



UNIVERSITY OF
COPENHAGEN

April, 2019

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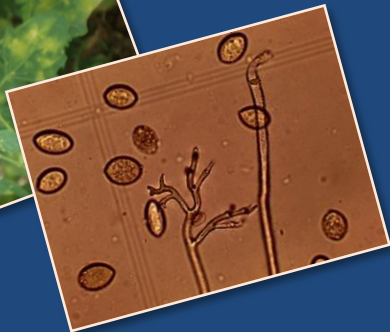
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Characterization of foliar diseases infecting quinoa
Chenopodium spp. and search for
sources of resistance to Downy mildew
(*Peronospora variabilis*)

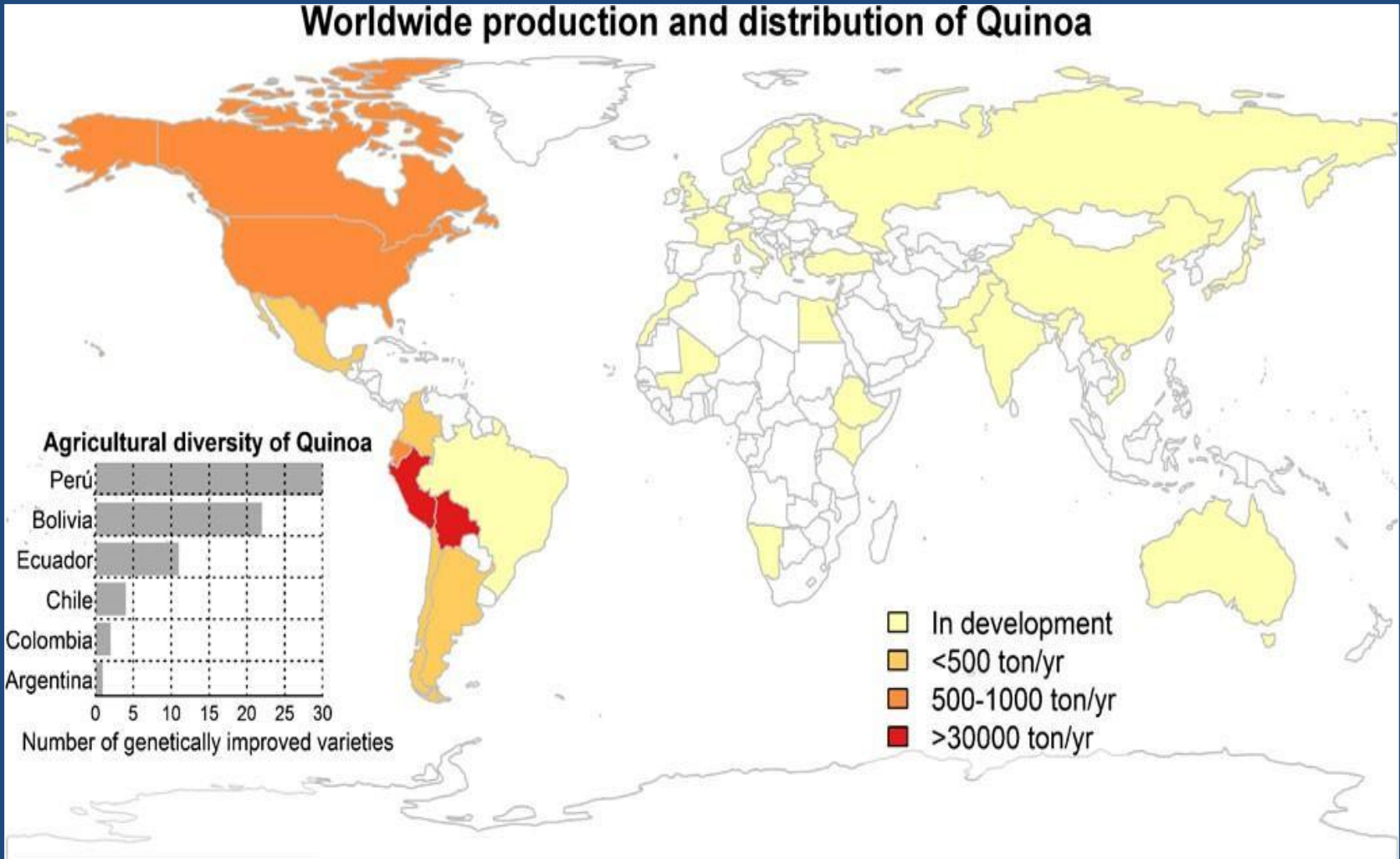
Carla Colque Little



- A dycotyledonous herbaceous plant with edible seeds, belonging to Order Caryophylliales and Amaranthaceae family. As a chenopod (goose foot) closely related to beets, chard and spinach



Quinoa distribution



Global distribution of quinoa production (Ruiz *et al*, 2013)

