

Instituto Nacional de Investigação Agrária e Veterinária, I.P.

REPÚBLICA PORTUGUESA

AGRICULTURA

## Reunião de Projeto

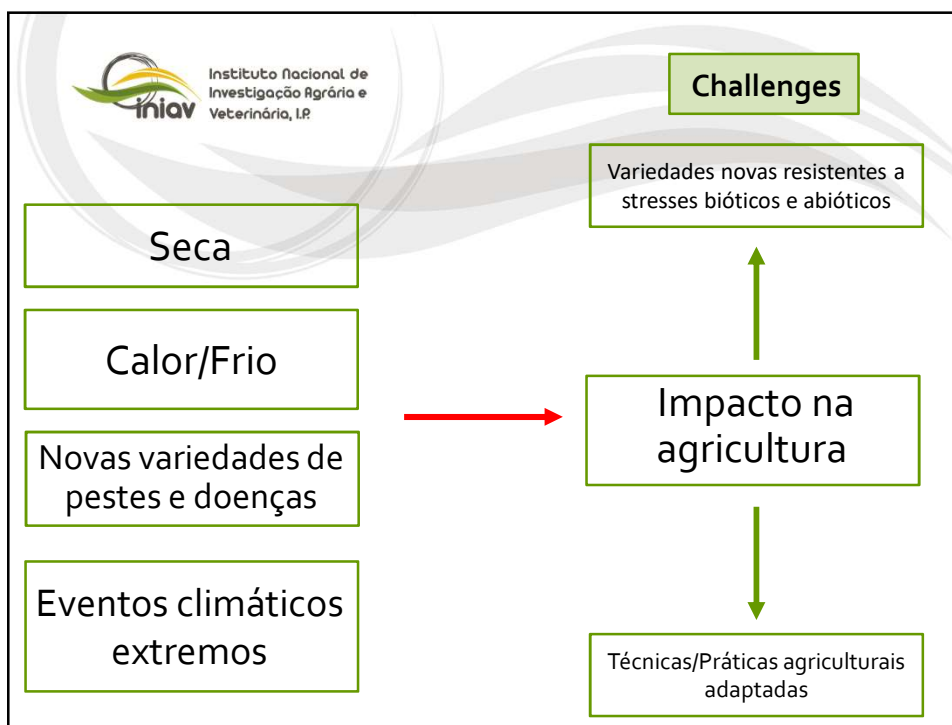
**CAEA-AGRI**  
Caminhos de Adaptação de Espécies Agrícolas às Alterações Climáticas

Tiago Machado, Carlos Gaspar, Violeta Lopes e Ana Barata  
30/06/2020

anpromis  
associação nacional dos produtores de milho e sorgo

ANSEME  
Associação Nacional de Produtores e Consumidores de Semeadura

COTHN  
CENTRO OPERATIVO E TECNOLÓGICO HORTIFRUTÍCOLA NACIONAL  
CENTRO DE COMPETÊNCIAS





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## GRIN-Global Around the World



**Current users**


- Australia (APG)
- Bolivia (INIAF)
- Chile (INIA)
- CIAT (CGIAR)
- CIMMYT (CGIAR)
- CIP (CGIAR)
- CRI (Crop Research Institute)
- IITA (CGIAR)
- Genetic Resources of Madeira Island, Portugal
- Portugal (INIAV)
- Tunisia (BNG)
- USDA-NPGS

**Evaluating**

- AfricRice (CGIAR)
- Azerbaijan
- Bioversity (CGIAR)
- Canada (PGRC)
- Colombia Agrosavia
- Denmark (Pometest)
- Denmark (Vegetable collection)
- Ecuador-Denaref
- Estonia (CRI)
- Ethiopia (EBI)
- Finland

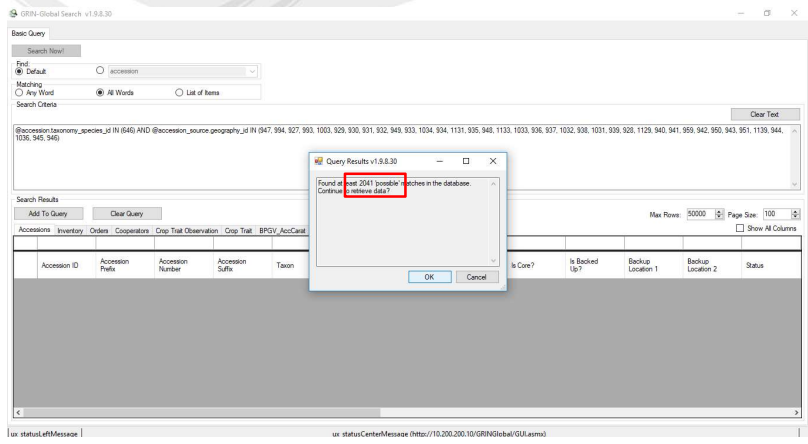
- Iceland
- ICRISAT (CGIAR)
- ILRI (CGIAR)
- IRRI (CGIAR)
- Jordan
- Kenya (GERRI)
- Latvia
- Lebanon
- Lithuania
- Mexico
- New Zeland (Agriculture)

- NordGen
- Norway (National Genebank)
- Oman (OARGRC)
- South Africa (ARC)




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**Search**



The screenshot shows the GRIN-Global Search v1.0.0.30 web application. It features a search bar with a dropdown menu for 'Find' (set to 'Accession') and radio buttons for 'Matching' (set to 'All Words'). Below the search bar is a text input field containing a complex query: '@accession\_taxonomy\_species\_id IN (646) AND @accession\_source\_geography\_id IN (947, 994, 927, 993, 1003, 928, 930, 931, 932, 949, 933, 1034, 934, 1131, 935, 948, 1133, 1033, 936, 937, 1032, 938, 1031, 939, 920, 1129, 940, 941, 959, 942, 950, 943, 951, 1139, 944, 1036, 945, 948)'. A 'Query Results v1.0.0.30' dialog box is open, displaying the message: 'Found 0 of 0 (0%) records in the database. Continue to retrieve data?'. The dialog has 'OK' and 'Cancel' buttons. Below the search results area, a table header is visible with columns: 'Accession ID', 'Accession Prefix', 'Accession Number', 'Accession Suffix', 'Taxon', 'Is Core?', 'Is Backed Up?', 'Backup Location 1', 'Backup Location 2', and 'Status'. The table body is currently empty.



