BREEDING OF VARIETES OF QUINOA (*Chenopodium quinoa* Willd.) FOR COLD WEATHER AND DROUGHT BY HIBRIDIZATION OF GENETICALLY DISTANT PARENT AND SUBCEQUENT SELFING.

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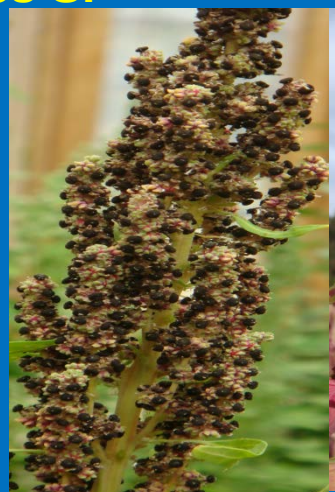

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INTRODUCTION

The Peruvian-Bolivian plateaus being the center of origin and domestication of quinoa, besides showing greater diversity and variability, is permanently exposed to prolonged droughts and strong frosts during its development, for that reason it requires new varieties that besides resisting these adverse climatic factors, must have outstanding agronomic characteristics of increased yield and grain size, tolerance to diseases and ideotype desired by the farmers, which can be obtained by hybridization, crossing genetically distant parents with different qualities of high productive efficiency and greater profitability. The different agro-adoclimatic conditions of Perú using genetic markers, indexes of genetic distances and successive self-fertilizations.

MATERIALS AND METHODS

Used Genitors

1. Salcedo- INIA
2. Huariponcho
3. Choclito
4. Pasankalla
5. Chullpi rojo
6. Negra collana
7. Kcancolla
8. Pandela rosada

Methodology

Crosses single (28) and double (6) were used, using 8 outstanding genders to obtain progenies, with the genetic markers the rates of genetic similarity and genetic distances were determined, using the proposed hybridization technique (Mujica *et al*., 2013). The progenies have been self-fertilized in Puno and Arequipa as an alternative to the S5 generation, with the aim of gaining homozygosity in the inherited characters, and then making the selection in different environments and based on proposed selection characters.