Why a Super food?

- Protein $\approx 15\%$
- Lysine , isoleucine
- Minerals and vitamins

- Polyphenols, phytosterols, and flavonoids with possible nutraceutical benefits
- interesting 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)

Resilient crop

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

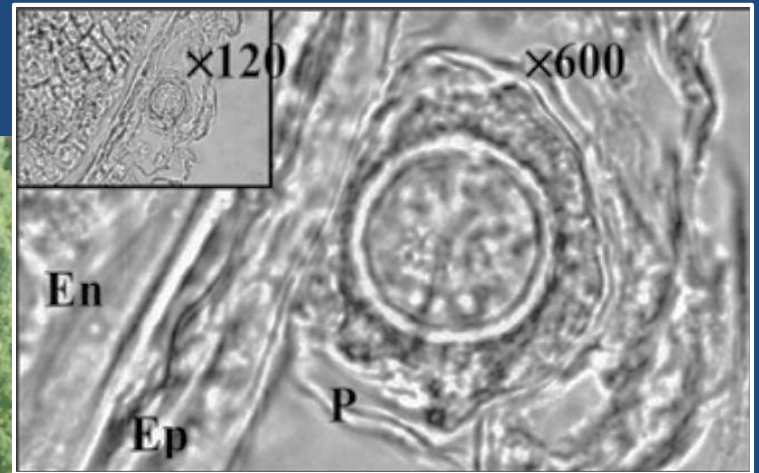


Denomination of origin

- AndeanRoyal quinoa grows in a unique environment at the shores of the salt flats.



Causes reduction on the yield downy mildew



Danielsen and Ames, 2000

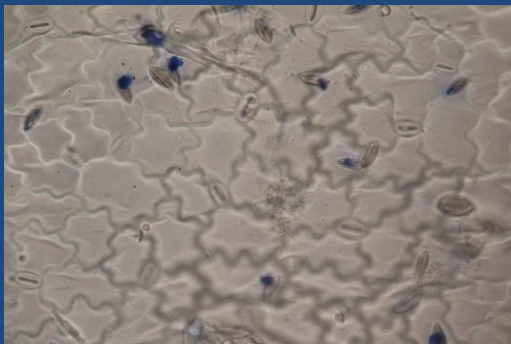
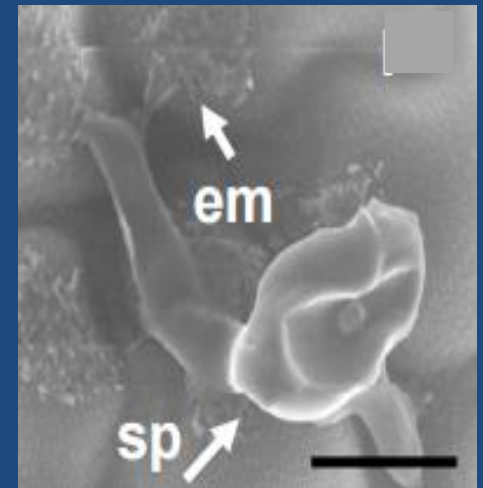
Quinoa downy mildew



