

Diversity of Chinese *Phytophthora infestans* isolates

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Presentation outline

- Importance of potato in China
- Late blight in China
- Potato cropping in China
- Characteristics of isolates
- Future prospects



Importance of potato in China



- Export and internal market demands in China
- Large, fast and high potential
- Stimulated by Chinese government

Potato late blight in China



- **Severity:** infected area 30-75%, yield loss 20-30%
 - 2008: expected infected area >45%
- **For instance: Gansu province, 1st yield**
 - Year: 2006-2007
 - Planting area: ~640,000 ha
 - Yield: >10 million ton
 - Infection area: 50-80%
 - Yield loss: 0.5 -1.5 million ton, ~10% loss
- One of six top agricultural diseases and pests in IPM work plan (2008) of Ministry of Agriculture, China

Potato late blight in China



- No broad-spectrum resistant varieties
 - 90% susceptible
- National-wide transportation of seed tubers and trade activities

National monitor and alert system of potato late blight

中国马铃薯晚疫病监测预警系统 (lateblight-china)

晚疫病发生实况

晚疫病预测

决策支持系统

其它病虫害

系统简介

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内蒙古锡林郭勒盟正蓝旗-2008-08-11

黑龙江哈尔滨哈尔滨市-2008-07-10

黑龙江哈尔滨哈尔滨市-2008-07-25

宁夏固原固原市-2008-07-17

内蒙古呼伦贝尔鄂温克族自治县-

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中国马铃薯晚疫病实时分布图

News of epidemic situation



Potato cropping in China

Se: seed potato

St: Starch potato

Pr: Processing potato

Ta: Table potato

Ex: Export potato

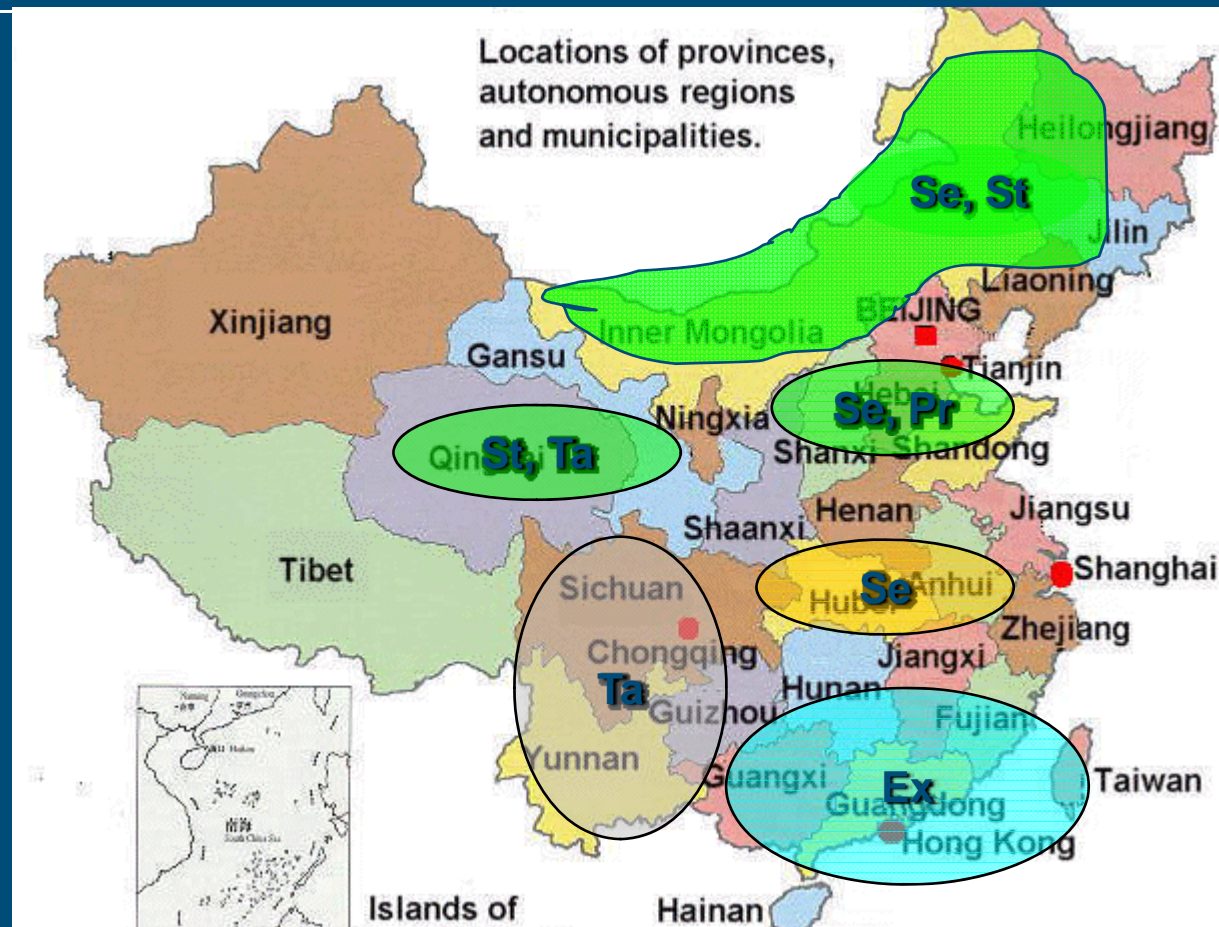
Planting season

Green: one-season

Yellow: two seasons

Gray: rotation

Blue: winter planting



Potato area is increasing especially in South.

Situation of seed tubers in China

Three ways where the farmers get seed tubers:

1. Home-grown seed tubers;
2. Local government subsidy to the seed tuber companies

Northwest area: Guizhou, Gansu, Ningxia

3. Local government subsidy to farmers
only for seed potato areas;



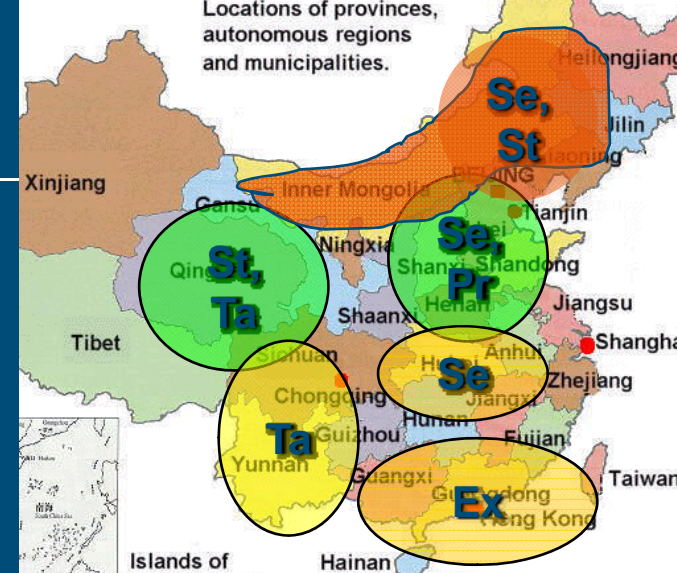
Potato varieties used in China



- More than 300 approved varieties;
- Different cultivar series from local breeding institutes;
- Mainly from about 6 series (20 varieties), which are all from breeding institutes in main potato areas;

