SOUTH-NORTH RESEARCH COOPERATION

Reflections on the encounter with the academic culture in Denmark

Carla Colque –Little
PhD Stipendiat

October 29, 2019

UNIVERSITY OF COPENHAGEN

DISPOSITION

A. MY RESEARCH PROJECT

1. INTRODUCTION
2. AIMS
3. MATERIALS AND METHODS
4. RESULTS
5. CONCLUSIONS

B. REFLECTION ON THE ENOCUNTER WITH THE ACADEMIC CULTURE IN DENMARK

1 CONTEXT FOR MY SCHOLARSHIP

SOUTH-NORTH RESEARCH COOPERATION PhD PROJECT ON QUINOA

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Background picture: Orqohuayta-Puno, Peru. March, 2017

Characterization of diseases infecting quinoa *Chenopodium* spp. and search for sources of resistance to Downy mildew (*Peronospora variabilis*)

Carla Colque-Little

1. Introduction

Sand Dunes Chipaya, Oruro-Bolivia

Chisi way mama	quinoa	quinua	inca rice

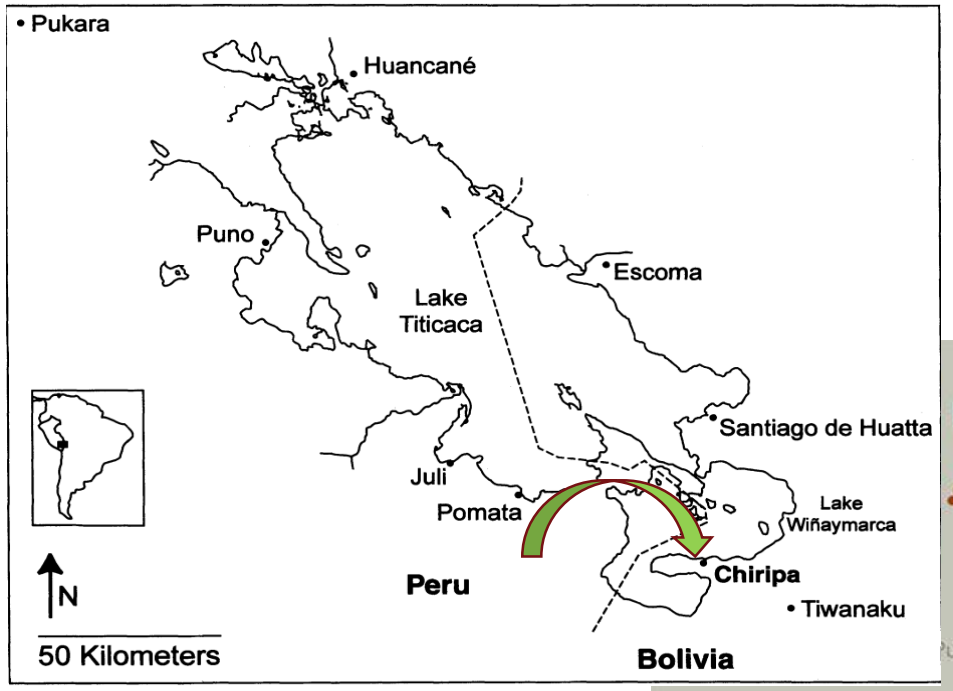


Figure 1 Map of Lake Titicaca Basin (Bruno and Whitehead 2003)

https://historiaperuana.pe/wp-content/uploads/mapa-cultura-tiahuanaco.jpg

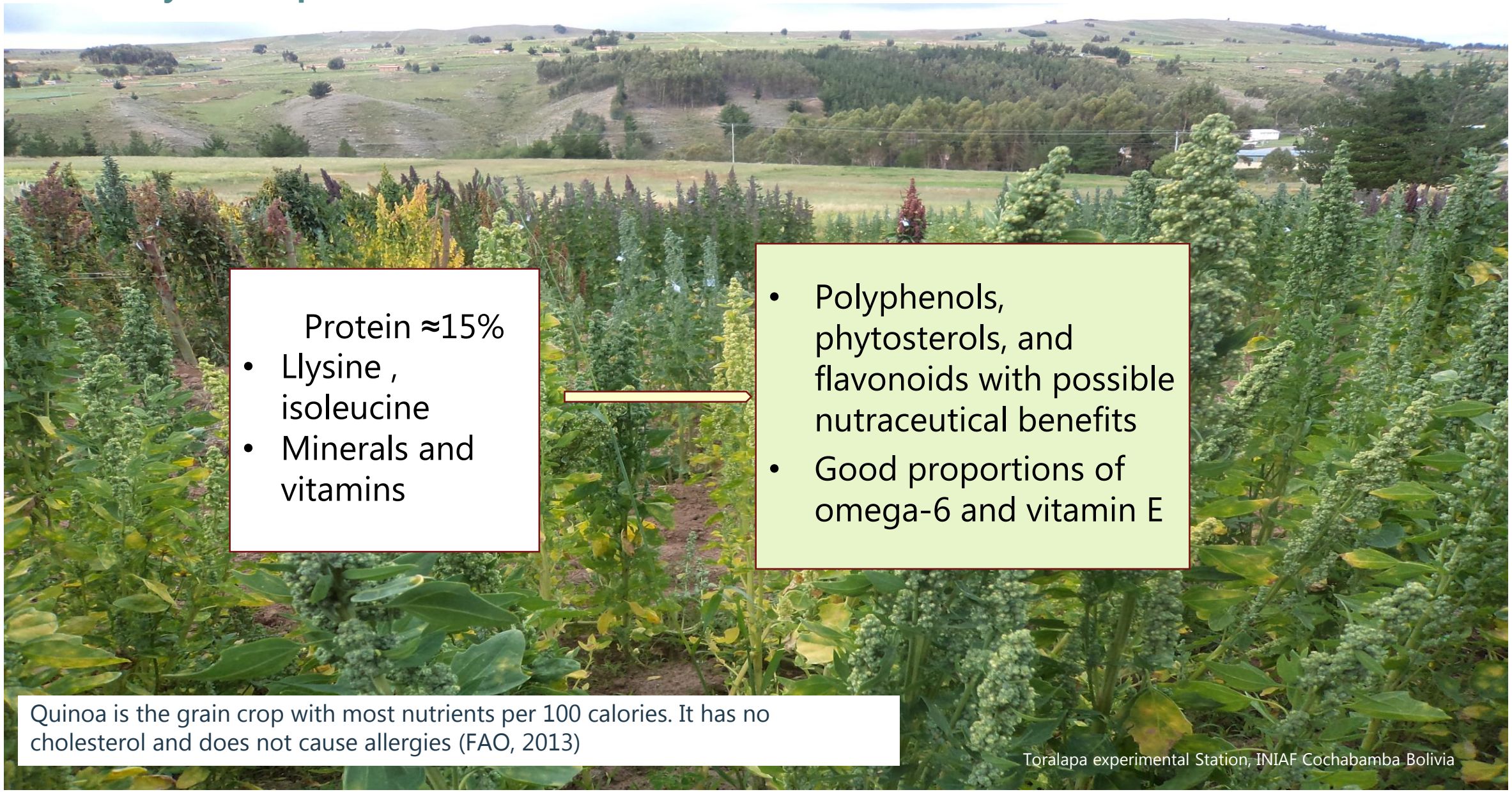
Picture 1. Chiripa Aschelogical site. Bolivia es Turismo. Oct, 2018

- A dycotiledonous herbaceous plant with edible seeds.

  Bbelonging to Order Cariophylialles and Amaranthacea family.

  As a chenopod (goose foot) closely related to beets, chard and spinach

Why an exceptional food?



Protein ≈15%

- Llysine , isoleucine
- Minerals and vitamins

- Polyphenols, phytosterols, and flavonoids with possible nutraceutical benefits
- Good proportions of omega-6 and vitamin E

Quinoa is the grain crop with most nutrients per 100 calories. It has no cholesterol and does not cause allergies (FAO, 2013)

Toralapa experimental Station, INIAF Cochabamba Bolivia

Tahua, Salinas de Garci Mendoza.Oruro, Bolivia (Shores of salt flat)

Resilient crop

Able to survive high altitudes, thin and cold air, hot sun, salty or sandy soil, little rainfall, and sub-freezing temperatures.

