu Valley-MG. (No Info.) = No information available.

Data S2.

Qualitative and quantitative grain descriptors used for morphological characterization to classify maize races.

Data S3.

Qualitative and quantitative ear descriptors used for morphological characterization to classify maize races. (No Info.) = No information available.

Data S4.

Qualitative and quantitative ear descriptors used for the morphological characterization of 22 samples of modern teosinto (Peabody number: 2001.1.396) conserved at the Peabody Museum of Archaeology and Ethnology, Harvard University. (-) Not applicable

Data S5.

Qualitative and quantitative ear and grain descriptors used for morphological characterization to classify maize races. (No Info.) = No information available. * Maize races from Brazil described in the literature for Lowland South America (Paterniani and Goodman, 1977).

Data S6.

Qualitative and quantitative ear and grain descriptors characterized in order to discuss the evolutionary history of the floury maize races of Lowland South America. (No Info.) = No information available. * Maize races from Brazil described in the literature for Lowland South America (Paterniani and Goodman, 1977).

Data S7.

Passport data for 13 accessions representing maize races used for molecular characterization in this study.

Data S8.

Single nucleotide polymorphisms (SNPs) markers selected for the molecular characterization of 13 maize accessions.

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