Species composition and resistance to fungicides of Russian potato and tomato early blight pathogens

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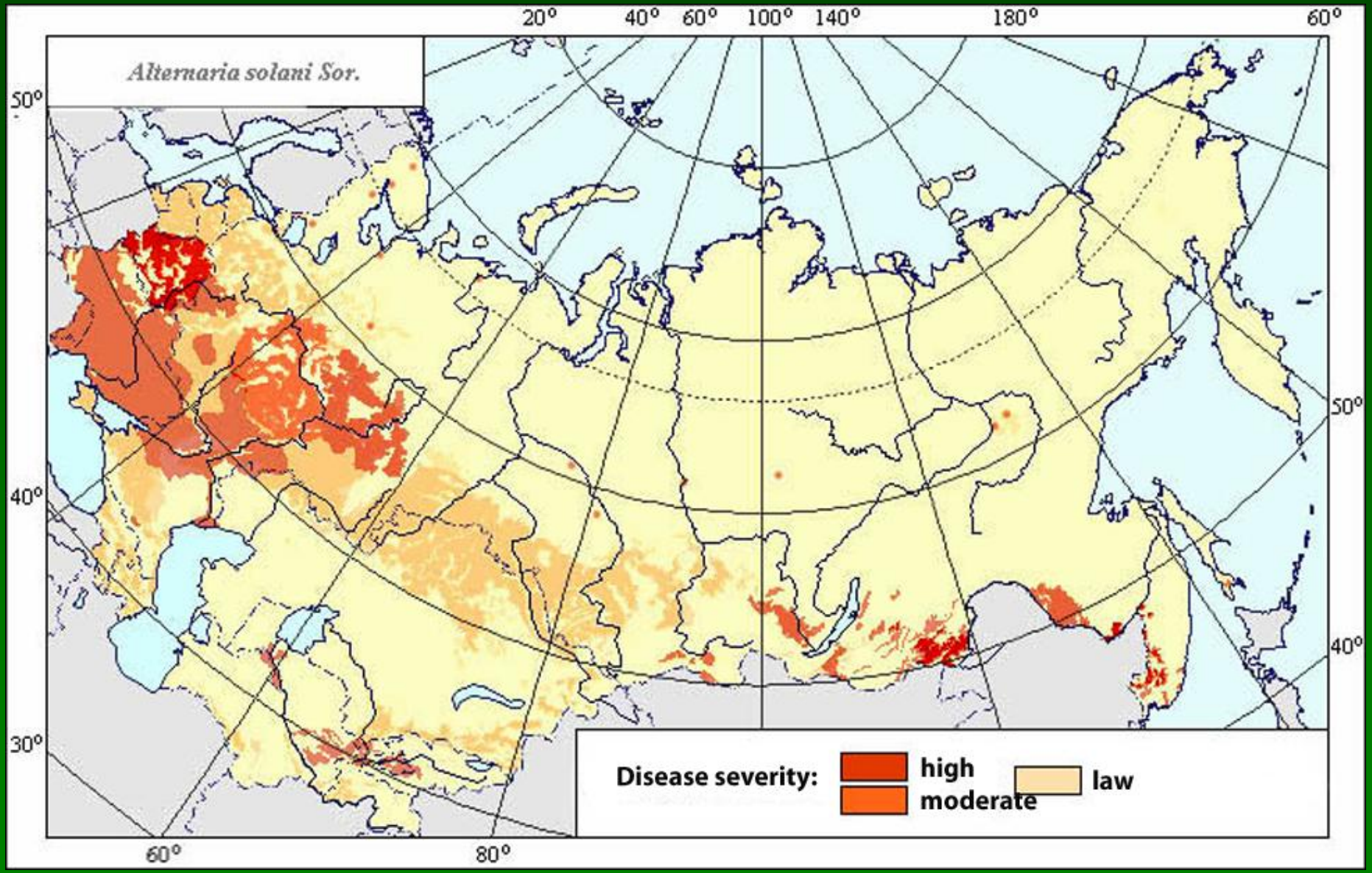