Quinoa world expansion

Before 1900		1935-1990		1991-2012		2013-2010
Argentina	7	Canada, Saskatchewan	*8	Austria (1990-)		Algeria
Bolivia	1/2	Cuba		Brazil (1997-2003)		Bhutan
Chile	*6	France, Loire Valley (1978)	8	China (1997-2003)	5	Burkina Faso
Colombia		Kenya (1935)		Czech Republic (1990-)		Cameroon
Ecuador	3	Tibet (1984)		Denmark (1997-2003)	*	Chad
Peru	*2	UK, Cambridge (1978)	*	Germany (1990-)		Djibouti
		USA (Southern Colorado)(1948)	4	India (1997-2003)		Ethiopia
				Italy (1993-		Ghana
				Israel	*	Guinea
				Japan		Iran
				Lebanon		Iraq
				Netherlands (1993-)	*	Kyrgyzstan
				Pakistan (2011)		Mauritania
				Poland (1990-)		Niger
				Spain		Portugal (2008-2012)
				Sweden (1990-)		Senegal
				Turkey (2006-)		Somali
				Australia		South Sudan
				Belgium		Sri Lanka
				Bulgaria		Sudan
				Costa Rica		Syria (2006-)
				Egypt (2006-)		Tajikistan
				Finland		Togo
				Greece (1990-)		Uganda
				Jordan		Yemen
				Laos		Zambia
				Madagascar		Armenia
				Malawi		Bangladesh
				Mali		Beirut
				Morocco (2008-2012)		Benin
				Namibia		Brunei
				Nepal		Congo
				New Zealand		Qatar
				Romania		Kazakhstan
				Russia		Korea
				United Arab Emirates		Latvia
				Venezuela		Liberia
						Lithuania
						Mexico
						Mongolia
						Norway
						Oman
						Rwanda
						Saudi Arabia
						Switzerland
						Thailand
						Tunisia
						Ukraine
						Uruguay
						Uzbekistan

Number of quinoa growing countries timeline and quantity of produce

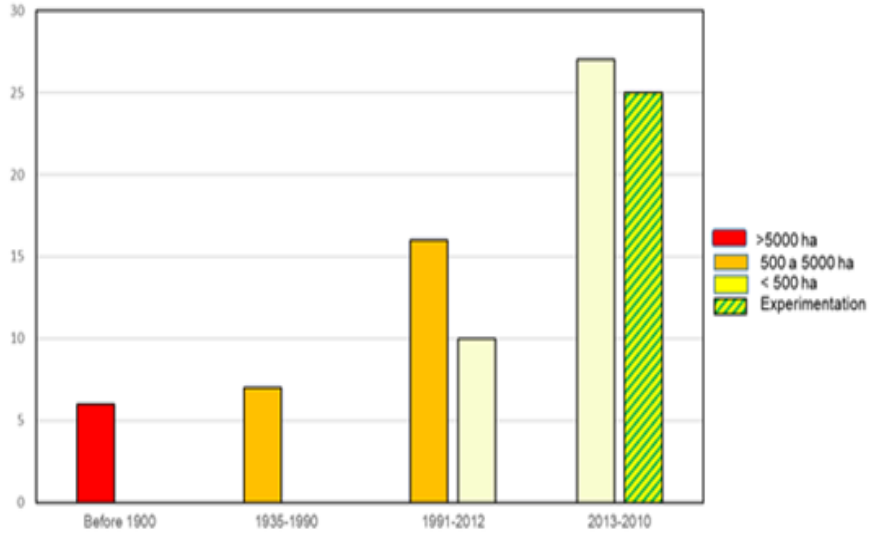
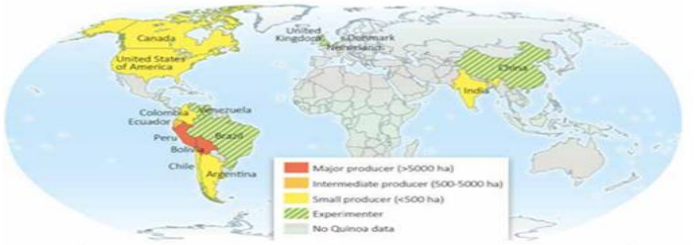


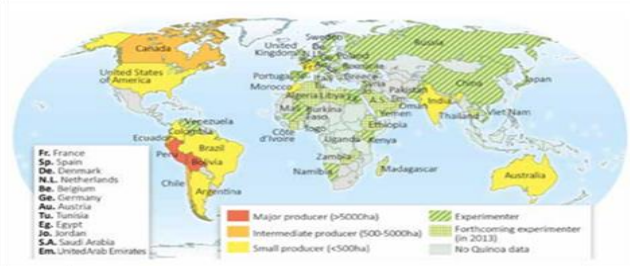
Figure 2. Quinoa growing countries timeline and quantity of produce (compiled by author from Public science and (Bazile et al., 2016) (Bazilie, D., Baudron, F., 2015).

Quinoa worldwide development in 1973



Quinoa worldwide development in 1993

Quinoa worldwide development in 2003



Quinoa worldwide development in 2013

Fig. 3. Quinoa worldwide development 1973-2013 (Bazilie, D., Baudron, F., 2015)

Quinoa Production, area and yield

Abiotic stressor

- Agricultural Practices
- Little or no replacement
- of soil fertility

Biotic Stressor

- Climate change negative effects
- Population dynamics of pests and **diseases**
- Lack of **seed** production