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Curator

GRIN-Global v1.9.8.30

File Tools Help

Search... Accession Wizard Cooperator Wizard Inventory Attachment Wizard Order Wizard Viability Wizard

Show lists from: Machado, Tiago

Accessions Inventory Orders Cooperators Crop Trait Observation Crop Trait Method BPGV\_AccCent Accession Source


Accession ID	Accession Path	Accession Number	Accession SubID	Taxon	Name	Origin	Maintenance Site	Is Core?	Is Backed Up?	Backup Location 1
22491	BPGV23648			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22492	BPGV23649			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22493	BPGV23650			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22495	BPGV23652			Zea mays	Miho de cinco lóbulos	Portugal, Agres	BPGV	Y	N	
22496	BPGV23653			Zea mays	Miho de cinco lóbulos	Portugal, Agres	BPGV	Y	N	
22481	BPGV23638			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22483	BPGV23640			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22484	BPGV23641			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22489	BPGV23646			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22490	BPGV23647			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22471	BPGV23628			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22472	BPGV23629			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22473	BPGV23630			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22474	BPGV23631			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22475	BPGV23632			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22476	BPGV23633			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22478	BPGV23635			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	
22488	BPGV23637			Zea mays	Miho	Portugal, Agres	BPGV	Y	N	

de 1472

Data Editing Edit Data Save Data Cancel Refresh Data

Showing rows 1472 of 1472

Connected to: http://10.200.200.10/GRINGlobal/GUI.aspx




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Efetio do "Method"


  

Acesso	Ano de Caracterização	Acesso	Ano de Caracterização
BPGV00376	1984	BPGV23648	2014
<b>Descritores</b> Sowing date Emergence date Plant height Ear height Top node height Total nº of nodes Leaf length Leaf width Days to tasseling Days to silking Maturation Tassel length 25 - Tassel Peduncle Length Branches tassel rating Tassel colour primary Tassel colour secondary Anther colour primary Prolificacy index Ear length Diameter of the tip of de ear Diameter of the base of de ear Diameter central of Cob Diameter of the Rachis Diameter of the Pith Kernel rows per ear Kernels Per Row kernel per ear Kernel type primary Endosperm Colour Primary Kernel colour Primary 60 - Waxiness 1000 - kernel weight Usage may be		<b>Descritores</b> Sowing date Emergence date Plant height Ear height Root lodging Stalk lodging Leaf length Leaf width Number of leaves above Days to tasseling Days to silking Maturation Tassel type Ear damage Ear husk cover Shape of uppermost ear Ear length Diameter central of ear kernel rows per ear Kernel length Kernel Width Kernel type primary Kernel type secondary Kernel type tertiary Kernel colour Primary 1000 - kernel weight 36 Traits	

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Descritores

Descritor	Unidade de medição	Abreviações
<b>Days until emergence</b>	<b>nº</b>	<b>DUE</b>
Plant height	cm	PLH
Ear height	cm	ERH
Top node height	cm	TNH
Total nº of nodes	nº	TNN
Leaf length	cm	LFL
Leaf width	cm	LFW
<b>Leaf area</b>	<b>cm2</b>	<b>LFA</b>
Number of leaves above	nº	NLA
Number of leaves below	nº	NLB
Total nº of leaves	nº	TNL
Days to tasseling (male flowering)	nº	DTT
Days to silking (female flowering)	nº	DTS
<b>Anthesis to silking interval (ASI)</b>	<b>nº</b>	<b>ASI</b>
<b>Maturation</b>	<b>nº</b>	<b>MAT</b>
Tassel length	cm	TAL
Tassel Peduncle Length	cm	TPL
Fertility index (ears per plant)	nº	PLI
Ear length	cm	ERL
Diameter tip of the ear	cm	DTE
Diameter base of the ear	cm	DBE
<b>Conicalness (ear shape)</b>	<b>*</b>	<b>CON</b>
Diameter of the Cob Tip	cm	DCT
Diameter of the Cob base	cm	DCB
Diameter of the Rachis	cm	DRI
Diameter of the Pith	cm	DPT
Kernel rows per ear	nº	KRE
Kernels Per Row	nº	KPR
Kernels Per ear	nº	KPE
Kernel length	mm	KEL
Kernel Width	mm	KEW
Kernel thickness	mm	KET
1000-kernel weight	g	TKW
<b>Kernels per plant</b>	<b>nº</b>	<b>KPP</b>
<b>Predicted grain yield per plant</b>	<b>g</b>	<b>GYP</b>
Elevation	m	ELV

