

SUPPL. MATERIAL

Cubio tuber (*Tropaeolum tuberosum*, Tropaeolaceae) morphological diversity in Colombia and Bolivia

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Table 1. Morphological characterization of 15 cubio individuals based on tuber descriptors. Abbreviations: PSC, predominant surface color; CB, secondary surface color in bands; CD, secondary surface color in dots; CE, secondary surface color in eyes/buds; PPC, predominant pulp color; CC, secondary cortex color; VRC, secondary vascular ring color; PC, secondary pith color; TS, tuber shape; ED, eye/bud depth.

Accession	PSC	СВ	CD	CE	PPC	CC	VCA	CP	F	ED
M2	Purple	Red	Absent	Absent	White	Purple	Purple	Grayish	Fusiform	Slightly
	_				_			red	conical	deep
A4	Intense	Absent	Absent	Absent	Intense	Absent	Absent	Absent	Fusiform	Slightly
	yellow				yellow				conical	deep
AS6	Light yel-	Red	Black	Black	Yellowish	Purple	Absent	Absent	Fusiform	Very
	low				white				conical	deep
A7	Intense yellow	Red	Absent	Absent	Yellow	Absent	Absent	Absent	Fusiform conical	Deep
M8	Yellowish	Absent	Grayish	Grayish	White	Purple	Purple	Grayish	Fusiform	Very
	white		purple	purple		•	•	red	conical	deep
M10	Yellowish	Absent	Purple	Purple	Yellowish	Purple	Purple	Absent	Fusiform	Deep
	white		•	•	white	•	•		conical	•
AS11	Light yel-	Absent	Absent	Purple	Yellowish	Absent	Purple	Grayish	Fusiform	Deep
	low			-	white		•	red	conical	-
M12	Yellowish	Red	Purple	Purple	Yellowish	Purple	Purple	Grayish	Fusiform	Deep
	white		-	-	white	•	•	red	conical	-
B15	Yellowish	Absent	Absent	Purple	White	Absent	Purple	Absent	Fusiform	Slightly
	white								cylindri-	deep
									cal	_
AS17	Intense	Red	Red	Absent	Yellow	Light red	Absent	Absent	Fusiform	Deep
	yellow								conical	
AS18	Yellowish	Red	Grayish	Grayish	White	Purple	Purple	Purple	Fusiform	Deep
	white		purple	purple					conical	
IS1	Black	Red	Absent	Absent	White	Purple	Purple	Grayish	Fusiform	Slightly
								red	conical	deep
IS2	Yellow-	Absent	Absent	Absent	Orange-	Absent	Absent	Absent	Fusiform	Deep
	orange				yellow				conical	
IS3	Light yel-	Absent	Absent	Dark	White	Absent	Absent	Absent	Conical	Very
	low			green						deep
IS4	Yellowish	Yellow	Absent	Light yel-	White	Absent	Absent	Absent	Fusiform	Deep
	white			low					conical	



Table 2. Morphological characterization of 15 cubio individuals, based on tuber descriptors and incorporating the dataset from Manrique *et al.* (2014). Abbreviations: PSC, predominant surface color; CB, secondary surface color in bands; CD, secondary surface color in dots; CE, secondary surface color in eyes/buds; PPC, predominant pulp color; CC, secondary cortex color; VRC, secondary vascular ring color; PC, secondary pith color; TS, tuber shape; ED, eye/bud depth.