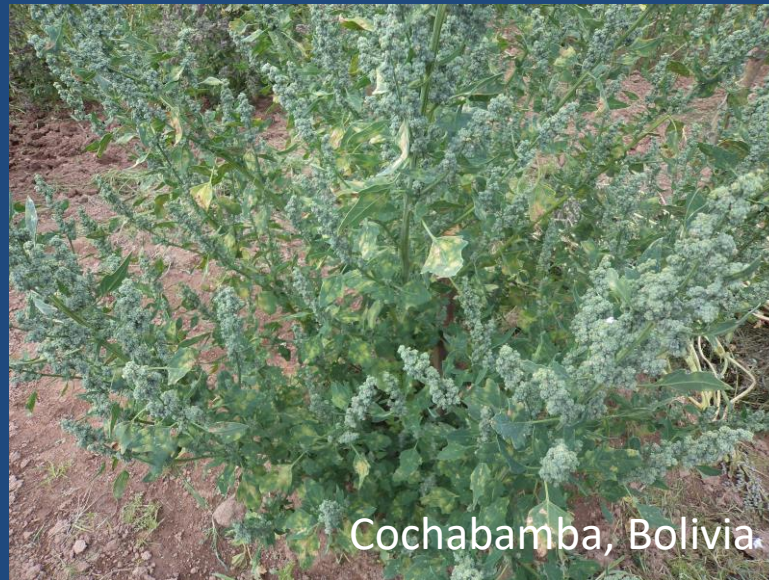
Microscopic view



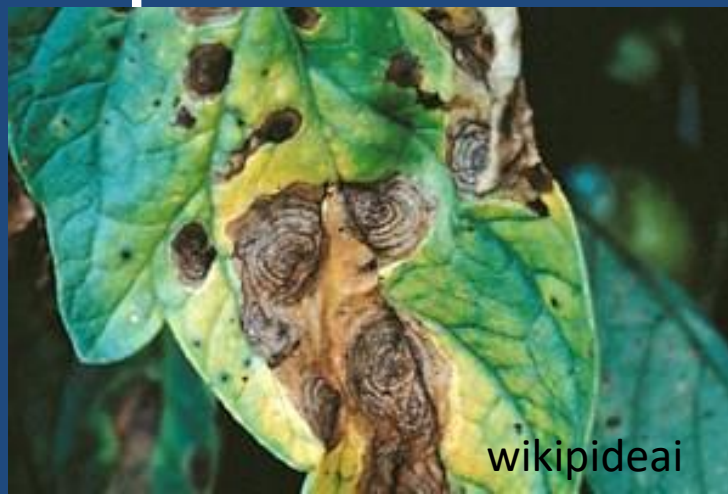
Electron microscope



Other foliar diseases



Alternaria sp.

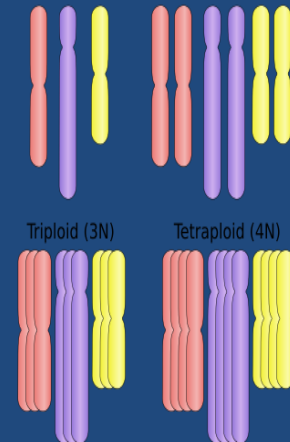


Genotyping wild quinoa



Andre's *et al.* *Mol Breeding* (2014) 34:13–30

- Allotetraploid species $2n = 4x = 36$
- Mainly possessing a diploid type of chromosomal segregation
- Self pollinated species