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Estatística descritiva


Descritores	Coleção					Amostra				
	Média	σ	Amplitude		CV (%)	Média	σ	Amplitude		CV (%)
			Max	Min				Max	Min	
PLH	211.76	43.61	355.00	86.30	20.60%	208.02	39.69	213.00	92.00	19.08%
ERH	95.96	32.73	245.00	11.00	34.33%	91.68	31.37	233.00	11.00	34.21%
TNH	169.85	38.66	300.00	22.00	22.70%	160.99	35.71	282.00	66.00	22.18%
TNN	10.06	1.74	18.00	4.00	17.27%	9.64	1.55	13.00	4.00	16.05%
LFL	77.24	11.78	114.90	34.00	15.25%	77.32	10.81	112.00	34.00	13.98%
LFW	8.89	1.37	17.00	4.20	15.39%	8.98	1.20	12.00	5.00	13.31%
NLA	4.53	0.78	7.00	2.90	17.14%	4.44	0.69	7.00	2.90	15.51%
NLB	5.76	1.40	11.00	2.00	24.26%	5.72	1.24	9.40	2.00	21.68%
<b>MAT</b>	<b>130.84</b>	<b>12.73</b>	<b>175.00</b>	<b>93.00</b>	<b>9.73%</b>	<b>131.11</b>	<b>10.94</b>	<b>166.00</b>	<b>93.00</b>	<b>8.34%</b>
DTT	64.19	8.55	91.00	44.00	13.32%	64.04	7.98	89.00	44.00	12.46%
DTS	65.68	8.66	93.00	44.00	13.03%	65.22	8.13	91.00	44.00	12.47%
TAL	35.10	5.26	50.00	12.00	14.99%	34.69	5.30	48.00	12.00	15.29%
TPL	9.95	3.95	29.80	2.00	39.73%	10.46	5.52	30.00	2.00	52.83%
PLI	1.81	0.51	5.40	1.00	28.27%	1.76	0.58	5.40	1.00	32.72%
ERL	15.06	4.69	130.00	7.00	31.12%	14.96	2.14	22.00	7.00	14.31%
DTE	3.44	0.49	5.22	2.00	14.37%	3.53	0.48	5.11	2.00	13.61%
DBE	4.19	0.55	6.00	2.40	13.12%	4.19	0.52	6.00	2.60	12.51%
DCT	2.16	0.41	4.10	1.00	19.19%	2.20	0.39	3.87	1.20	17.94%
DCB	2.82	0.47	4.50	1.50	16.57%	2.78	0.45	4.50	1.50	16.15%
DRI	2.07	0.41	4.00	1.00	19.98%	2.10	0.38	4.00	1.10	18.30%
DPT	1.15	0.41	10.30	0.34	35.23%	1.16	0.29	2.30	0.59	24.83%
KRE	13.04	2.45	36.00	8.00	18.75%	13.39	2.69	36.00	8.00	20.07%
KPR	27.68	4.88	50.00	12.00	17.63%	27.18	4.62	50.00	12.00	16.98%
KEL	9.07	1.10	20.00	3.00	13.22%	9.14	0.96	11.40	3.00	10.54%
KEW	8.81	1.42	15.00	3.00	16.15%	8.77	1.31	12.50	3.00	14.96%
KET	4.49	0.99	11.00	1.50	22.06%	4.69	0.75	7.00	3.00	16.09%
TKW	294.99	75.06	655.00	106.00	25.44%	302.50	60.77	525.00	112.00	20.09%
ELV	<b>361.93</b>	<b>274.98</b>	<b>1150.00</b>	<b>5.00</b>	<b>75.98%</b>	<b>404.24</b>	<b>268.46</b>	<b>1150.00</b>	<b>5.00</b>	<b>66.41%</b>