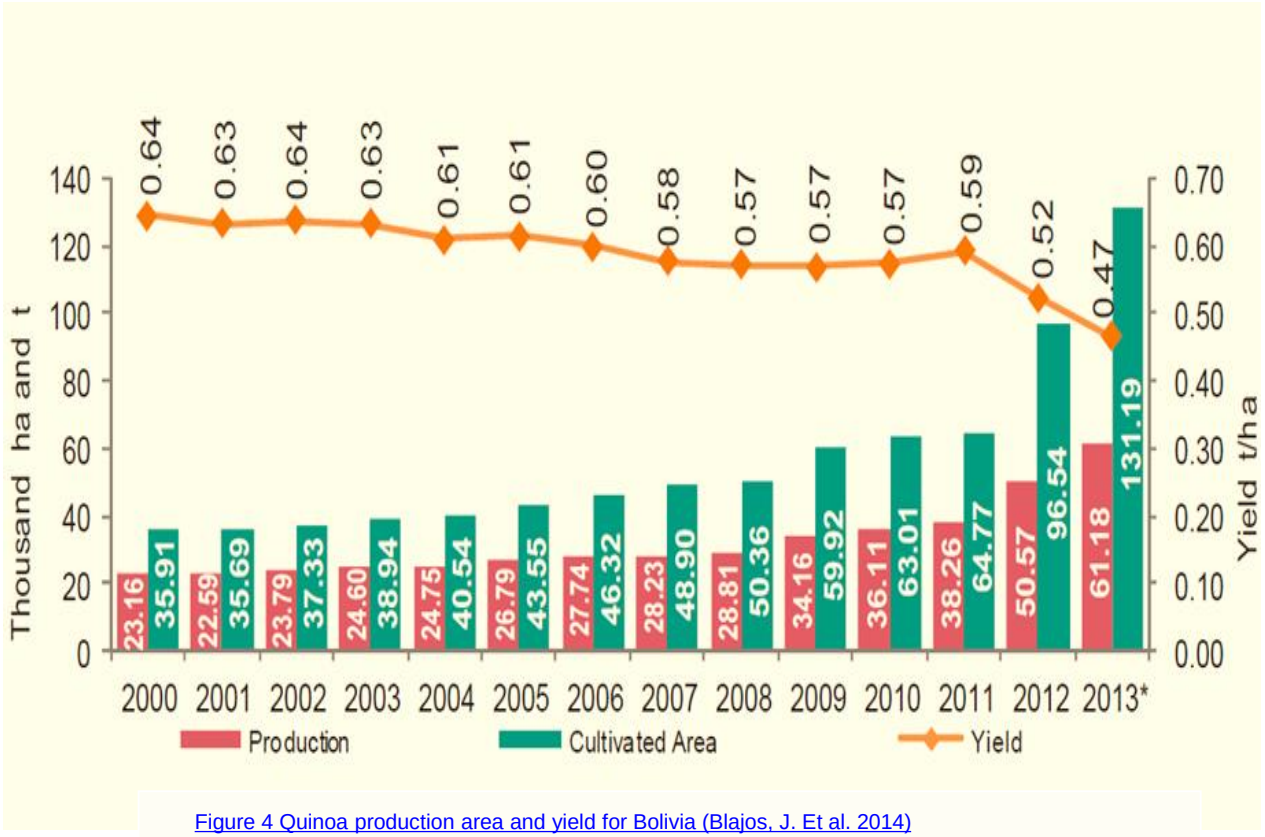
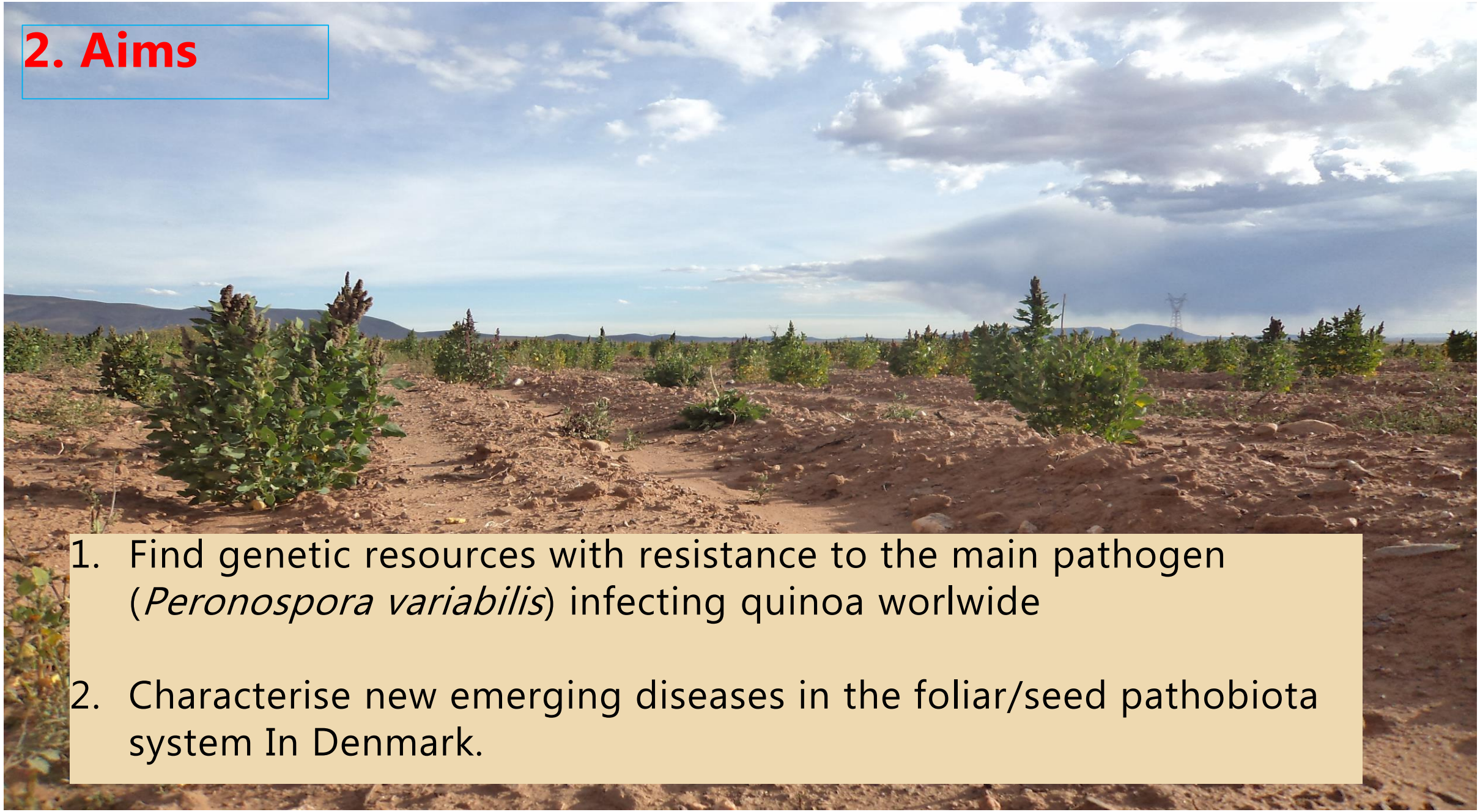


Figure 4 Quinoa production area and yield for Bolivia (Blajos, J. Et al. 2014)

2. Aims



1. Find genetic resources with resistance to the main pathogen (*Peronospora variabilis*) infecting quinoa worlwide

2. Characterise new emerging diseases in the foliar/seed pathobiota system In Denmark.

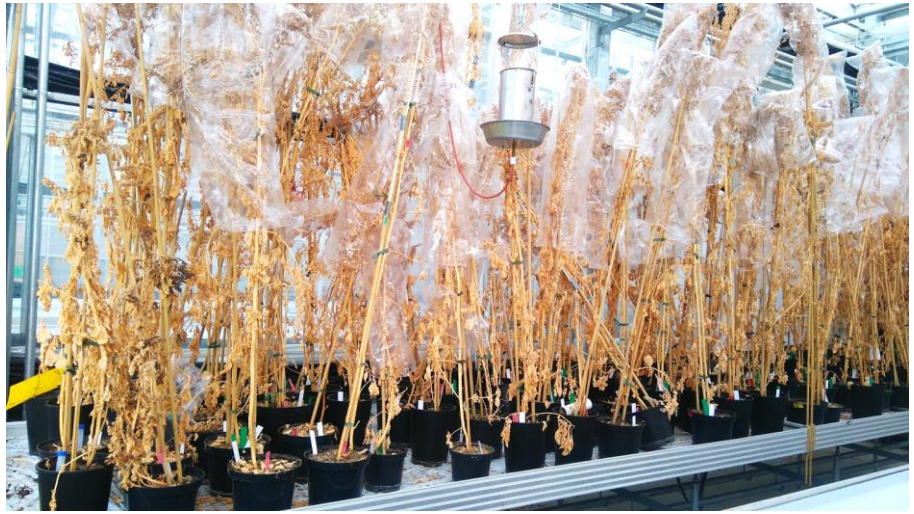
Hypotheses

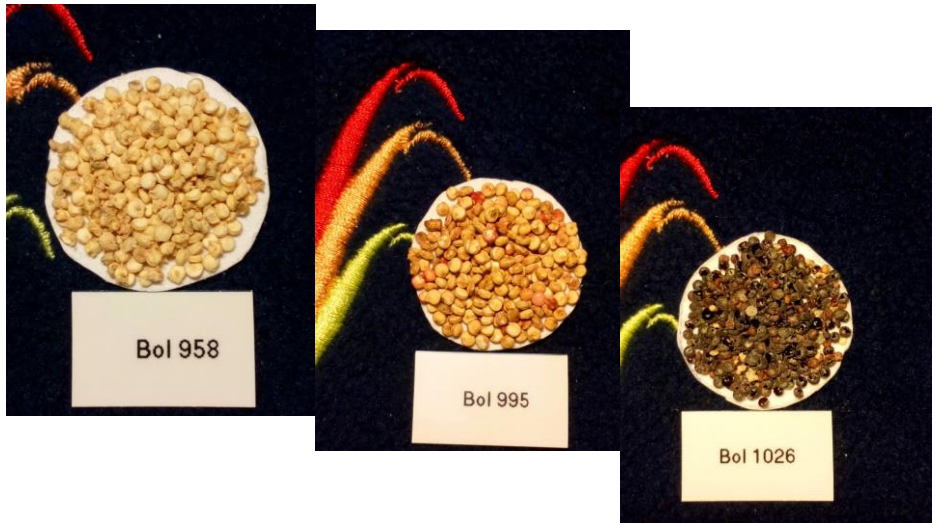
- Genetic variation of downy mildew disease resistance could be observed among the 124-Bolivian quinoa accessions. Based on this well-differentiated genetic populations and admixtures could be postulated

- A number quantitative trait loci (QTLs) could be be associated with downy mildew resistance. These markers may provide a tool to be utilized in molecular quinoa breeding as marker-assisted selection