Accession	PSC	СВ	CD	CE	PPC	CC	VCA	СР	F	ED
M2	Purple	Light red	Absent	Absent	White	Purple	Purple	Grayish red	White	Yellowish white
A4	Intense yellow	Absent	Absent	Absent	Intense yellow	Absent	Absent	Absent	Yellowish white	Yellowish white
AS6	Light yellow	Light red	Black	Black	Yellowish white	Purple	Absent	Absent	Light yellow	Yellowish white
A7	Intense yellow	Light red	Absent	Absent	Yellow	Absent	Absent	Absent	Yellowish white	Yellowish white
M8	Yellowish white	Absent	Grayish purple	Grayish purple	White	Purple	Purple	Grayish red	Light yellow	Yellowish white
M10	Yellowish white	Absent	Purple	Purple	Yellowish white	Purple	Purple	Absent	Yellowish white	Yellowish white
AS11	Light yellow	Absent	Absent	Purple	Yellowish white	Absent	Purple	Grayish red	Yellowish white	Yellowish white
M12	Yellowish white	Light red	Purple	Purple	Yellowish white	Purple	Purple	Grayish red	Light yellow	Yellowish white
B15	Yellowish white	Absent	Absent	Purple	White	Absent	Purple	Absent	White	Light yellow
AS17	Intense yellow	Light red	Light red	Absent	Yellow	Red	Absent	Absent	Yellowish white	Yellowish white
AS18	Yellowish white	Light red	Grayish purple	Grayish purple	White	Purple	Purple	Purple	Yellowish white	Yellowish white
IS1	Black	Light red	Absent	Absent	White	Purple	Purple	Grayish red	White	Yellowish white
IS2	Yellow orange	Absent	Absent	Absent	Orange yellow	Absent	Absent	Absent	Yellowish white	Yellowish white
IS3	Light yellow	Absent	Absent	Dark green	White	Absent	Absent	Absent	Light yellow	White
IS4	Yellowish white	Yellow	Absent	Light yellow	White	Absent	Absent	Absent	Yellowish white	Yellowish white
AMM 5134	Yellow orange	Absent	Absent	Purple	Orange yellow	Absent	Absent	Absent	White	White
AMM 5159	Yellow orange	Absent	Grayish red	Grayish red	Orange yellow	Absent	Absent	Absent	Yellowish white	Yellowish white
AMM 5160	Yellow orange	Absent	Absent	Absent	Yellow	Absent	Absent	Absent	Yellowish white	White
T 40-84	Yellow orange	Grayish red	Absent	Grayish red	Yellow	Absent	Absent	Absent	Yellowish white	Yellowish white
T 147 85	Intense yellow	Absent	Absent	Absent	Yellow	Absent	Absent	Absent	White	Yellowish white

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Accession	CPS	СВ	CP	CO	СРР	CC	CA	CM	P	F
ARB	Yellow	Absent	Absent	Purple	Orange	Absent	Absent	Absent	White	Yellowish
5072	orange				yellow					white
AGM	Light	Absent	Absent	Absent	Yellow	Absent	Absent	Absent	White	Yellowish
5108	yellow									white
AGM	Brown	Absent	Absent	Yellow	Orange	Brown	Absent	Absent	White	Yellowish
5109					yellow					white
AGM	Light	Absent	Absent	Purple	Yellowish	Absent	Absent	Absent	White	Light
5110	yellow				white					yellow
AGM	Yellow	Absent	Absent	Purple	Orange	Absent	Absent	Absent	White	Light
5111	orange				yellow					yellow
AGM	Intense	Purple	Absent	Purple	Yellow	Absent	Absent	Absent	White	Yellowish
5113	yellow									white
AGM	Light	Absent	Absent	Red	Yellowish	Absent	Absent	Absent	White	Yellowish
5115	yellow				white					white
AGM	Intense	Purple	Purple	Purple	Yellow	Absent	Absent	Absent	White	Yellowish
5116	yellow									white
AGM	Brown	Absent	Absent	Yellow	Orange	Brown	Absent	Absent	White	Yellowish
5118					yellow					white
AGM	Intense	Grayish	Grayish	Grayish	Yellow	Absent	Absent	Absent	White	Yellowish
5119	yellow	red	red	red						white
AJB	Intense	Grayish	Grayish	Grayish	Yellow	Absent	Absent	Absent	White	Yellowish
5314	yellow	red	red	red						white
AJB	Light	Absent	Absent	Absent	Yellow	Absent	Absent	White	White	Yellowish
5318	yellow									white
AJB	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	White	Light
5322	orange				yellow					yellow
ARB	Yellow	Absent	Absent	Purple	Orange	Absent	Absent	Absent	Yellowish	White
5238	orange				yellow				white	
ARB	Yellow	Absent	Absent	Purple	Orange	Absent	Absent	Absent	Yellowish	White
5239	orange				yellow				white	
ARB	Yellowish	Purple	Absent	Purple	Yellowish	Absent	Absent	Absent	Yellowish	Yellowish
5240	white				white				white	white
ARB	Grayish	Purple	Absent	Purple	Orange	Purple	Absent	Absent	Yellowish	Light
5241	purple				yellow				white	yellow
ARB	Yellow	Absent	Purple	Purple	Orange	Absent	Absent	Absent	Yellowish	Yellowish
5242	orange				yellow				white	white
MH 1160	Yellowish	Absent	Purple	Purple	White	Absent	Purple	Absent	Yellowish	White
	white								white	
MH 1157	Yellowish	Red	Purple	Red	White	Absent	Yellow	Absent	White	Yellowish
	white									white