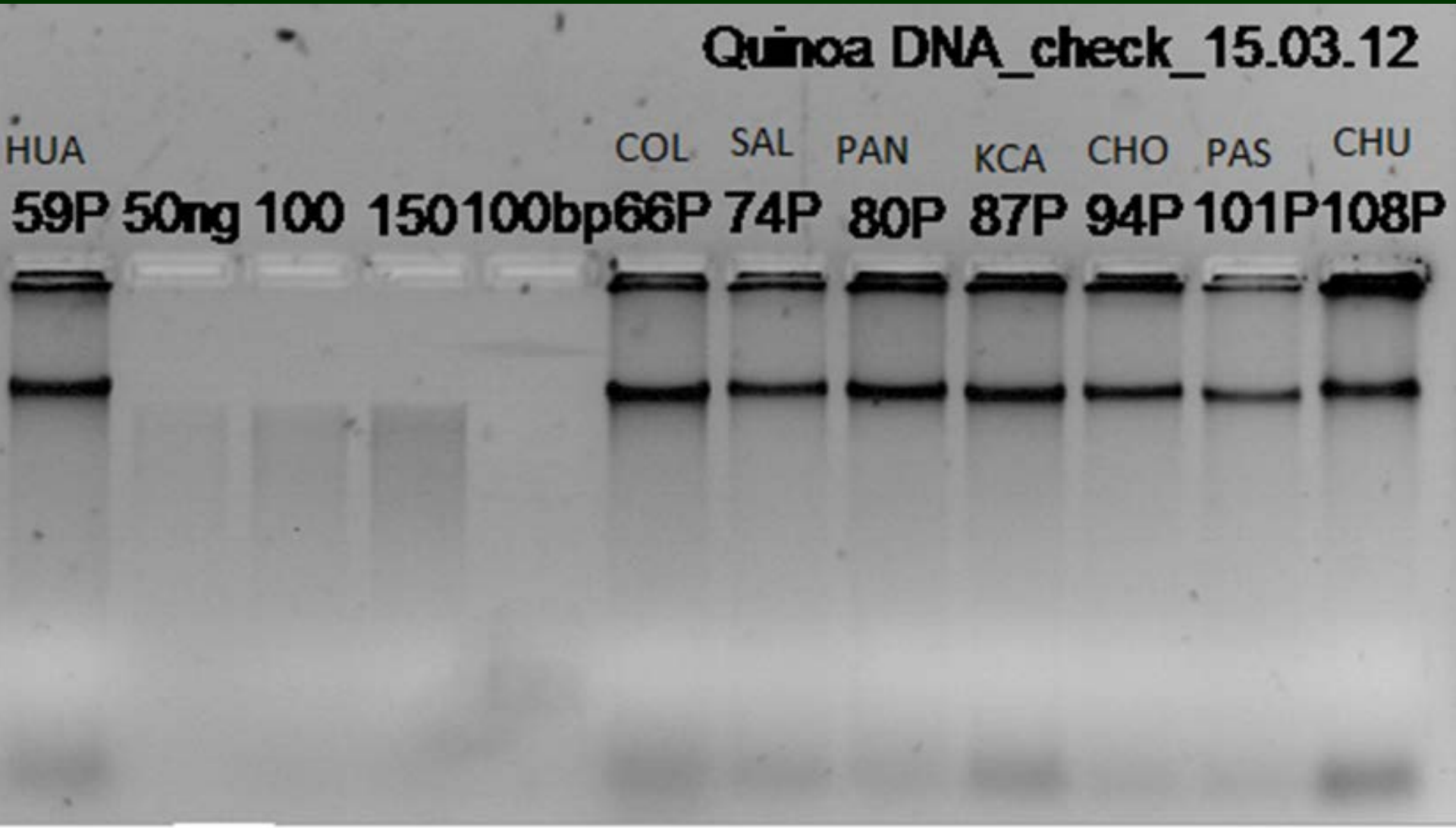


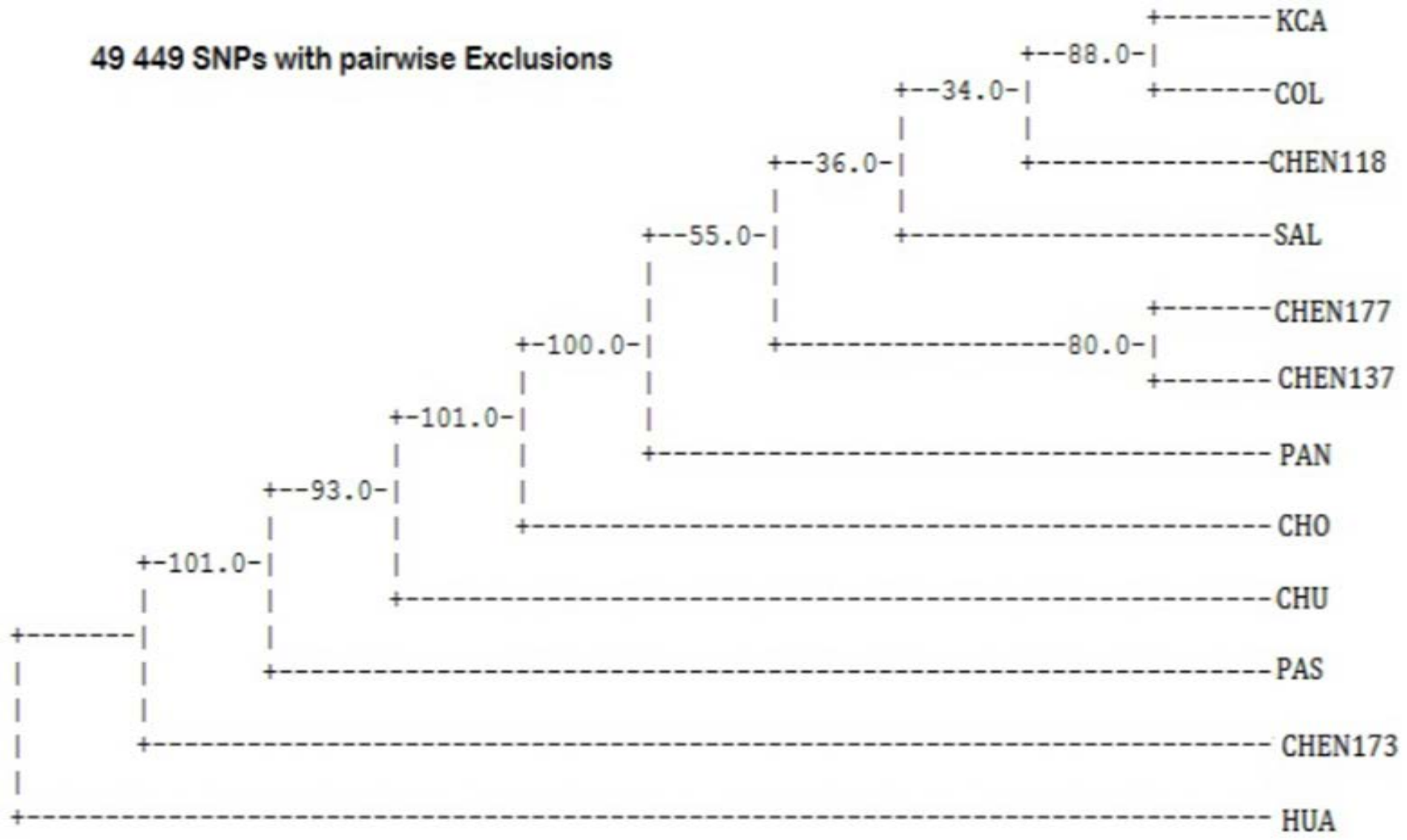


VARIETIES SEED OF QUINOA

VARIETIES OF QUINOA

MOLECULAR CHARACTERIZATION





Genetics distances of the quinoa varieties

Materials uses in the cross

Methodology used for hibridization(Mujica *et al*., 2012)


5 stamens
5 stamens
5 stamens
5 stamens

Seed obtained

Single crosses among distant and closes parents genetically (28 CROCESS SIMPLES)