3. Materials and Methods

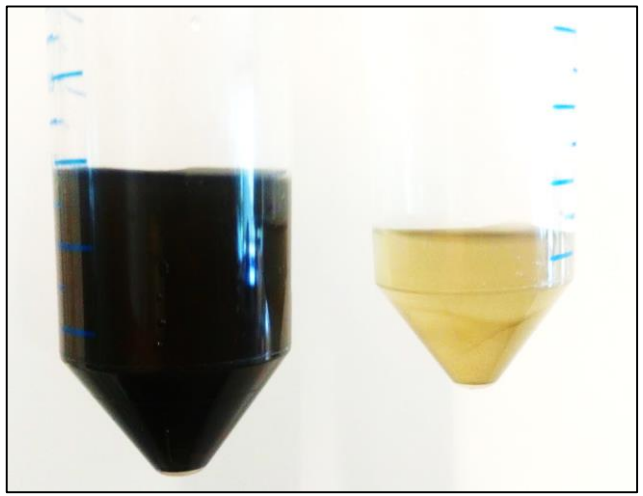
Self polinated genotypes

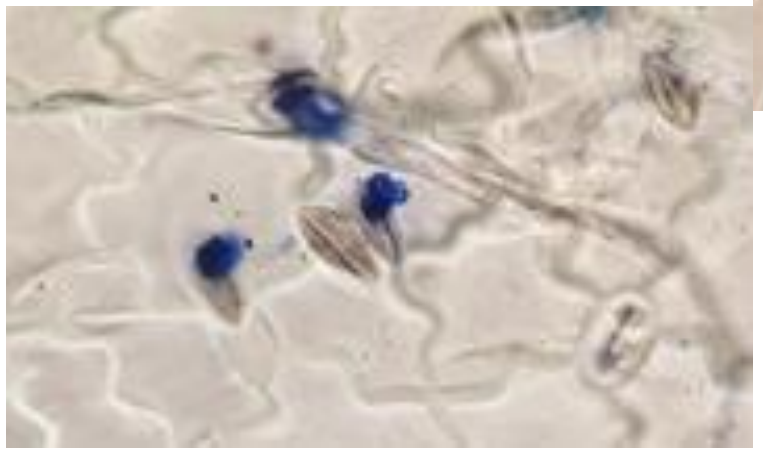


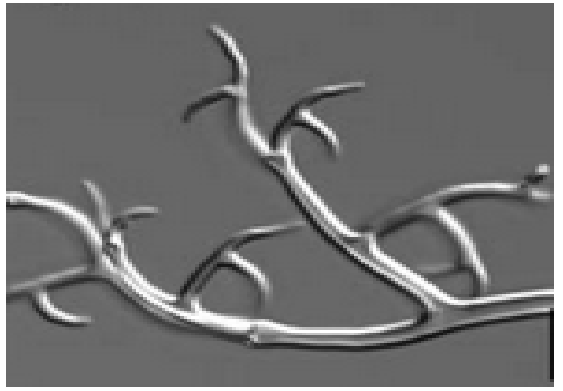


Pathogen isolation propagation

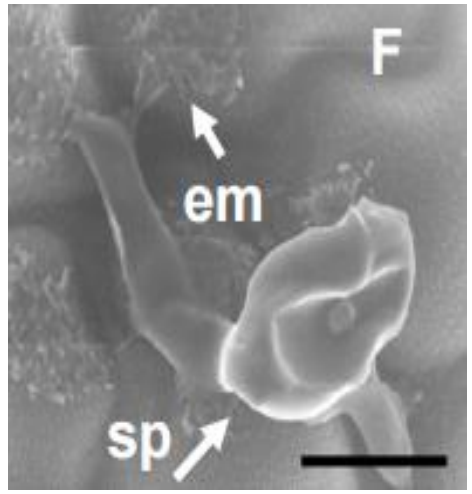
Chenopodium album or flat hen



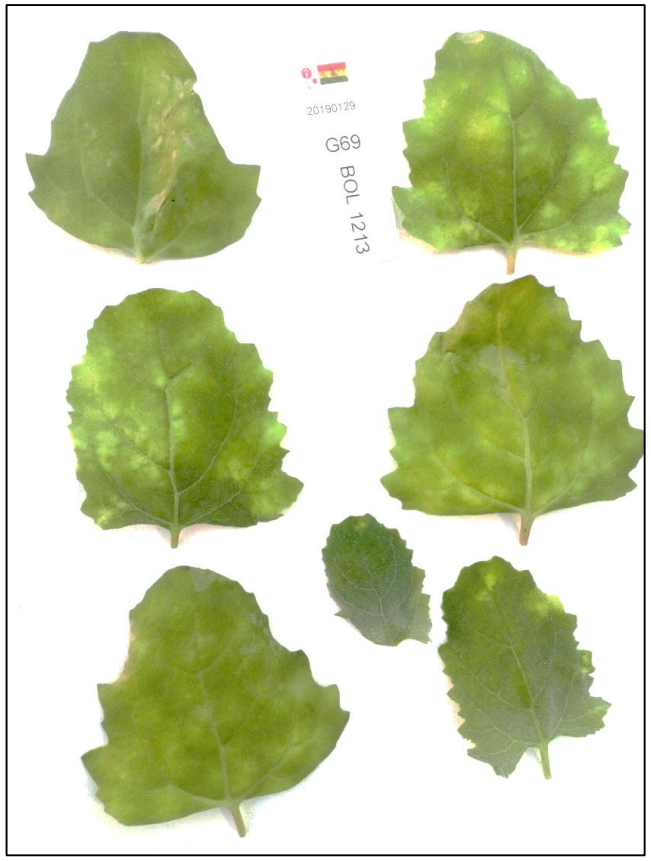