Research objectives

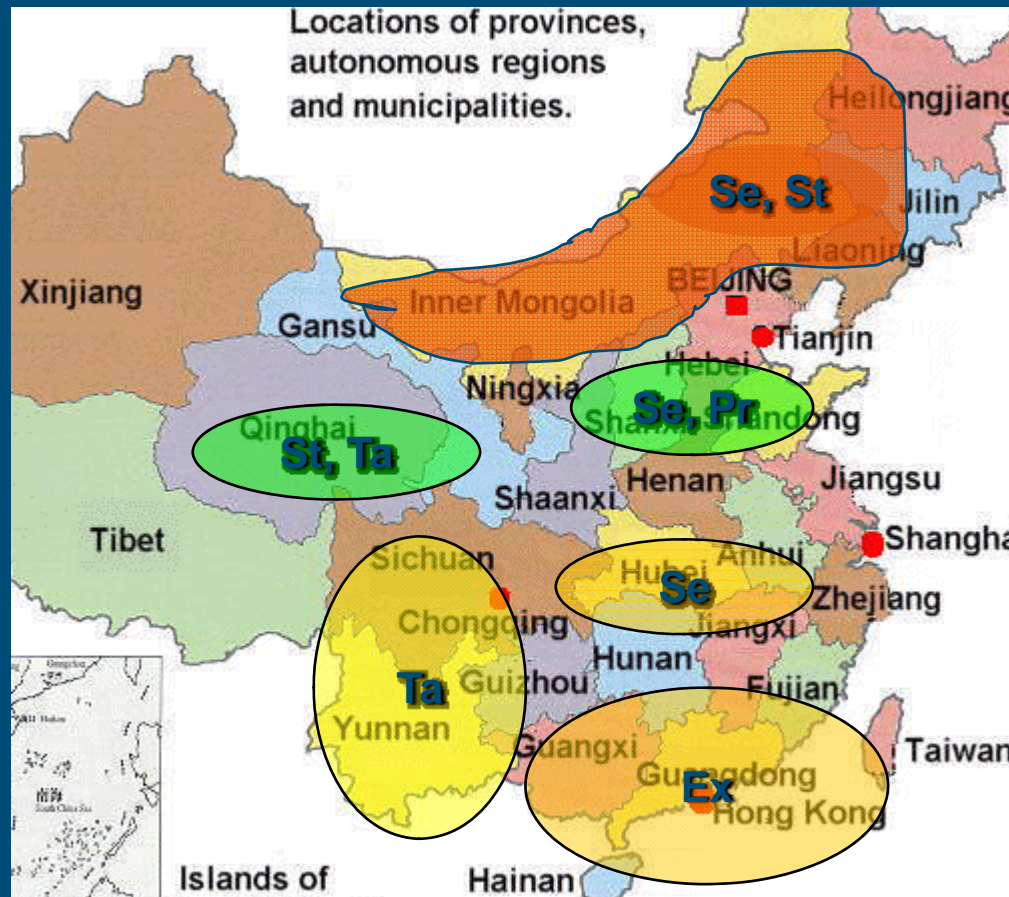
- Sampling
- Storage of isolates
- Phenotyping: virulence, fungicide resistance
- Genetic analysis: haplotype, SSRs
- Population diversity
- Migration, trends, forecast
- Short- and long-term resistance management