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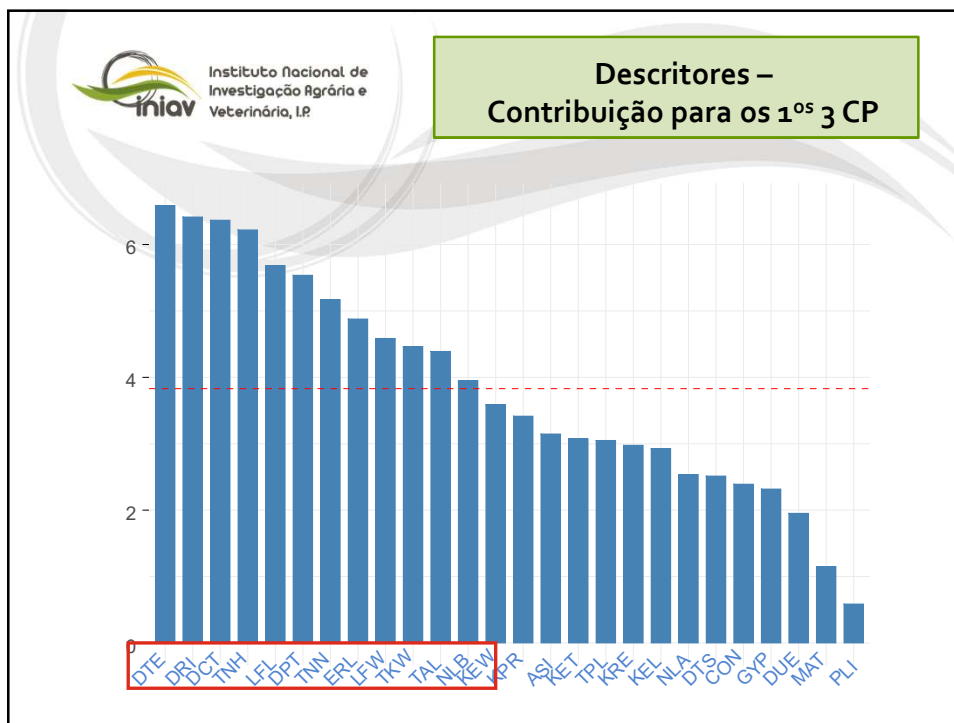
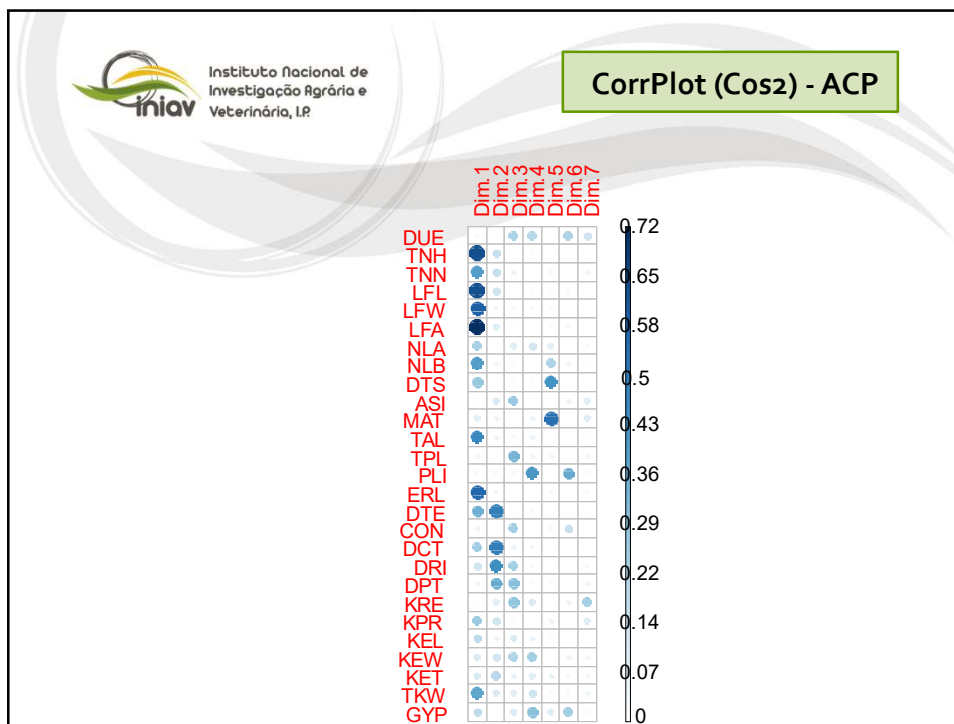
### Descritores selecionados

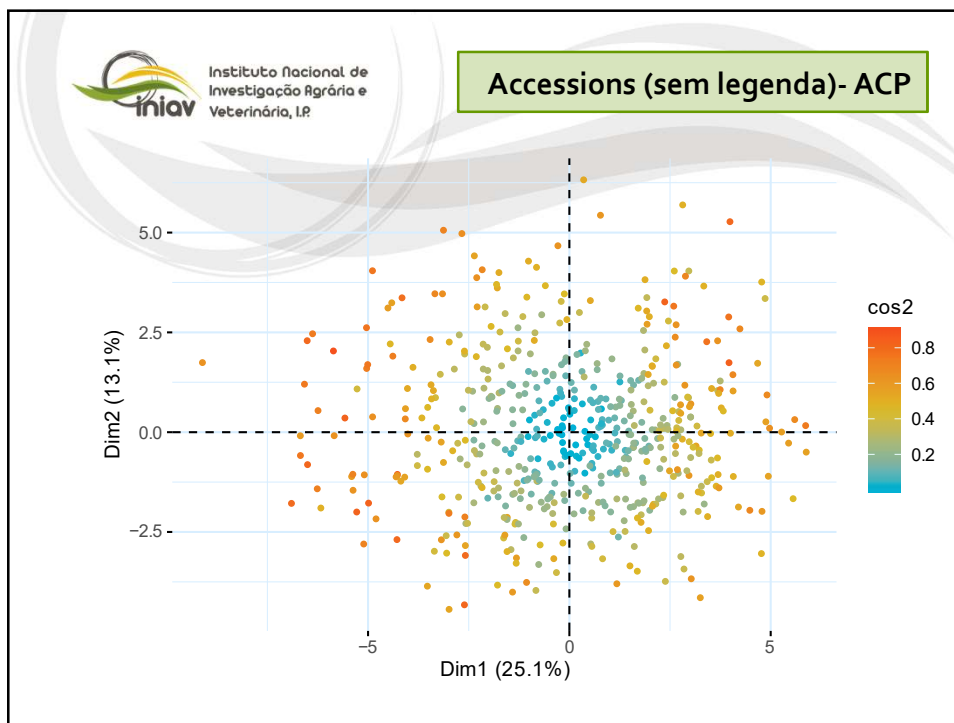
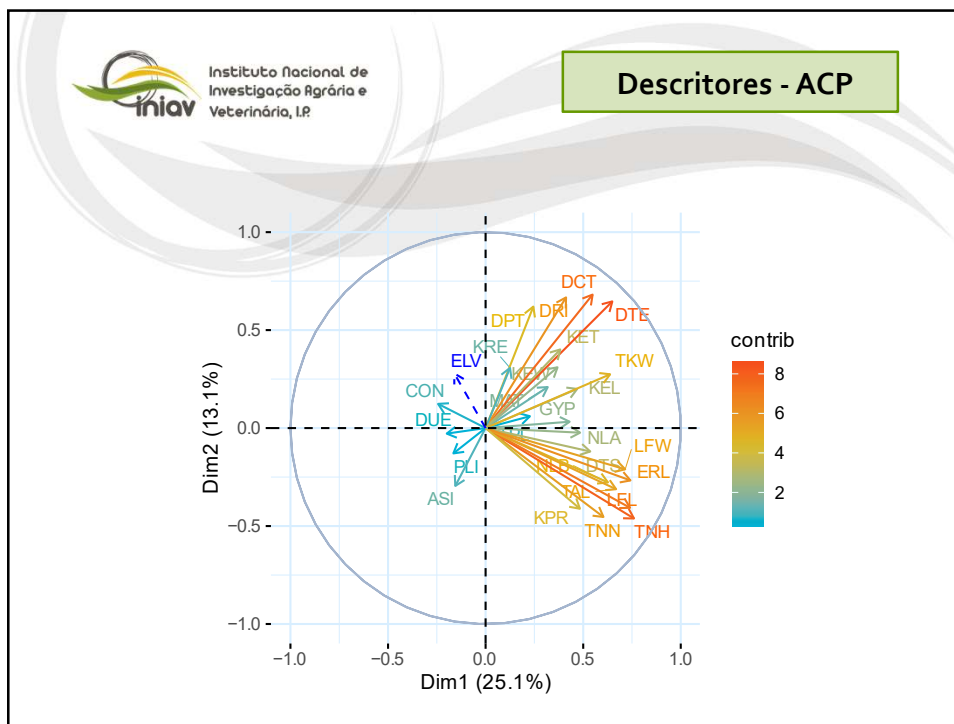
Descritor	Unidades de medição	Abreviações
Days until emergence	nº	DUR
Plant height	cm	PLH
Ear height	cm	ERH
Top node height	cm	TNH
Total nº of nodes	nº	TNN
Leaf length	cm	LFL
Leaf width	cm	LFW
Leaf area	cm2	LFA
Number of leaves above	nº	NLA
Number of leaves below	nº	NLB
Total nº of leaves	nº	TNL
Days to tasseling (male flowering)	nº	DTT
Days to silking (female flowering)	nº	DTS
Anthesis to silking interval (ASI)	nº	ASI
Maturation	nº	MAT
Tassel length	cm	TAL
Tassel Peduncle Length	cm	TPL
Prolificacy index (ears per plant)	nº	PLI
Ear length	cm	ERL
Diameter tip of the ear	cm	DTE
Diameter base of the ear	cm	DBE
Conicalness (ear shape)	*	CON
Diameter of the Cob tip	cm	DCT
Diameter of the Cob base	cm	DCB
Diameter of the Rachis	cm	DRI
Diameter of the Pith	cm	DPT
Kernel rows per ear	nº	KRE
Kernels Per Row	nº	KPR
Kernels Per ear	nº	KPE
Kernel length	mm	KEL
Kernel Width	mm	KEW
Kernel thickness	mm	KET
1000-kernel weight	g	TKW
Kernels per plant	nº	KPP
Predicted grain yield per plant	g	GYP
Elevation	m	ELV