SAL HUA CHO CHU PAS COL PAN

1x2 – 2x3 – 3x4 – 4x5 – 5x6 – 6x7 – 7x8

1x3 – 2x4 – 3x5 – 4x6 – 5x7 – 6x8

1x4 – 2x5 – 3x6 – 4x7 – 5x8

1x5 – 2x6 – 3x7 – 4x8

1x6 – 2x7 – 3x8

1x7 – 2x8

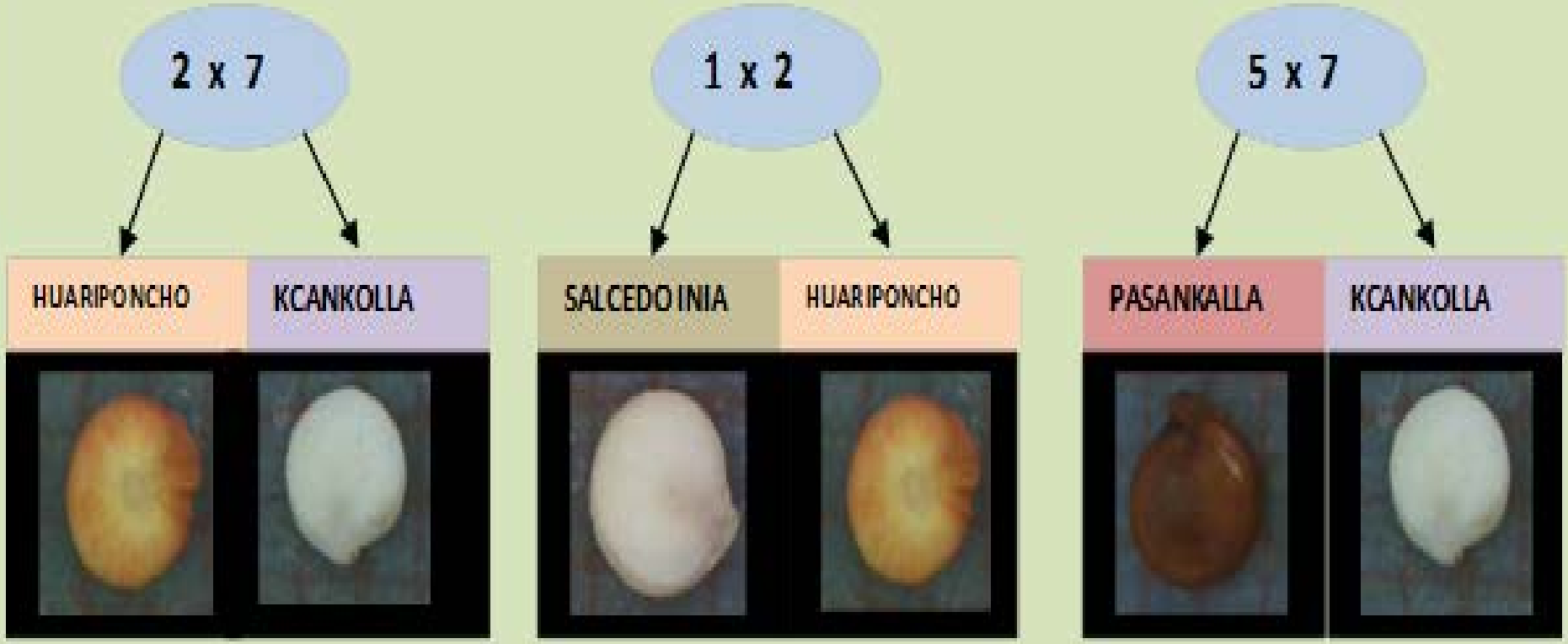
1x8

D Genetically distant Varietes.

C Genetically close Varietes.

1. Salcedo-INIA (SAL)
2. Huariponcho (HUA)
3. Choclito (CHO)
4. Chullpi Rojo (CHU)
5. Pasankalla (PAS)
6. Negra Collana (COL)
7. Kcancolla (KCA)
8. Pandela Rosada (PAN)

Single crosses genetically distant



HYBRID DISTANT HUARIPONCHO x KANCOLLA

HYBRID DISTANT SALCEDO-INIA X HUARIPONCHO

HYBRID DISTANT PASANKALLA X KANCOLLA

Self- fertilizations S0- Greenhouse- Puno- 2012


Self-fertilizations S1 Greehouse Arequipa- 2012


Self-fertilizations S2. E.E.Camacani- Puno- 2013.


Universidad Nacional del Altiplano
Proyecto: Mejoramiento Genético de Quinua
KWS-UNA-UHOH-CAMARA ALEMANA
AUTOFECUNDACIONES (F.S: 8.10.12)
DISTANTES
KCANCOLLA (KCA) X HUARIPONCHO (HUA)
SALCEDO INIA (SAL) X HUARIPONCHO (PAN)
PASANKALLA (PAS) X KCANCOLLA (KCA)


Universidad Nacional del Altiplano
Proyecto: Mejoramiento Genético de Quinua
KWS-UNA-UHOH-CAMARA ALEMANA
AUTOFECUNDACIONES (F.S: 8.10.12)
CERCANAS
XCANCOLLA (KCA) X NEGRA COLLANA (COL)
SALCEDO INIA (SAL) X PANDELA (PAN)
SALCEDO INIA (SAL) X NEGRA COLLANA (COL)