Research on Chinese isolates

■ Previous studies

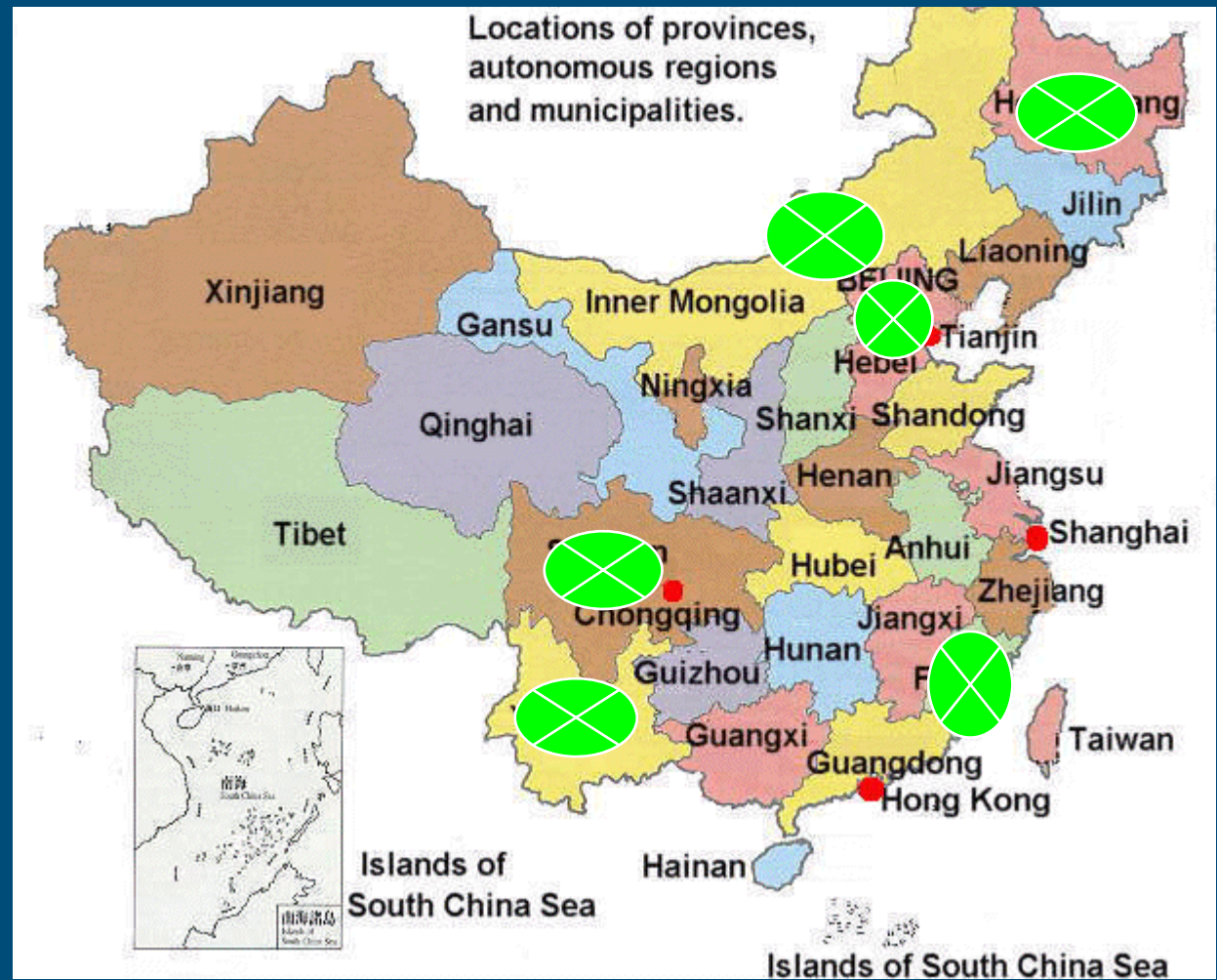
- A1, A2 in China (Zhang Z, *et.al.* 1996)
- Ila haplotype and A1 (Guo J, *et. al.* 2008)
 - low genetic diversity
 - high diversity for virulence