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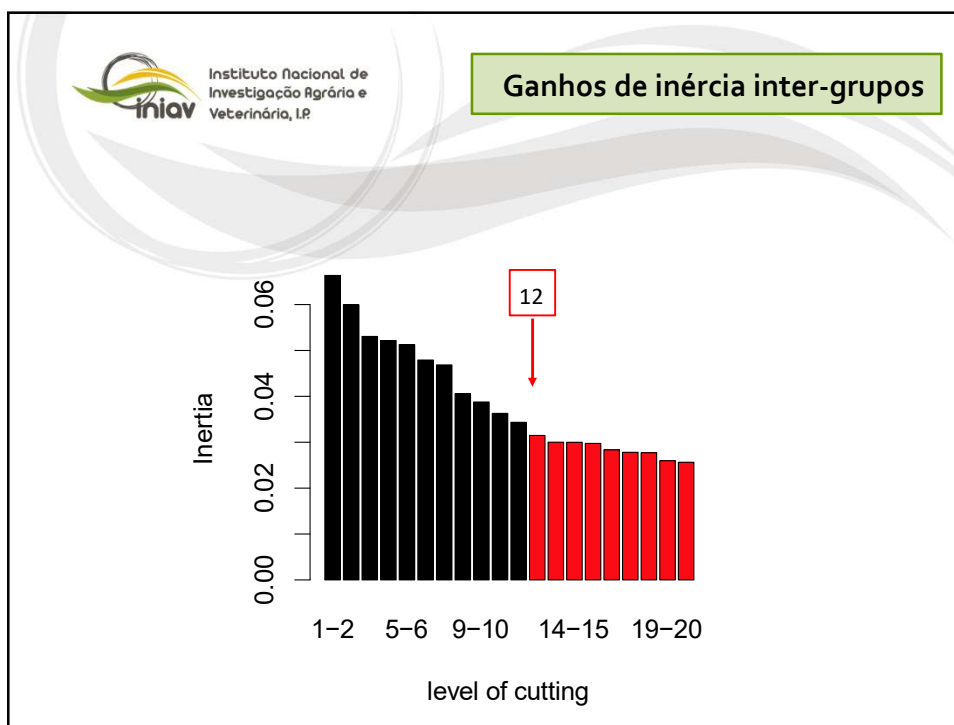
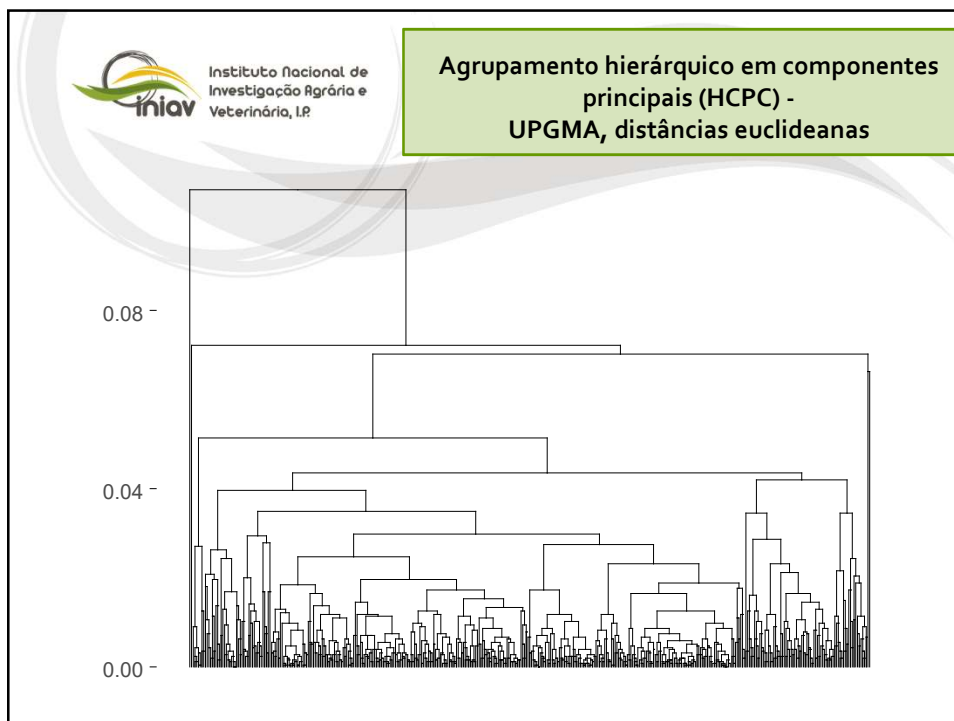
### Eigenvalues- ACP