Table 2. Morphological characterization of 15 cubio individuals, based on tuber descriptors and incorporating the dataset from Manrique *et al.* (2014). Abbreviations: PSC, predominant surface color; CB, secondary surface color in bands; CD, secondary surface color in dots; CE, secondary surface color in eyes/buds; PPC, predominant pulp color; CC, secondary cortex color; VRC, secondary vascular ring color; PC, secondary pith color; TS, tuber shape; ED, eye/bud depth.

Accession	CPS	СВ	CP	CO	СРР	CC	CA	CM	P	F
MH 1161	Yellow	Absent	Purple	Purple	Orange	Absent	Absent	Absent	Yellowish	Yellowish
	orange				yellow				white	white
PCP 056	Yellow	Absent	Absent	Absent	Yellow	Absent	Absent	Absent	Yellowish	Yellowish
	orange								white	white
ARB	Yellow	Absent	Grayish	Grayish	Orange	Absent	Absent	Absent	Yellowish	Yellowish
5237	orange		red	red	yellow				white	white
T 5-83	Intense yellow	Light red	Absent	Light red	Yellow	Absent	Absent	Absent	Yellowish white	White
T 1-83	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Light	White
1 1-03	orange	Absent	Ausciit	Ausciii	yellow	Ausciii	Ausciii	Ausciit	yellow	Willie
GOM 88	Intense	Absent	Absent	Absent	Yellow	Absent	Absent	Absent	Yellowish	Yellowish
GOIM 00	yellow	Hosent	71050111	Hosent	Tenow	Hosent	7105011	7 1030111	white	white
GOM 89	Intense	Absent	Absent	Absent	Yellow	Absent	Absent	Absent	Yellowish	Yellowish
00111 07	yellow	11000111	riosem	11000111	10110 11	1105011	11000111	1105011	white	white
GOM 91	Intense	Light red	Absent	Light red	Yellow	Absent	Absent	Absent	Yellowish	Yellowish
	yellow								white	white
GOM 92	Light	Absent	Purple	Purple	Yellowish	Absent	Purple	Absent	White	Yellowish
	yellow				white					white
GOM 93	Light	Absent	Purple	Purple	Yellowish	Absent	Purple	Absent	White	Yellowish
	yellow				white					white
GOM 94	Light yellow	Absent	Purple	Purple	Yellowish white	Absent	Purple	Absent	White	Yellowish white
GOM 96	Light	Absent	Purple	Purple	Yellowish	Absent	Purple	Absent	Yellowish	Yellowish
GOIM 70	yellow	Hosent	rurpic	rurpic	white	Hosent	Turpic	7 1030111	white	white
AVM	Yellow	Absent	Grayish	Grayish	Orange	Absent	Absent	Absent	Yellowish	White
5556	orange	1105011	red	red	yellow	1 HOSCIIC	7 TOSCIII	7 105011	white	vv iiiee
AVM	Light	Absent	Absent	Red	Yellowish	Absent	Absent	Absent	Yellowish	Yellowish
5557	yellow	1105011	11000111	1100	white	11000110	11000111	1105011	white	white
AVM	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	White
5558	orange				yellow				white	
AVM	Intense	Absent	Absent	Light red	Yellow	Absent	Absent	Absent	Yellowish	White
5559	yellow			υ					white	
AVM	Intense	Purple	Absent	Purple	Yellow	Absent	Absent	Absent	Yellowish	Yellowish
5560	yellow	•		•					white	white
AVM	Light	Absent	Absent	Purple	Yellowish	Absent	Absent	Absent	White	Light
5561	yellow			•	white					yellow
AVM	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	White
5562	orange				yellow				white	
ARB	Intense	Light red	Light red	Light red	Yellow	Absent	Absent	Absent	Light	White
5575	yellow								yellow	