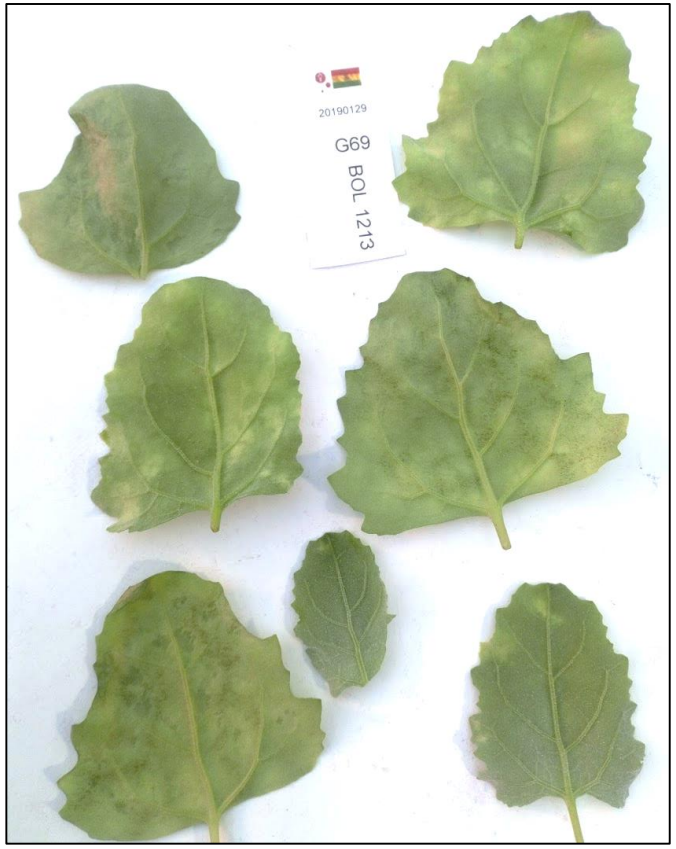


Choi, et al 2008. Mycopath 165



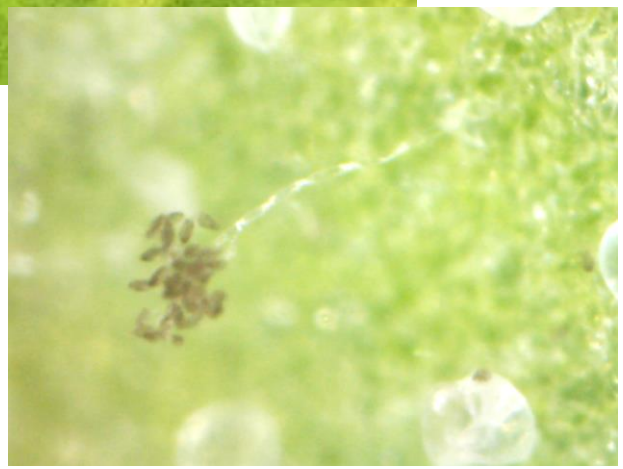
Measuring porcentage of pathogenicity

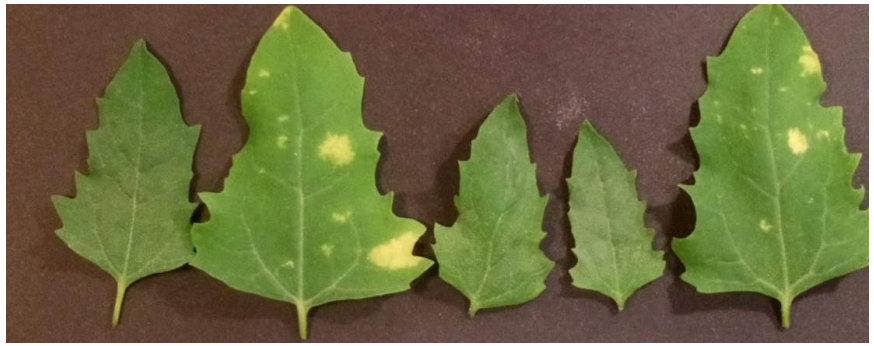




Severity=% adaxial side with lession

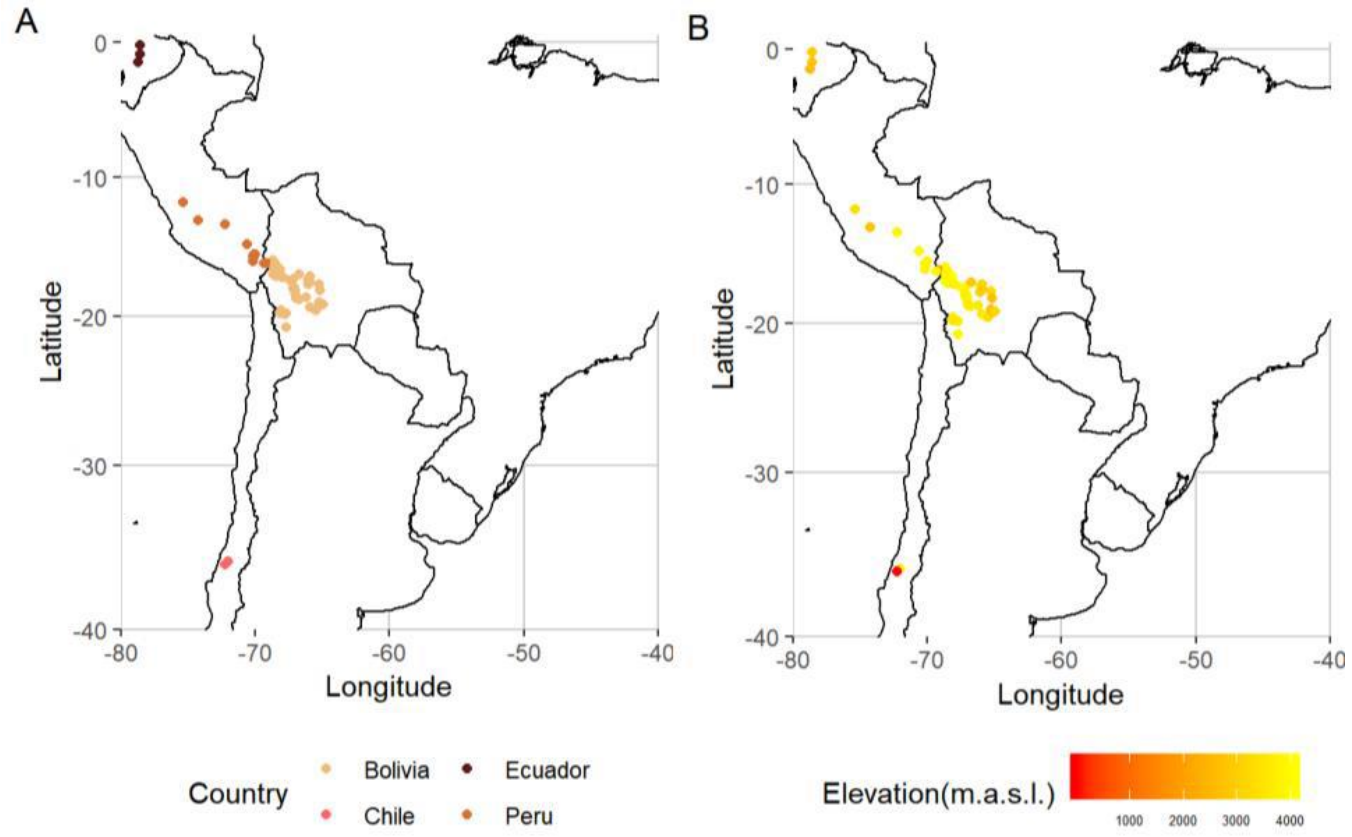
Sporulation=% lession covered by spores in the abdaxial side