Isolates studied in this research

119 isolates

Mainly collected
in 2006 and 2007



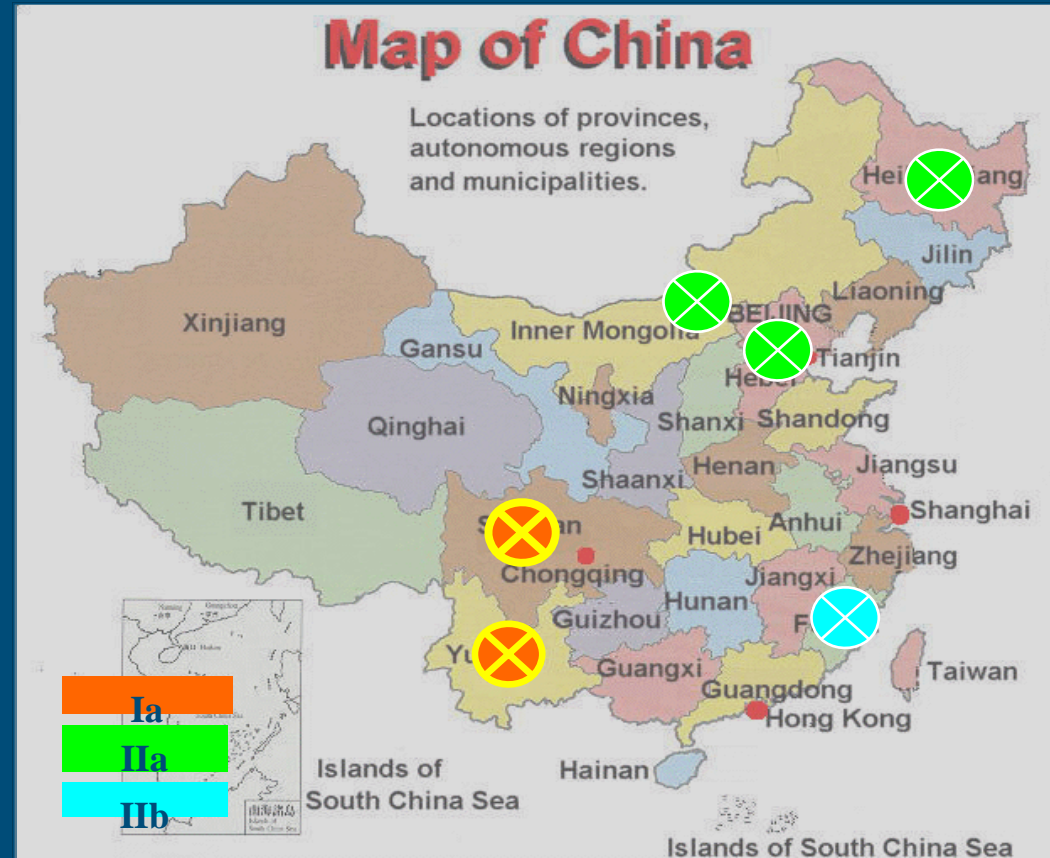
Mitochondrial Haplotyping of Chinese isolates