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Accession	CPS	СВ	CP	CO	СРР	CC	CA	CM	P	F
ARB	Yellow	Absent	Absent	Red	Orange	Absent	Absent	Absent	Yellowish	White
5576	orange				yellow				white	
ARB	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	White
5577	orange				yellow				white	
ARB	Light	Absent	Absent	Absent	Yellowish	Absent	Absent	Absent	White	Yellowish
5578	yellow				white					white
ARB	Light	Purple	Absent	Purple	Yellowish	Absent	Purple	Absent	Yellowish	Yellowish
5579	yellow				white				white	white
ARB	Yellow	Absent	Absent	Red	Orange	Absent	Absent	Absent	White	Yellowish
5580	orange				yellow					white
ARB	Light	Absent	Absent	Absent	Yellowish	Absent	Absent	Absent	Yellowish	Yellowish
5581	yellow				white				white	white
ARB	Intense	Absent	Absent	Absent	Yellow	Absent	Absent	Absent	Yellowish	Yellowish
5582	yellow								white	white
T 33-84	Yellow	Absent	Absent	Purple	Orange	Absent	Absent	Absent	White	Light
	orange				yellow					yellow
T 36-84	Light	Absent	Absent	Purple	Yellowish	Absent	Purple	Absent	White	Yellowish
	yellow				white					white
T 12-83a	Light	Absent	Absent	Purple	Yellowish	Yellow	Absent	Absent	White	White
	yellow				white					
CM DPA	Yellowish	Absent	Purple	Purple	White	Absent	Purple	Absent	Yellowish	White
02 02	white								white	
CM DPA	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	White
02 03	orange				yellow				white	
CM DPA	Yellow	Absent	Grayish	Grayish	Orange	Absent	Absent	Absent	White	Light
02 04	orange		red	red	yellow					yellow
CM DPA	Yellow	Absent	Absent	Purple	Orange	Absent	Absent	Absent	Yellowish	Yellowish
02 05	orange			~	yellow				white	white
CM DPA	Yellow	Absent	Grayish	Grayish	Orange	Absent	Absent	Absent	Yellowish	Yellowish
02 05b	orange		red	red	yellow				white	white
CM DPA	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	Yellowish
02 07	orange				yellow				white	white
CM DPA	Yellow	Absent	Absent	Red	Orange	Absent	Absent	Absent	White	Yellowish
02 08	orange				yellow					white
CM DPA	Yellow	Absent	Absent	Purple	Orange	Absent	Absent	Absent	Yellowish	White
02 08a	orange	D 1	A.1.	D 1	yellow	A.1 .	A.1	A.1	white	33.71
CM DPA	Intense	Purple	Absent	Purple	Yellow	Absent	Absent	Absent	Yellowish	White
02 09	yellow	A.1	A.1.	D 1	0	A.1 .	A.1 .	A.1 .	white	33.71
CM DPA	Yellow	Absent	Absent	Purple	Orange	Absent	Absent	Absent	White	White
02 13	orange				yellow					