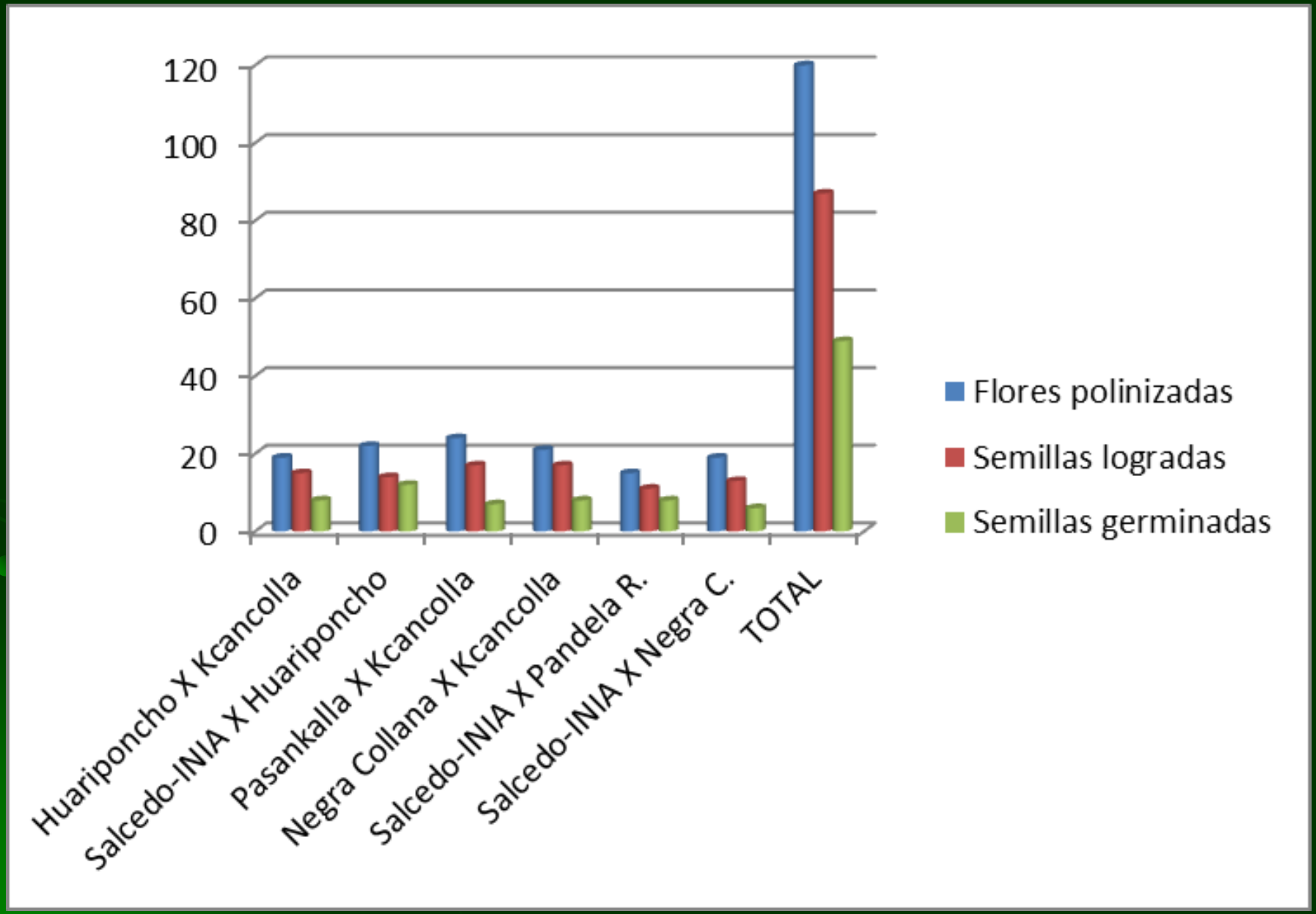

Self-fertilizations S3- Sabandía, Arequipa, 2013




Self-fertilizations S4- Characato, Arequipa- 2014


Self-fertilizations S5- Camacani, Puno- 2015

Flawers polinizations, Seed obtained and seed germinations of crosses single of quinoa