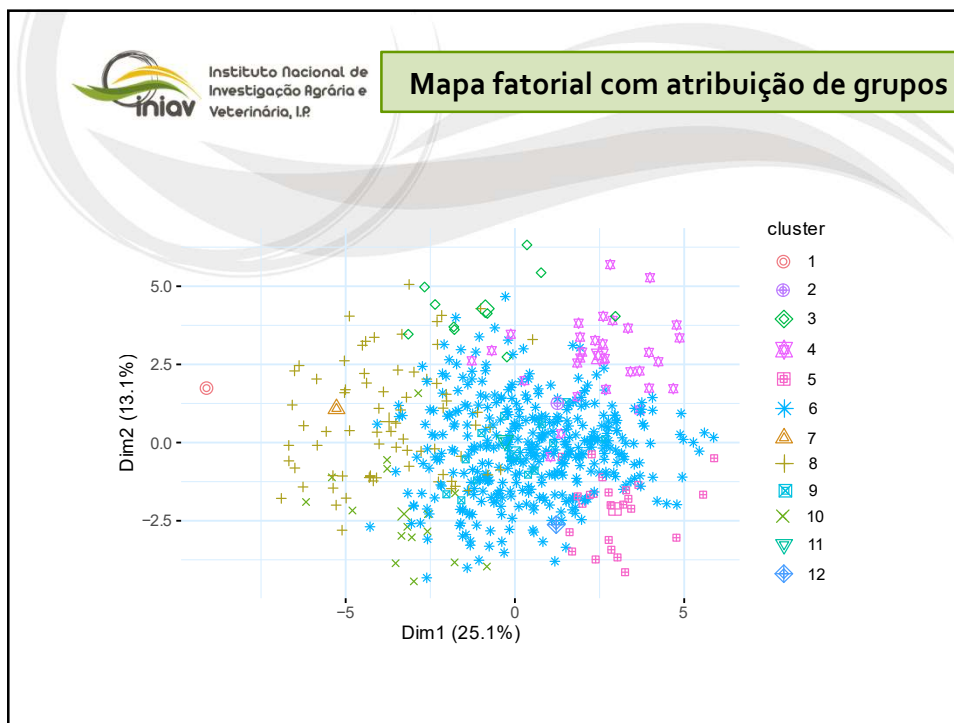
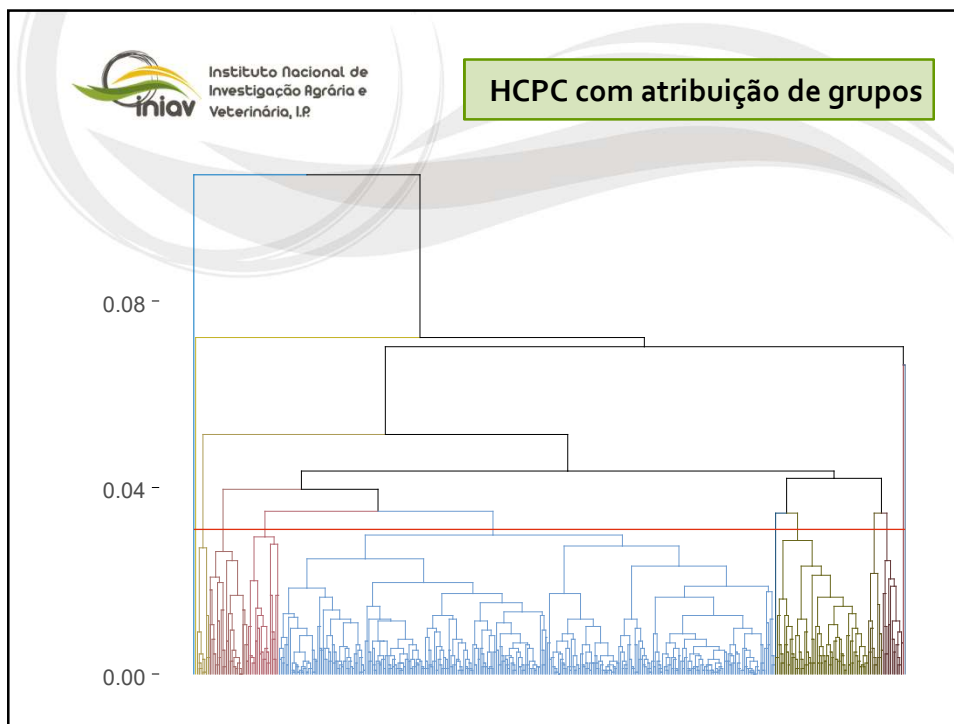
Componentes principais	Eigenvalue	Porcentagem de variância	Porcentagem acumulada de variância
PC 1	7.19	26.63	26.63
PC 2	3.51	13.00	39.63
PC 3	2.85	10.57	50.20
PC 4	2.08	7.70	57.89
PC 5	1.76	6.53	64.42
PC 6	1.39	5.16	69.58
PC 7	1.10	4.08	73.66
PC 8	0.90	3.32	76.98
PC 9	0.76	2.81	79.79
PC 10	0.69	2.56	82.35
PC 11	0.62	2.29	84.64
PC 12	0.59	2.19	86.83
PC 13	0.51	1.89	88.72
PC 14	0.44	1.64	90.35
PC 15	0.39	1.45	91.80
PC 16	0.35	1.30	93.10
PC 17	0.29	1.07	94.18
PC 18	0.27	1.00	95.17
PC 19	0.27	0.99	96.16
PC 20	0.24	0.88	97.04
PC 21	0.22	0.80	97.83
PC 22	0.18	0.66	98.49
PC 23	0.15	0.55	99.05
PC 24	0.13	0.48	99.53
PC 25	0.09	0.34	99.87
PC 26	0.03	0.12	99.98
PC 27	0.00	0.02	100.00