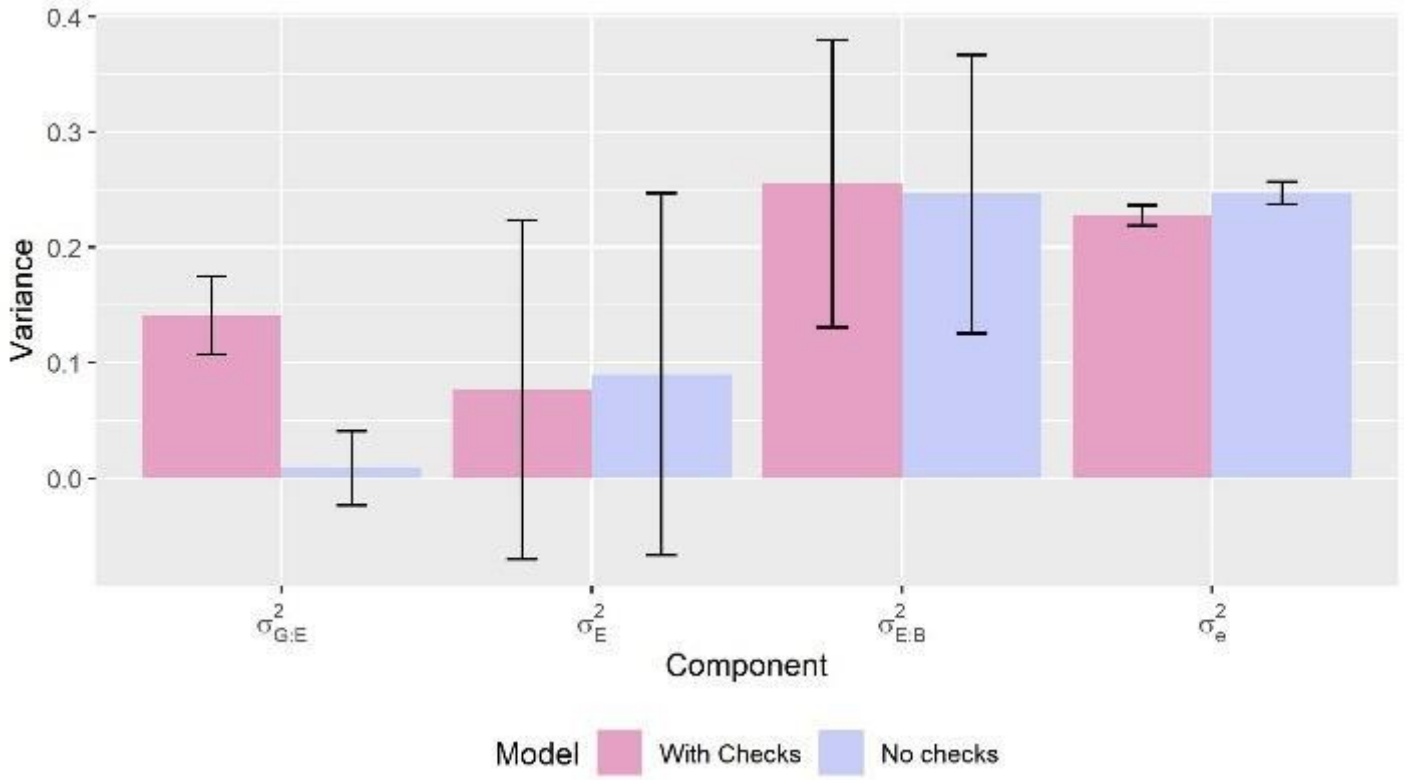
4 Results

Data set



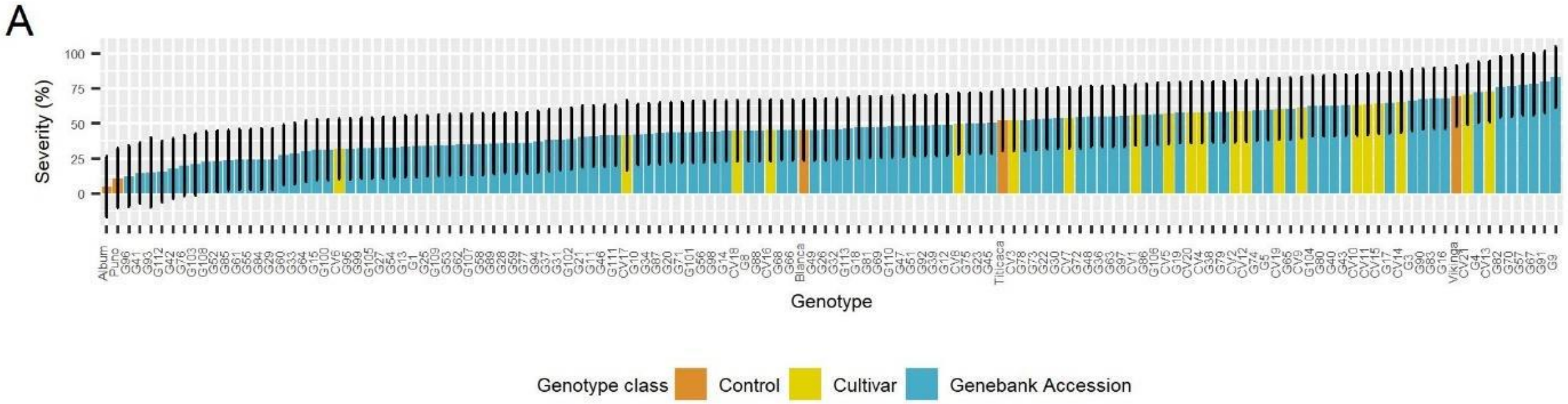
Distribution of germplasm bank accessions across south America by country (A) and by elevation (B) according to the passport data. Source: Bolivian National Germplasm Bank (http://germoplasma.iniaf.gob.bo)

Measuring interactions genotype vs environment



Variance components estimates and their standard errors for incidence GLMMs with and without checks. σ2G:E, σ2E; σ2E:B: Variance components for the genotype-experiment interaction, experiments and blocks nested within the replicates, σ2e : Residual variance.

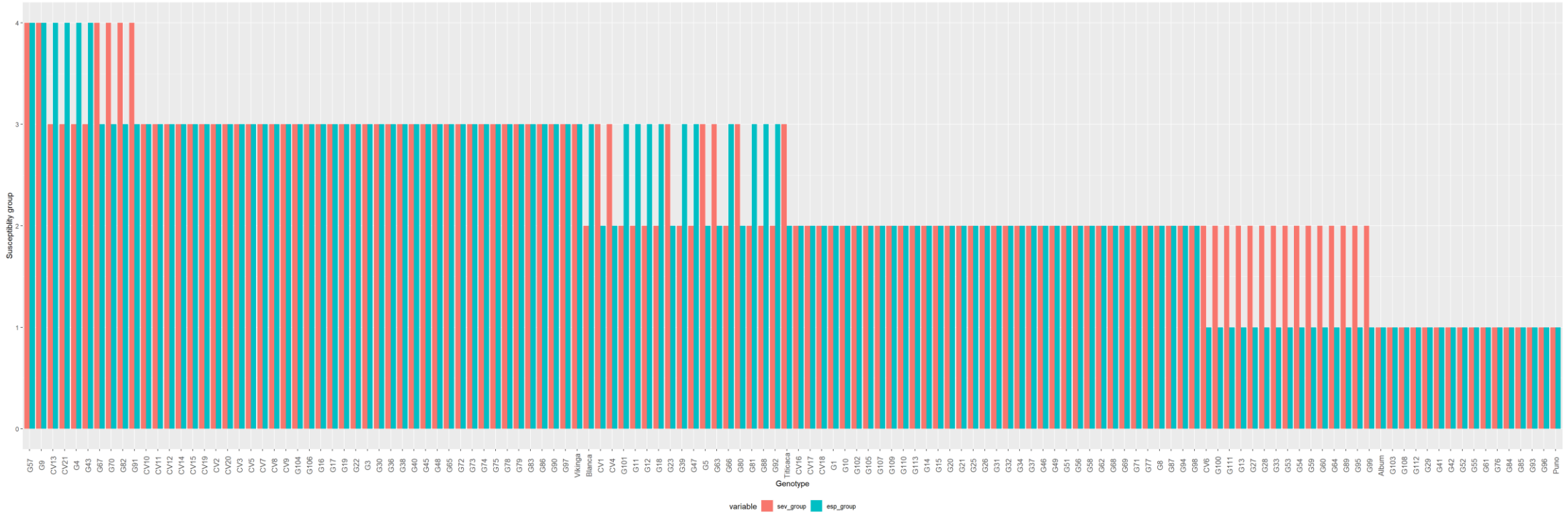
SEVERITY



Estimated severity means ordered from small to large for the genotypes after fitting a model with untransformed data. Error bars represent the 95% confidence intervals.

Grouping the genotypes

The groups are defined as:
Group I (Very resistant): Genotypes with mean % of severity <= 25% and mean % of esporulation <= 25%
Group II (Resistant): Genotypes with severity >25% and sporulation between 0.1-25%
Group III (Tolerant): Genotypes with severity >25% and sporulation between 25-60%
Group IV (Susceptible):Genotypes with severity >50% and sporulation between 60-80%
Group V (Very susceptible): Genotypes with severity >50% and sporulation >80%

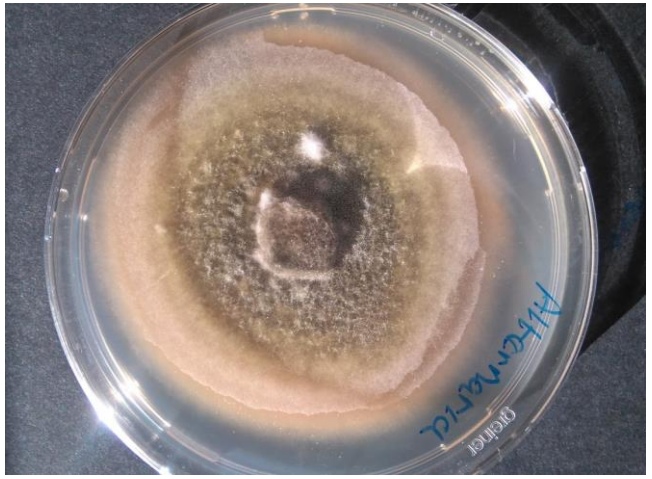


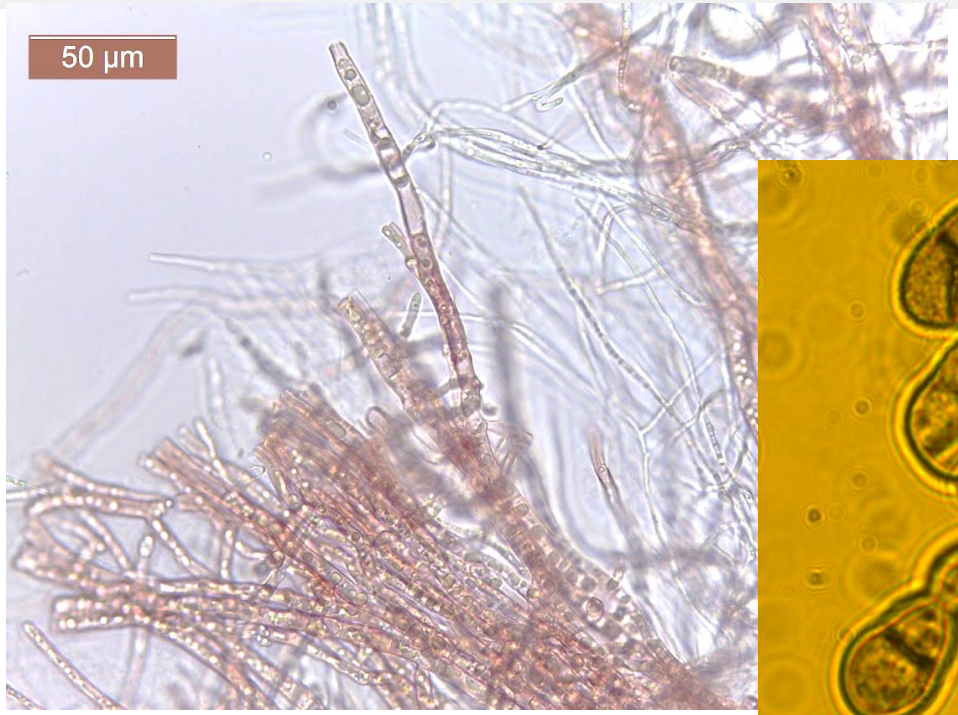
Hypotheses

- Consistent reduction of yield and seed quality is linked to foliar diseases not yet described for quinoa