SELECTION FEATURES

- Yield
- Resistance to cold
- Drought resistance
- Grain size
- Precocity
- Ideotype of plant
- Mildiw resistance
- Resistance to kona kona

Selection 20%

Table 1. Yield (g/panicle) for selected and upper lines of the cross simple distant quinoa (*Chenopodium quinoa* Willd.) Huariponcho by Kancolla.

Simple crosses distant	N°Lines S5 obtained	N°Lines selec.	Identificatión líneas selec.	Yield (g/panj) average lines selec.	Yield (g/panj) average 3 upper lines	Yield (g/panj) upper lines 1	Yield (g/panj) upper lines 2	Yield (g/panj) upper lines 3
Hua x Kca	1960	392	**HUAxKCA190**	**19.02**	**21.06**	**HxK190.1 21.68**	HxK190.7 21.02	HxK190.5 20.48
			HUAxKCA95	18.97	20.82	HxK95.2 21.11	HxK95.4 20.77	HxK95.9 20.57
			HUAxKCA38	18.72	21.92	HxK38.5 21.94	HxK38.1 21.91	HxK38.2 21.91
			HUAxKCA22	18.70	21.21	HxK22.6 21.31	HxK22.9 21.23	HxK22.8 21.09

Table 2. Yield (g/panicle) for selected and upper lines of the cross simple distant quinoa (*Chenopodium quinoa* Willd.) Salcedo x Huariponcho.

Simple crosses distant	N° lines obtained.	N°Líneas selec.	Identification líneas selec.	Yield (g/panj) average line select.	Yield (g/panj) average 3 upper líneas	Yield (g/panj) upper lines 1	Yield (g/panj) upper lines 2	Yield (g/panj) upper lines 3
Sal x Hua	1960	392	**Sal x Hua184**	**19.36**	**21.08**	**SxH184.5 21.43**	SxH184.4 21.30	SxH184.2 20.51
			Sal x Hua30	19.23	21.54	SxH30.7 21.86	SxH30.1 21.52	SxH30.3 21.23
			Sal x Hua124	19.0	20.77	SxH124.2 21.36	SxH124.5 20.52	SxH124.6 20.44
			Sal x Hua34	18.78	20.75	SxH34.3 21.76	SxH34.5 20.32	SxH34.10 20.17
			Sal x Hua68	18.72	20.89	SxH68.10 21.21	SxH68.72 0.85	SxH68.9 20.62

Table 3. Yield (g/panicle) for selected and upper lines of the cross simple distant quinoa (*Chenopodium quinoa* Willd.) Pasankalla by Kancolla

Simple crosses Distant.	N°Lines S5 obtained	N°Lines selec.	Identification lines selec.	Yield (g/panj) average lines selec.	Yield (g/panj) average 3 upper lines	Yield (g/panj) upper lines 1	Yield (g/panj) upper lines 2	Yield (g/panj) upper lines 3
Pas x Kca	1960	392	**PASxKCA127**	**16.56**	**17.92**	**PxK127.1 17.97**	PxK127.8 17.91	PxK127.4 17.89
			PASxKCA68	16.53	17.81	PxK68.8 17.97	PxK68.2 17.96	PxK68.5 17.51
			PASxKCA165	16.29	17.53	PxK165.1 17.73	PxK165.7 17.55	PxK165.10 17.31
			PASxKCA59	16.25	17.55	PxK59.5 17.95	PxK59.3 17.57	PxK59.7 17.13
			PASxKCA113	16.06	17.35	PxK113.1 17.60	PxK113.3 17.57	PxK113.9 16.87

Researchers participant

END PRESENTATION