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Accession	CPS	СВ	CP	CO	СРР	CC	CA	CM	P	F
CM DPA	Yellow	Absent	Absent	Red	Orange	Absent	Absent	Absent	Yellowish	Yellowish
02 13a	orange				yellow				white	white
CM DPA	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	Yellowish
02 15	orange				yellow				white	white
CM DPA	Yellow	Absent	Absent	Purple	Orange	Absent	Absent	Absent	Yellowish	White
02 16	orange				yellow				white	
CM DPA	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	Yellowish
02 18	orange				yellow				white	white
CM DPA	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	White
02 20	orange				yellow				white	
CM DPA	Intense	Absent	Absent	Light red	Yellow	Absent	Absent	Absent	Light	White
02 22	yellow								yellow	
CM DPA	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	Yellowish
02 23	orange				yellow				white	white
CM DPA	Black	Absent	Absent	Absent	Purple	Absent	Absent	Absent	Yellowish	White
02 24									white	
AAQ	Intense	Absent	Absent	Light red	Yellow	Absent	Absent	Absent	White	Yellowish
5488	yellow				_					white
ARV	Yellow	Grayish	Absent	Grayish	Orange	Absent	Absent	Absent	Yellowish	Yellowish
5364	orange	red		red	yellow				white	white
ARV	Light	Light red	Light red	Light red	Yellow	Absent	Absent	Absent	Yellowish	Yellowish
5365	yellow	***		***	****	ъ 1			white	white
ARV	Intense	Light red	Absent	Light red	White	Purple	Absent	Absent	Yellowish	White
5366	grayish								white	
A DX7	red	A 1 4	A 1 4	D1.	37 - 11 1 - 1 -	A 1 4	A 1 4	A 1 4	3371-14	T 1.1.4
ARV	Yellowish	Absent	Absent	Purple	Yellowish	Absent	Absent	Absent	White	Light
5367 ARV	white	Abcont	A boomt	Dumala	white	Abcont	1 haant	Absent	White	yellow
5368	Intense	Absent	Absent	Purple	Yellow	Absent	Absent	Absent	willte	Light yellow
ARV	yellow Intense	Absent	Absent	Purple	Yellow	Absent	Absent	Absent	White	Light
5369	yellow	Ausent	Ausciit	ruipie	Tellow	Auseni	Ausciii	Ausent	Willte	yellow
ARV	Grayish	Yellow	Yellow	Yellow	Orange	Absent	Absent	Absent	Yellowish	Yellowish
5370	red	TCHOW	TCHOW	TCHOW	yellow	Ausciii	Ausciii	Ausciit	white	white
ARV	Intense	Absent	Absent	Purple	Yellow	Absent	Absent	Absent	White	Light
5371	yellow	HOSCIII	HOSCIII	Turpic	TCHOW	Hosent	HOSCIII	Hosent	Willie	yellow
M 01	Yellow	Absent	Grayish	Grayish	Orange	Absent	Absent	Absent	Yellowish	Yellowish
COL 1A	orange	Hosent	red	red	yellow	7105011	7 TOSCIII	7 105011	white	white
M 01	Intense	Purple	Purple	Purple	Yellow	Absent	Absent	Absent	White	Yellowish
COL 1A*	yellow	P	P	P						white
M 02	Yellow	Absent	Absent	Purple	Orange	Absent	Absent	Absent	White	Yellowish
COL 1B	orange				yellow			- ~		white