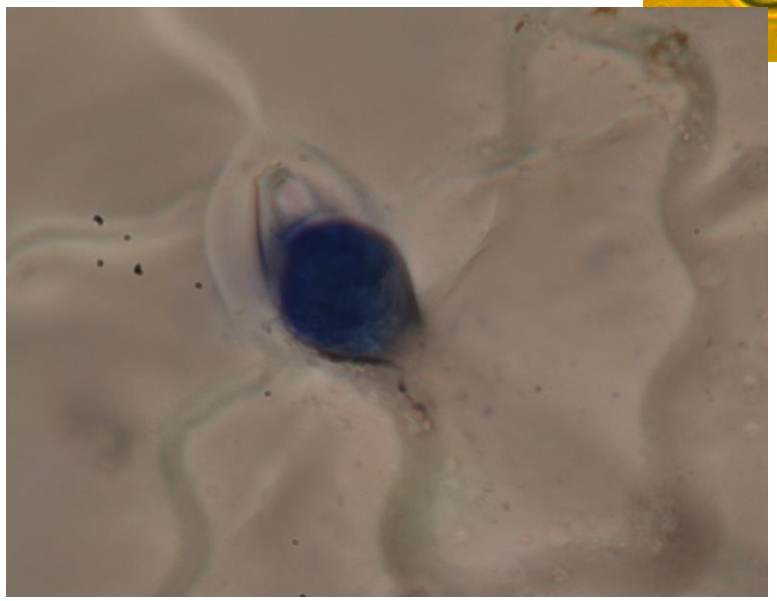
Isolation

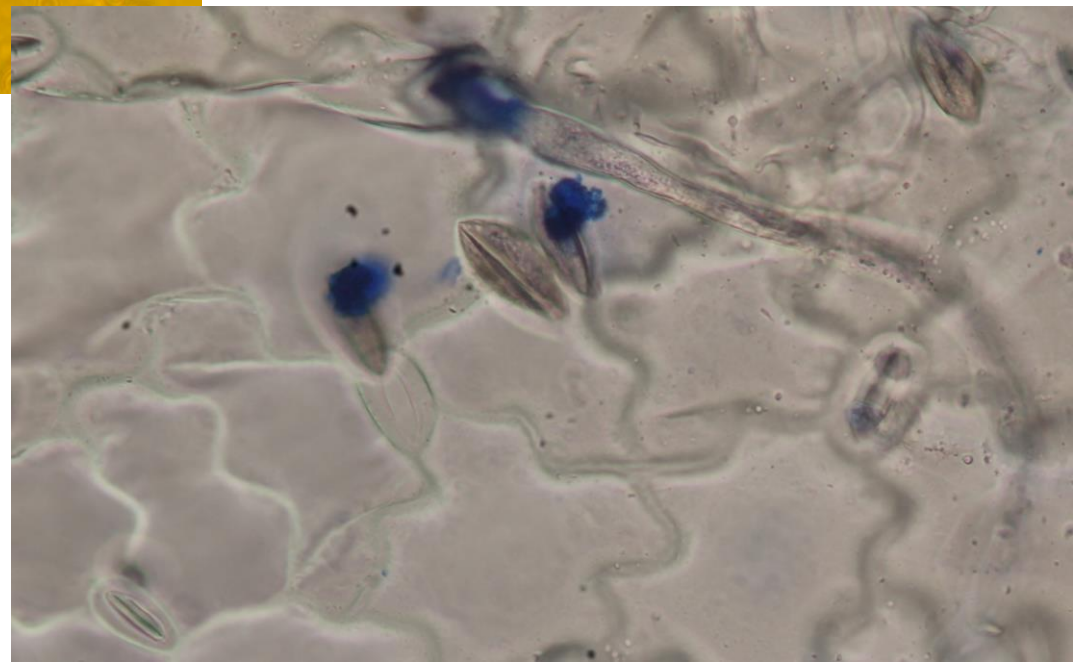

Healthy
Puno
Ascochyta 1
Ascochyta 2
Ascochyta 3
Ascochyta 4
Ascochyta 5



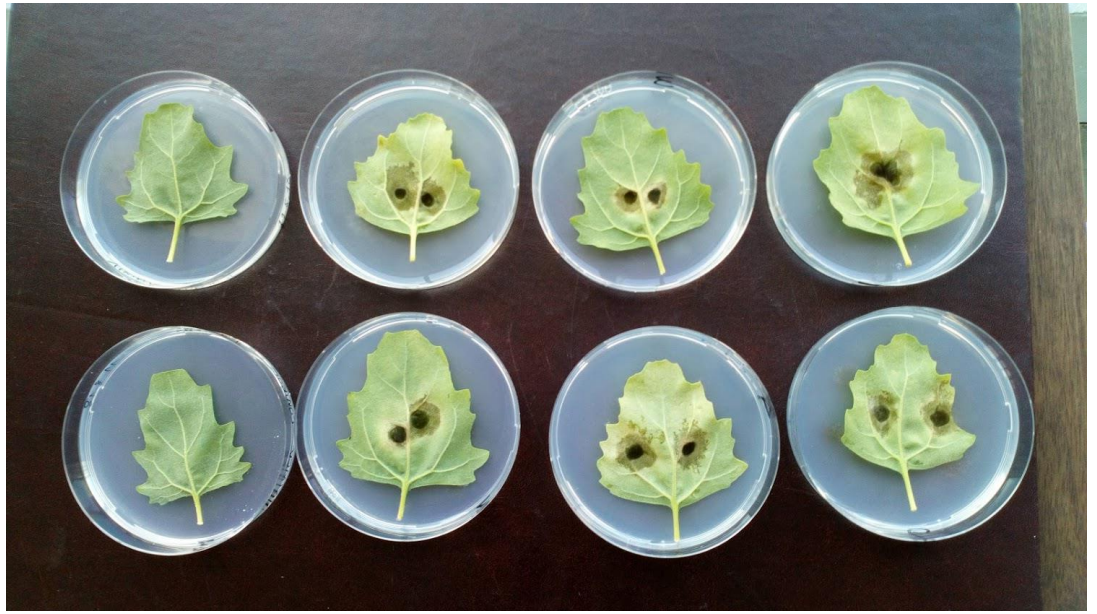

50 µm


11-08-2018
20 µm
A.alternata in potato cells





Pathogenicity tests



Potatoes, quinoa and early blight

5 Conclusions

Results

	B	C	D	E
I#	Percentage	MiSeq12-01	MiSeq12-02	MiSeq12-03
	scata4113_1_Fungi_Ascomycota_Dothideomycetes_Capnodiales_Cladosporium	41.27	40.38	41.87
	scata4113_0_Fungi_Ascomycota_Dothideomycetes_Pleosporales_Alternaria	4.75	2.91	30.66
	scata4113_2_Fungi_Ascomycota_Dothideomycetes_Pleosporales_Alternaria	7.58	8.79	7.47
	scata4113_3_Fungi_Ascomycota_Dothideomycetes_Pleosporales_Epicoccum	2.91	2.63	9.44
	scata4113_4_Fungi_Ascomycota_Dothideomycetes_Capnodiales_Dissoconium	27.18	31.75	0.39
	scata4113_5_Fungi_Ascomycota_Sordariomycetes_Hypocreales_Fusarium equiseti?	1.53	0.11	1.89
	scata4113_6_Fungi_Ascomycota_Leotiomycetes_Helotiales_Botrytis	0.54	1.83	0.35
	scata4113_7_Fungi_Ascomycota_Sordariomycetes_Hypocreales_Fusarium tricinctum species complex	1.45	0.06	0.23
	scata4113_8_Fungi_Ascomycota_Sordariomycetes_Hypocreales_Fusarium nygamai/thapsinum	0.23	0.00	0.04
	scata4113_9_Fungi_Ascomycota_Dothideomycetes_Capnodiales_Ramularia collo-cygni	2.07	3.43	0.23
	scata4113_10_Fungi_Ascomycota_Dothideomycetes_ Sordariales	0.00	0.06	1.12
	scata4113_11_Fungi_Ascomycota_Dothideomycetes_Pleosporales_Neoascochyta	0.84	3.20	0.00
	scata4113_13_Fungi_Ascomycota_Dothideomycetes_Capnodiales	0.08	0.00	0.96
	scata4113_14_Fungi_Ascomycota_Dothideomycetes_Pleosporales_Neocamarosporium	3.91	0.17	0.12
	scata4113_15_Fungi_Ascomycota_Dothideomycetes_Capnodiales_Cladosporium	0.15	0.11	0.08
	scata4113_12_Fungi_Ascomycota_Dothideomycetes_Pleosporales_Curvularia	0.00	0.00	0.00
	scata4113_21_Fungi_Ascomycota_Dothideomycetes_Capnodiales_Ramularia	0.00	0.06	0.04
	scata4113_16_Fungi_Ascomycota__Dothideomycetes_Dothideales_Sydowia	0.00	0.00	0.04
	scata4113_20_Fungi_Ascomycota__Dothideomycetes_Dothideales	0.00	0.11	0.27
	scata4113_17_Fungi_Ascomycota_Eurotiomycetes_Eurotiales_Penicillium steckii	0.00	0.00	0.12