Ia, IIa, IIb found



Mating type test of Chinese isolates

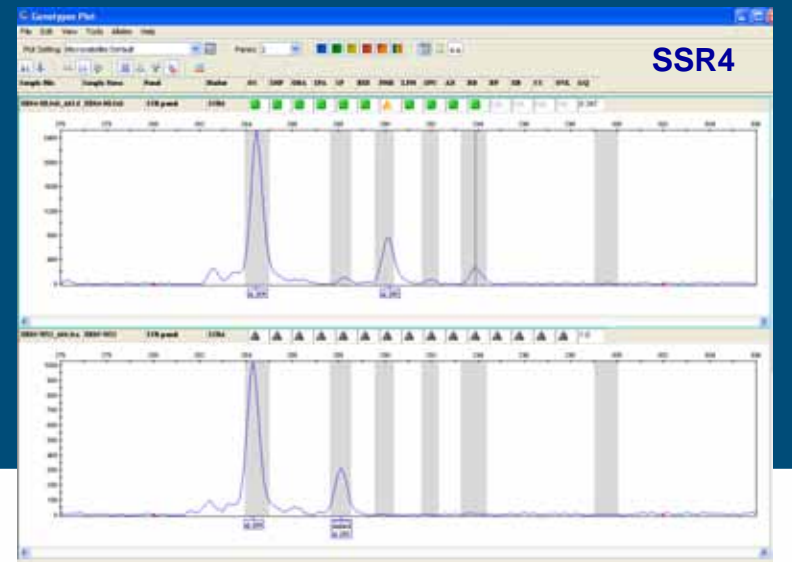
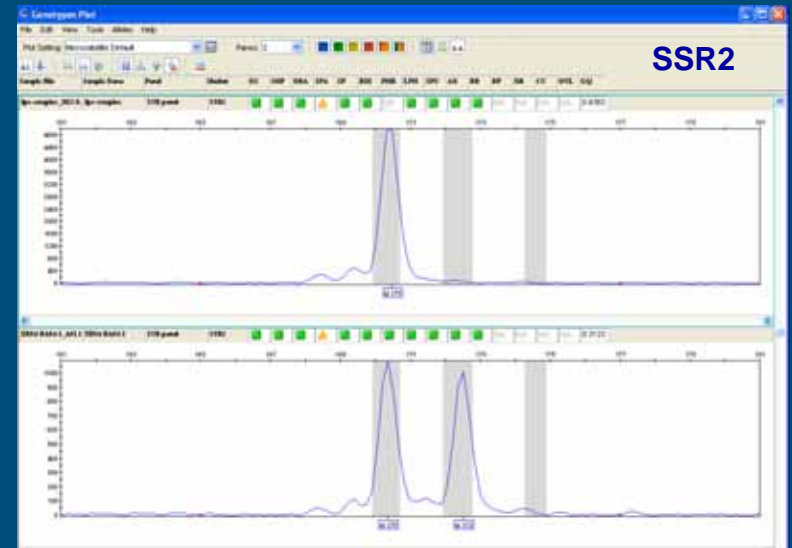
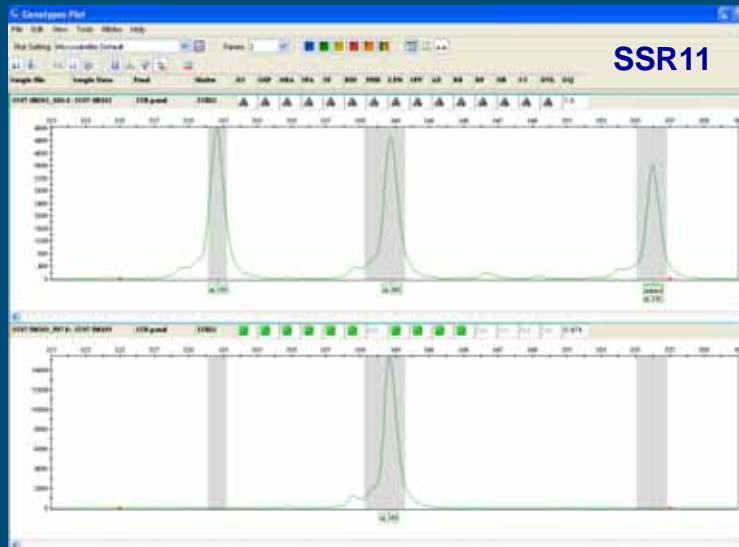
- Sichuan, Yunnan: both A1 & A2
- Others all A1