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Accession	CPS	СВ	CP	СО	СРР	CC	CA	CM	P	F
M 02 O	Yellow	Purple	Absent	Purple	Yellow	Absent	Absent	Absent	Yellowish	Yellowish
CO	orange								white	white
M 04	Intense	Absent	Absent	Red	Yellow	Absent	Absent	Absent	White	Yellowish
COL 2A	yellow									white
M 04	Intense	Purple	Purple	Purple	Yellow	Absent	Absent	Absent	White	Yellowish
COL 5C	yellow									white
M 05	Yellow	Absent	Absent	Red	Orange	Absent	Absent	Absent	Yellowish	White
COL 2B	orange				yellow				white	
M 06	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	White
COL 2C	orange				yellow				white	
M 07	Intense	Light red	Absent	Light red	Yellowish	Yellow	Absent	Absent	Yellowish	Yellowish
COL 3A	yellow				white				white	white
M 08	Intense	Purple	Purple	Purple	Yellow	Absent	Absent	Absent	White	Yellowish
COL 3B	yellow									white
M 09	Yellow	Grayish	Grayish	Grayish	Orange	Absent	Absent	Absent	Yellowish	White
COL 3C	orange	red	red	red	yellow				white	
M 10	Intense	Purple	Purple	Purple	Yellow	Absent	Absent	Absent	White	Yellowish
COL 3B	yellow									white
M 11	Intense	Absent	Absent	Red	Yellow	Absent	Absent	Absent	White	Yellowish
COL 3E	yellow									white
M 12	Light	Absent	Purple	Purple	Yellowish	Absent	Purple	Absent	Yellowish	Yellowish
COL 3F	yellow				white				white	white
M 13	Intense	Absent	Yellow	Yellow	Yellow	Grayish	Absent	Absent	Yellowish	Yellowish
COL 4A	grayish					red			white	white
	red									
M 14	Yellow	Absent	Absent	Purple	Yellow	Absent	Absent	Absent	White	Yellowish
COL 4B	orange									white
M 15	Yellow	Absent	Absent	Absent	Orange	Absent	Absent	Absent	Yellowish	White
COL 5A	orange				yellow				white	
M 16	Intense	Purple	Purple	Purple	Yellow	Absent	Absent	Absent	White	Yellowish
COL 5B	yellow									white
M 17	Light	Absent	Purple	Purple	Yellowish	Absent	Purple	Absent	Yellowish	Yellowish
COL 6A	yellow				white				white	white
M 19	Intense	Absent	Red	Red	Yellow	Absent	Absent	Absent	Yellowish	Yellowish
COL 6	yellow								white	white
M 21	Light	Absent	Purple	Purple	Yellowish	Absent	Purple	Absent	Yellowish	Yellowish
COL 7B	yellow				white				white	white
M 22	Intense	Light red	Light red	Light red	Yellowish	Yellow	Absent	Absent	Yellowish	Yellowish
COL 7	yellow				white				white	white
M 23	Intense	Absent	Absent	Absent	Yellow	Absent	Absent	Absent	Yellowish	White
COL 7D	yellow								white	

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Accession	CPS	СВ	CP	CO	CPP	CC	CA	CM	P	F
M 24 COL 7B	Light yellow	Absent	Purple	Purple	Yellowish white	Absent	Purple	Absent	Yellowish white	Yellowish white
PICA PL 92 MA	Yellow orange	Absent	Purple	Purple	Orange yellow	Absent	Absent	Absent	Yellowish white	Yellowish white

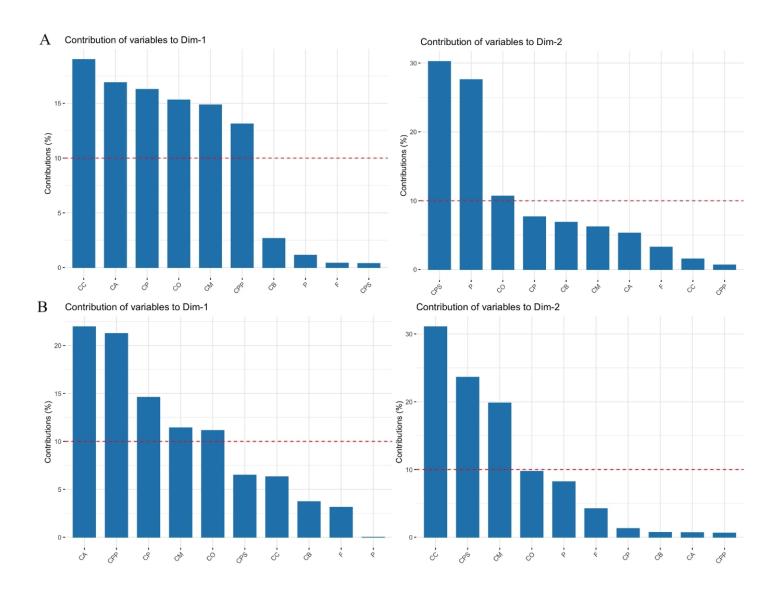


Figure 1. Contribution of variables to dimensions 1 (left) and 2 (right) of the Principal Component Analysis (PCA) based on the morphological characterization of tubers from a dataset of 15 cubio individuals under study (A) and including the dataset from Manrique *et al.* (2014) (B).