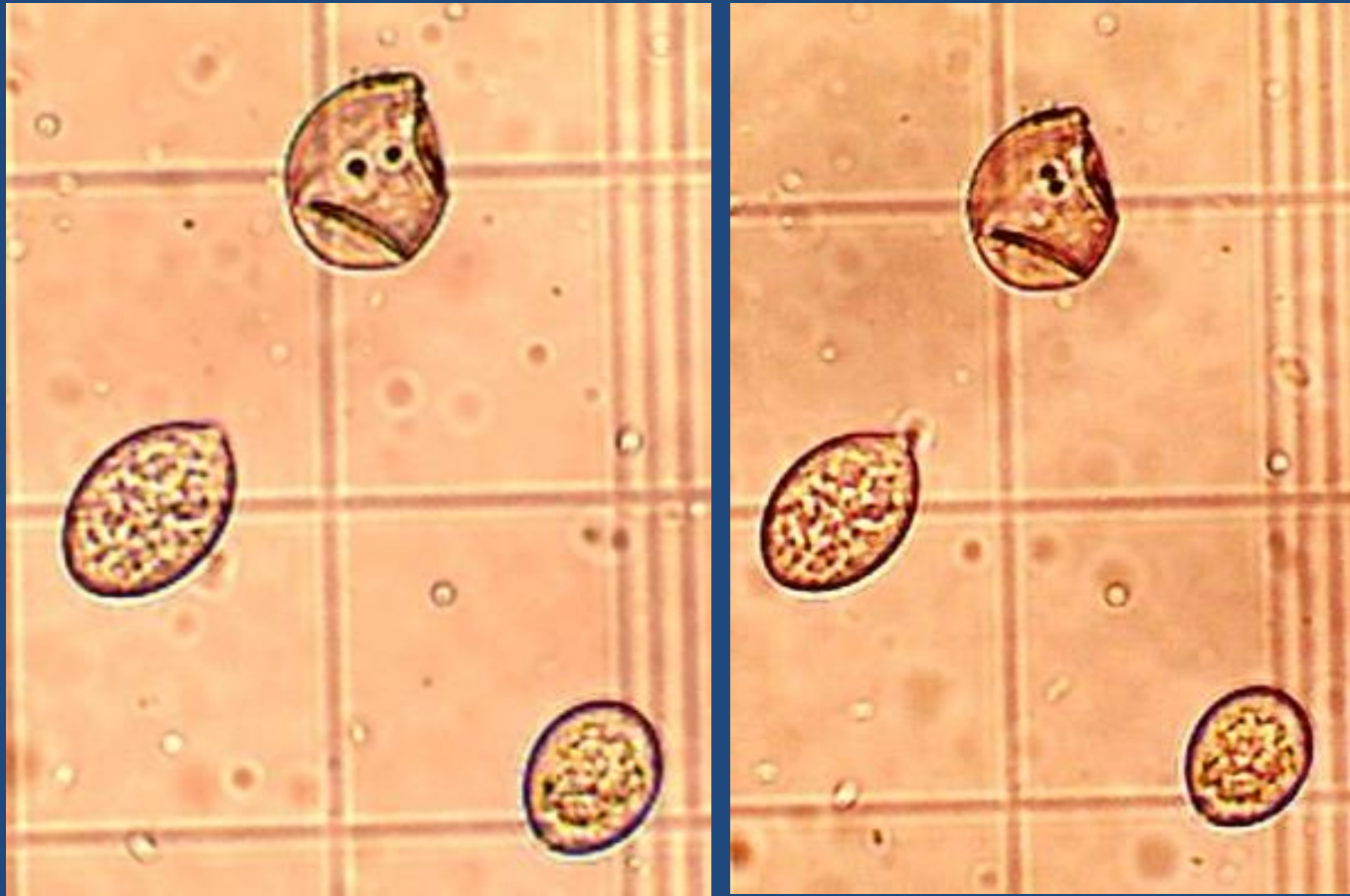
Artificial inoculations



100 SCHOLARSHIPS FOR THE SCIENTIFIC AND TECHNOLOGICAL
SOVEREIGNTY. **Plurinational State of Bolivia**



Yachay (quechua)Knowledge.



Pictures by R. Torrico and C. Colque-Little 2016

Thank you