SSR analysis of Chinese isolates

8 SSR markers from PRI

43 alleles



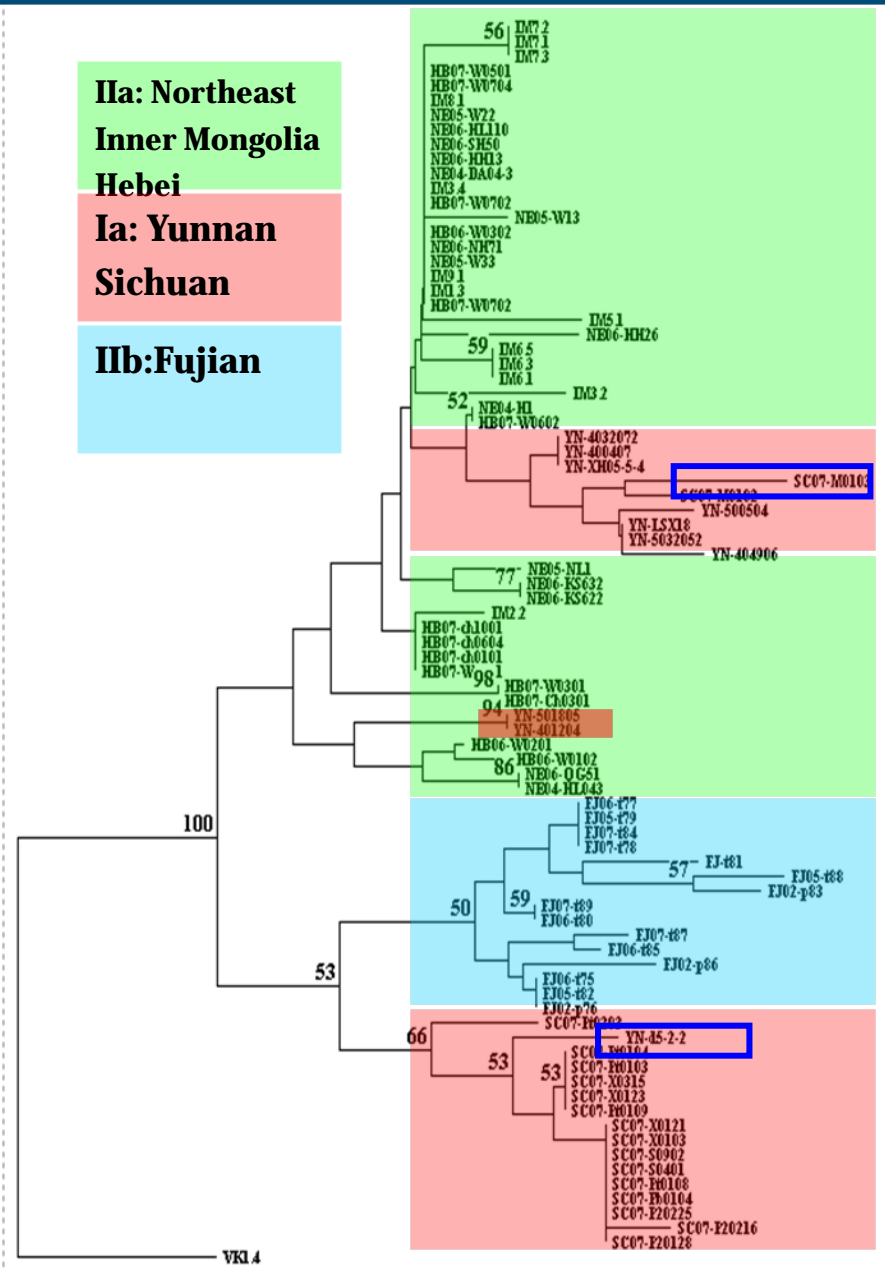
Results

Map of China

Locations of provinces, autonomous regions and municipalities.