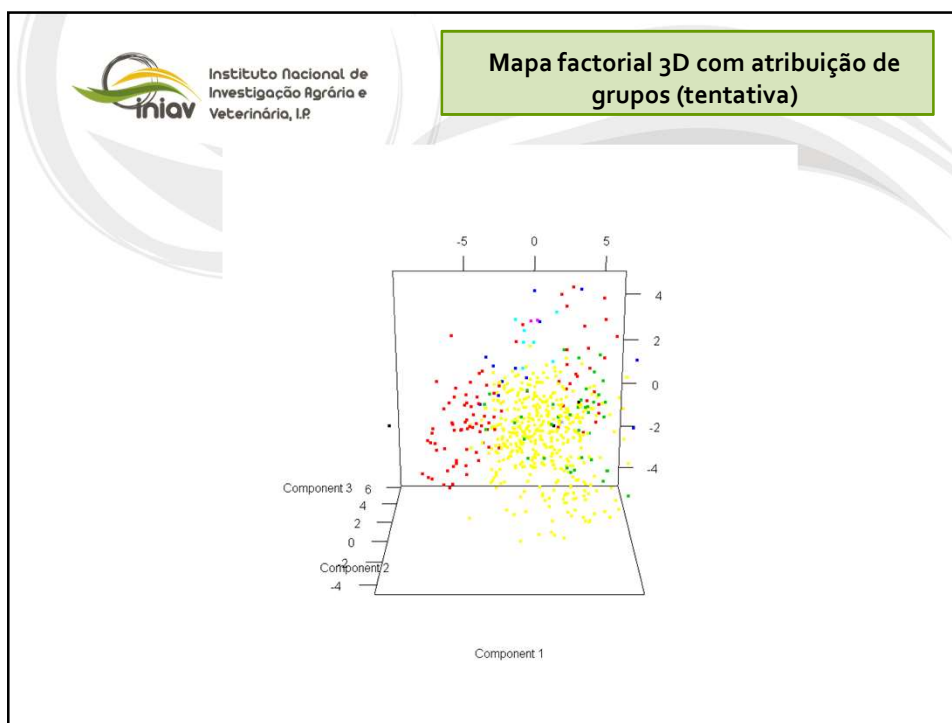











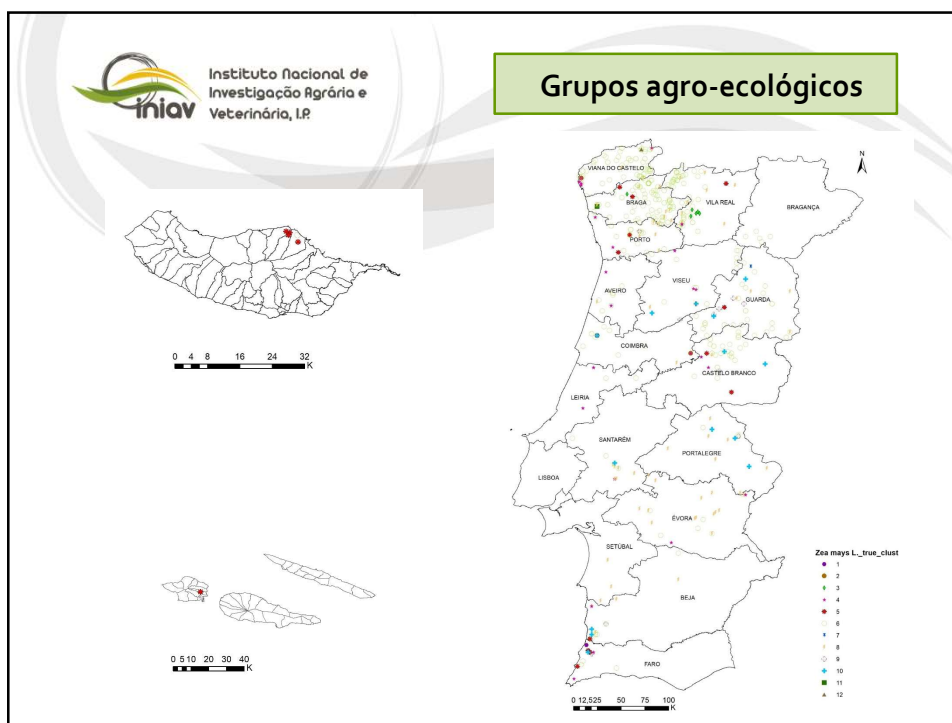


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**Grupos agro-ecológicos**

Grupos	N	Grupos agro-ecológicos
1	1	**
2	1	**
3	10	Short and thick eared high altitude flint*
4	31	High yield low altitude flints*
5	24	Southern early long eared flints
6	395	Northern Flints
7	1	**
8	73	Southern small eared short flints
9	12	Small kernel high conicity flints
10	16	Southern flinty popcorn
11	1	**
12	1	**

\*Presence of fasciation  
\*\* Out-of-type groups



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### Acessos representativos dos grupos

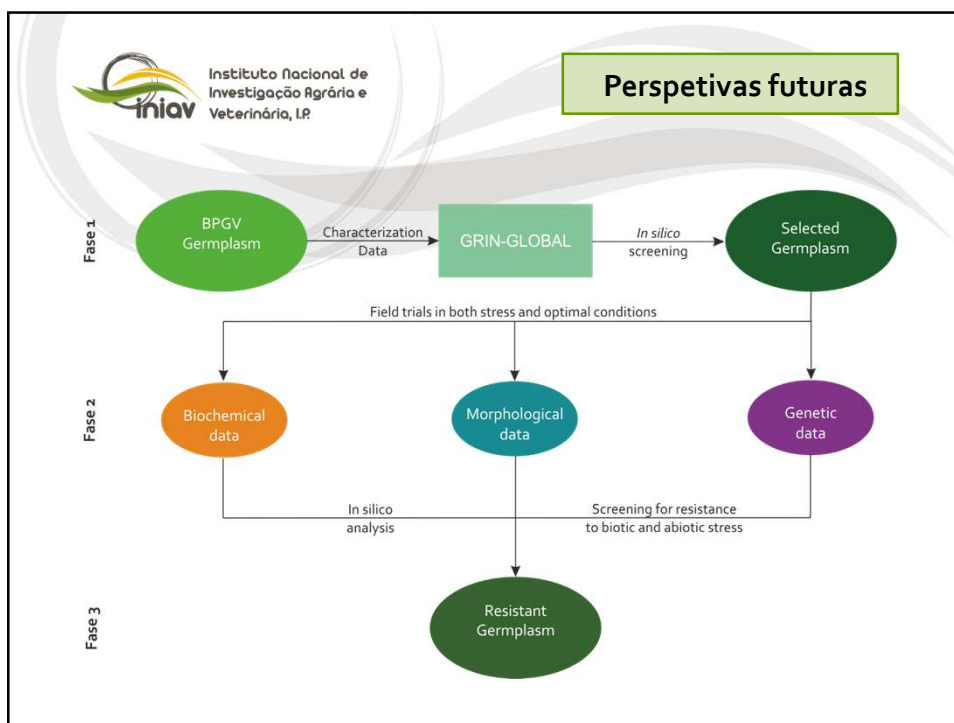
Grupo	N	Acesso
1	1	00638
2	1	08721
3	10	03064; 03585; 03588; 03065; 03068
4	31	02609; 02614; 02615; 00375; 01240
5	24	00614; 00644; 01906; 00616; 00624
6	395	01010; 00107; 06525; 07041; 05188
7	1	00712
8	73	00828; 01050; 00835; 00340; 01447
9	12	00669; 00729; 00672; 00665; 00666
10	16	01009; 00813; 00742; 00674; 00675
11	1	01222
12	1	08796



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## Conclusões

- ➔ Existe uma vasta variabilidade inexplorada na coleção de milho portuguesa, sendo esta pela 1ª vez descrita com o número de indivíduos e detalhe utilizado;
- ➔ Usando uma abordagem inovadora, foi possível identificar os descritores utilizados na caracterização morfológica de acessos de *Zea Mays* L. que contribuem de forma significativa para a distinção e variação entre os mesmos;
- ➔ Classificou-se uma amostra da coleção portuguesa de variedades de milho regional em doze grupos agro-ecológicos distintos, tendo estes grupos sido descritos relativamente às características dos acessos que os compõem;
- ➔ Estes dados irão permitir selecionar germoplasma com características associadas a resistência aos stresses abióticos provocados pelas alterações climáticas, através da escolha de indivíduos modelo de grupos agro-ecológicos de interesse.



**Agradecimentos**

- Eng<sup>a</sup> Ana Maria Barata
- Eng<sup>a</sup> Violeta Lopes
- Eng<sup>e</sup> FDR 2020 PROGRAMA DE DESENVOLVIMENTO RURAL 2014-2020
- Equipa BPGV
- Instituições parceiras do projeto CAEA-AGRI: ANPROMIS, ANSEME and COTHN

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