RACIAL CLASSIFICATION OF BORDERLAND BLUE CORN LANDRACES

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Introduction

Blue corn (*Zea mays* L.) landraces are historically and culturally important in the Borderland region of the southwestern USA. Relatedness among landraces within a region can not be understood until representative accessions are characterized by examining phenotypic or genotypic traits.

Objectives

- Characterize the agronomic, morphological and genotypic diversity of blue corn landraces from Borderland region of the southwestern USA.

Materials & Methods

- Evaluated eight accessions (landraces) at two locations in New Mexico

- A total of 46 morphological traits were evaluated at pre and post-harvest stages.
  - Kernel compositional traits (oil, protein, total fatty acids, starch and anthocyanin) were analyzed at Experiment Station Chemical Laboratory, University of Missouri.

Principle Component Analysis (PCA):

- Phenotypic diversity was analyzed using MetaboAnalyst 3.0 Software (Xia et al., 2009 & 2012).
- Different morphological and biochemical traits were included.

Results

Table 1. ANOVA for Pre-Harvest Traits (2014)

Source	Plant Height	Ear Height	# of Tillers	Secondary Branches	Primary Ear/Node	# of Nodes
Los Lunas	0.34	0.23	1.28	0.93	0.45	0.82
Alcalde	10.9***	2.45	3.33*	4.46**	1.48	1.96
Across Locations						
Accessions	1.77	1.0	1.80	1.32	0.46	0.82
Location	71.2***	19.3***	11.3***	15.7***	25.9***	41.4***
A*L Interaction	1.54	0.82	1.96	1.40	1.18	1.49

Table 2. ANOVA for Post-Harvest Ear Traits (2014)

Source	Ear Length	Ear Diameter	# of Husk leaves	Cob Diameter	ED/ CD	Kernel Rows/Ear
Los Lunas	1.70	6.15*	0.79	2.90**	1.56	2.41
Alcalde	3.52*	3.08**	1.72	1.16	4.48**	6.78***
Across Locations						
Accessions	2.43**	0.69	2.15	2.67**	0.91	1.64
Location	0.40	0.05	12.3***	10.72**	0.07	1.29
A*L Inter.	1.30	1.15	0.50	1.14	1.18	2.76**

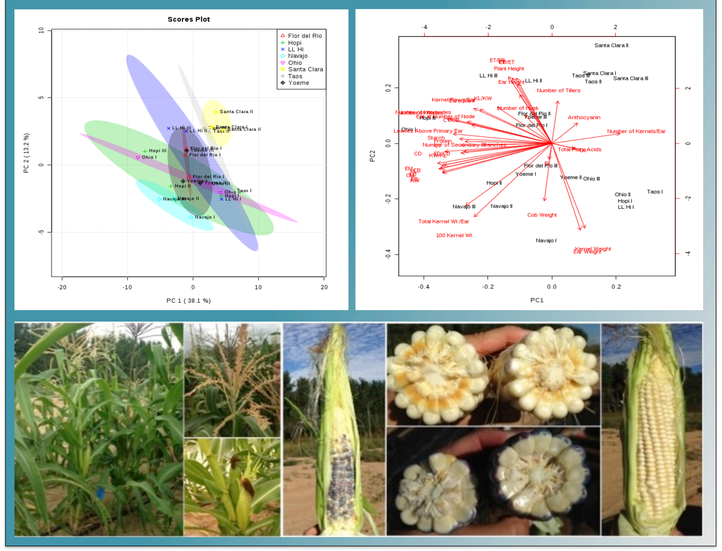
Table 3. ANOVA for Post-Harvest Kernel Traits (2014)

Source	Kernel Length	Kernel Diameter	KL/ KW	Kernel wt.	100-Kernel wt.	Grain Yield
Los Lunas	2.38	2.48	2.84**	3.74**	4.28***	1.96
Alcalde	1.97	5.39**	2.08	3.60**	3.27***	1.85
Across Locations						
Accession	3.85**	5.22***	1.04	6.03**	6.63***	1.33
Location	0.24	3.74	3.93**	2.14	1.83	17.35***
L*A Inter.	0.52	0.85	0.22	1.35	1.39	2.71*

Table 4. Mean Values of Kernel Compositional Traits (2014)

Accession	Oil (%)	Protein (%)	Fatty Acids (%)	Starch (%)	Anthocyanin (mg/100g)
Navajo	4.8	9.9	4.59	57.3	59.2
Santa Clara	5.9	10.3	5.69	57.4	63.5
LL Hi	5.8	9.3	5.62	57.5	55.8
Flor del RIo	4.4	10.6	4.26	57.3	36.5
Yoeme	5.9	10.5	5.72	54.1	55.7
Ohio	5.0	10.1	4.86	59.4	57.7
Hopi	5.8	9.9	5.54	57.3	60.8
Taos	6.3	9.3	6.05	59.3	54.2

Fig. 1. Principle Component Analysis



Conclusions

- Pre- and post-harvest traits were fairly consistent within individual locations and across all locations.
- Pre-harvest traits are less variable than post-harvest traits.
- In pre-harvest traits, kernel traits are more variable than ear traits.
- PCA results do not show any separation between Corn Belt 'Ohio Blue' and other southwestern landraces.
- All southwestern landraces are closely related except Navajo and Santa Clara Blue.

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