Ia: Northeast
Inner Mongolia
Hebei
Ia: Yunnan
Sichuan
Ib: Fujian



Polym

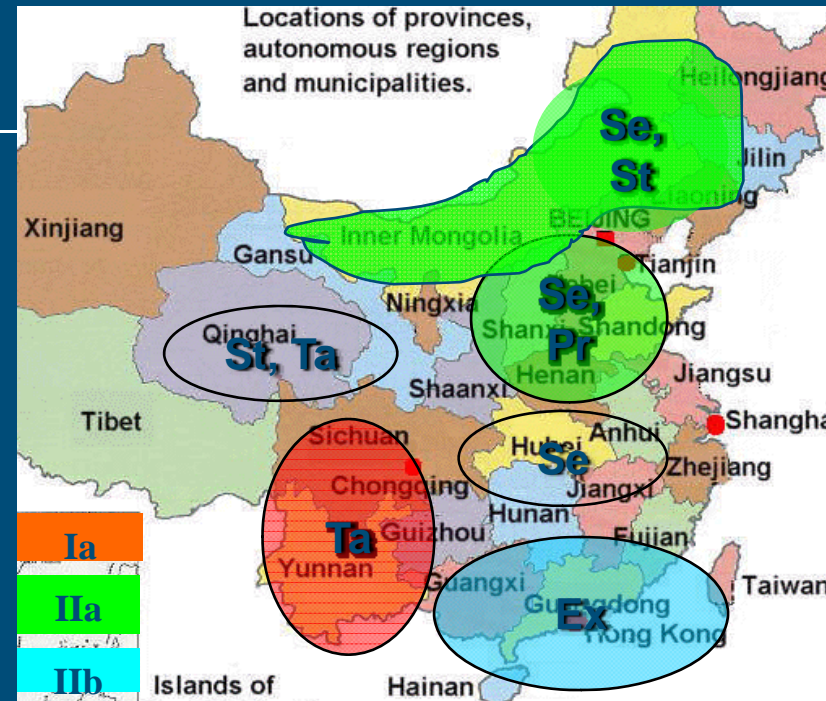
-  IN
-  to
-  Mo
-  IN
-  Av
-  Av

	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2
	1	2	3	7	0	4	7	7	8	9	9	9	0	0	1	1
	8	9	4	7	2	2	4	9	4	3	7	9	1	6	0	3
ipi01	C	T	T	A	A	T	G	C	C	A	T	C	T	G	C	A
ipi02	A	T	T	A	A	T	G	C	C	A	T	C	T	G	C	A
Chinese	C	T	T	A	A	T	G	C	C	A	T	C	T	G	C	A
H30P04	C	TG	T	AG	AG	TG	G	C	C	A	T	GT	T	GC	C	A
avrblb1	/	G	G	A	G	G	C	T	A	T	G	T	G	C	A	G
	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
	1	1	1	2	2	7	7	7	8	9	9	0	0	0	4	7
	4	8	9	5	8	/	8	9	3	0	1	4	5	6	2	0
ipi01	C	G	A	T	T	G	C	T	T	C	C	A	G	A	C	A
ipi02	C	G	A	T	T	G	C	C	T	T	A	A	T	A	G	C
Chinese	C	G	A	T	T	G	C	TG	T	GT	GA	A	GT	A	CG	AC
H30P04	GA	G	A	T	T	G	C	TG	T	GT	GA	A	GT	A	CG	AC
avrblb1	A	C	T	C	A	T	A	T	C	C	C	G	C	T	C	C

AVR3a
avr3a
Chinese

■ Conclusion

- Haplotypes Ia, IIa and IIb were found; correlated to regions
- SSRs revealed several clonal lineages
- SSR , a useful tool to monitor the pathogen population in future
Including haplotype and mating type
- Pathogen migration: local culture, economic level and breeding tradition → influence by distribution layout



Future prospects

- Long-term storing the isolates
- Deeper sampling in coming years
- Importance of monitoring the population migration
- Virulence tests
- Aim to organize a comprehensive project, like Euroblight

Introduction of my institute IVF-CAAS



- Located in Beijing, China
- Governed by CAAS, Ministry of Agriculture
- Established in 1958
- 195 employees include 140 research staff
- 8 research departments
 - Biotechnology
 - Potato Breeding



Acknowledgments

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Dr. Geert Kessel

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Questions ???