all tag by cluster counts

- The most tolerant groups of accessions according to the severity estimates include checks (*C. album* and Puno), and gene bank accessions (G41, G42, G76, G93, G96 and G112). On the other hand, the most susceptible genotypes are Vikinga (Danish cultivar), varieties CV13 and CV21, and ace

Genome-Wide Association Study (GWAS) for pathogen resistance and correlated traits in the quinoa (*Chenopodium quinoa*)-downy mildew pathosystem

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4. PAPER 2:

"First report of *Alternaria infectoria*, *Alternaria alternata* and *Cladosporium allicinum* as foliar pathogens on quinoa (*Chenopodium quinoa*)"

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B. Reflection on the academic encounter in Denmark

- Mum: …….why would they build a University so far away from the sun? ☺

Bolivia

www.worldmap1.com/south-america-earth-map

Population: 11 514 800 (INE, Bolivia, 9/10/2019).

Area: 1 .098 581 km2
Density: 10,4 persons/km2

Literacy: 95% for over 15 years old (2012). INE; 2019

National basic wages
2.122 Bs = 2080 Dkk

Life expectancy 71.33 years (2019) (www.macrotrends.net).

Retirement Age: 58 (aljazeera.com/news)

Population below poverty line(%): 35% knoema.com/atlas/Bolivia

Birth rate 21.628 births per 1000 people (www.macrotrends.net)

Education matters

- Bolivian population: 50 % literate (70% rural), and elite educated minority (borgenproject.org).
- Bolivia devotes 23 % of its annual budget to education (borgenproject.org).

- Public spending 7.2% of GDP in 2005 (Unicef.org)
- Parents with higher levels of education and income spend more on their children's education (Unicef.org). (around 25% of income)
- Private schools in Bolivia cost between $70 (25% of National Income wages) and $450 dollars a month (boliviabella.com).

First PhDs funded 100% by Bolivian resources

..it is aimed for Bolivia to develop knowledge and technology to support the productivity and economic growth with sovereignty…."therefore the program for postgraduate scholarships was launched in 2014 for Bolivian graduates to access the best universities of the world"(Memouir for the first public launch of scholarships, 2014)

A journey of Faith and challenge

- ✓ Independance
- ✓ Resiliance
- ✓ Autonomy
- ✓ Self confidence
- ✓ New skills
- ✓ Jante loven

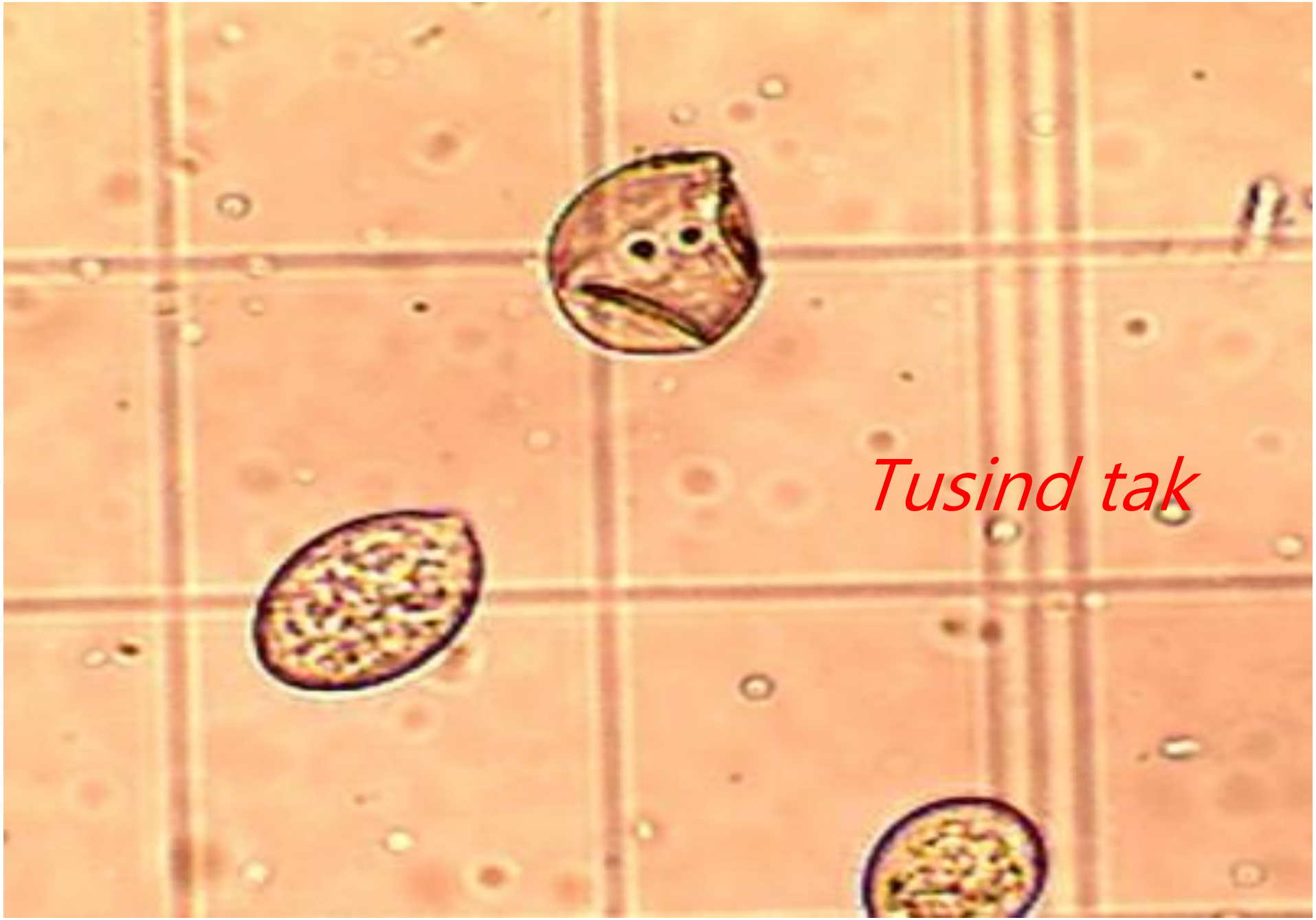
- ❖ Lost family members

PhD studies at KU

TEAM A PhD fellow	TEAM B PhD stipendiat
Danish salary	Stipend coming form sponsor country
Vacation, maternity/paternity, sick leave	none
Psychological aid	none
CONSEQUENCES	
	No possibility to apply for student assistant or student helper jobs
	Feeling of inequality
	Feeling of unfairness
WRONG ASUMPTIONS	
PhD fellows pays for everything	Stipendiat is paying less or partially
PhD fellow is well adapted and knows how to manoeuvre in the academic arena of Denmark	Stipendiat needs to adjust to the culture and learn how to interact in his/her new environment

SUGGESTIONS

- Modify the admission process for international PhD stipendiats. Include 6 weeks of stipend to cover vacation and allow negotiations for covering cases of sick leave.
- Classify PhD stipendiat as students so they can access to few hours work as research assistants or student helpers.
- Create a file containing information regarding the Financial situation of the student.
- Principal supervisor should clarify the situation of the student to secretaries, technicians and every body in their section.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