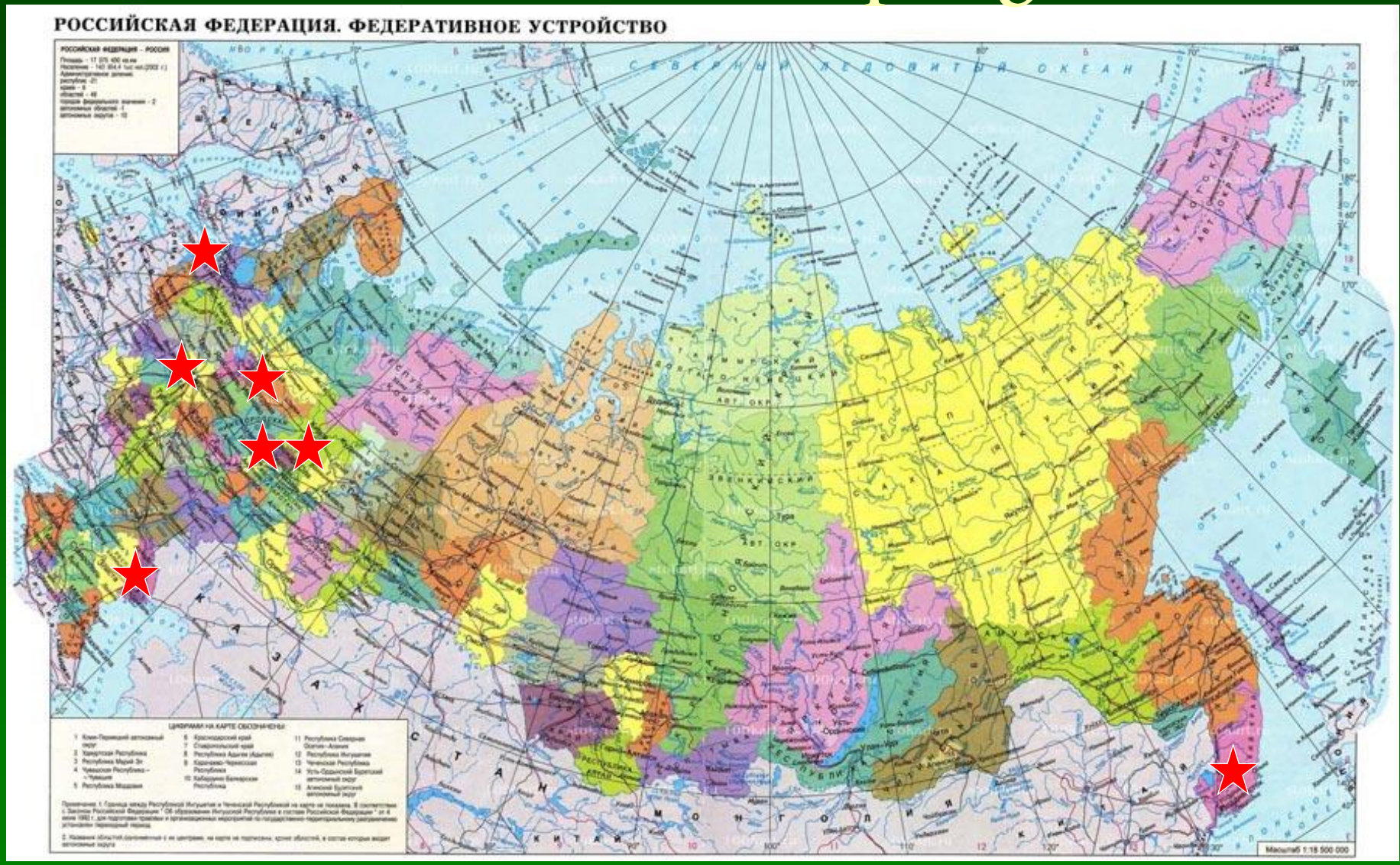
Distribution of potato and tomato early blight in Russia



Collecting blighted samples

Samples with typical symptoms were used for isolation

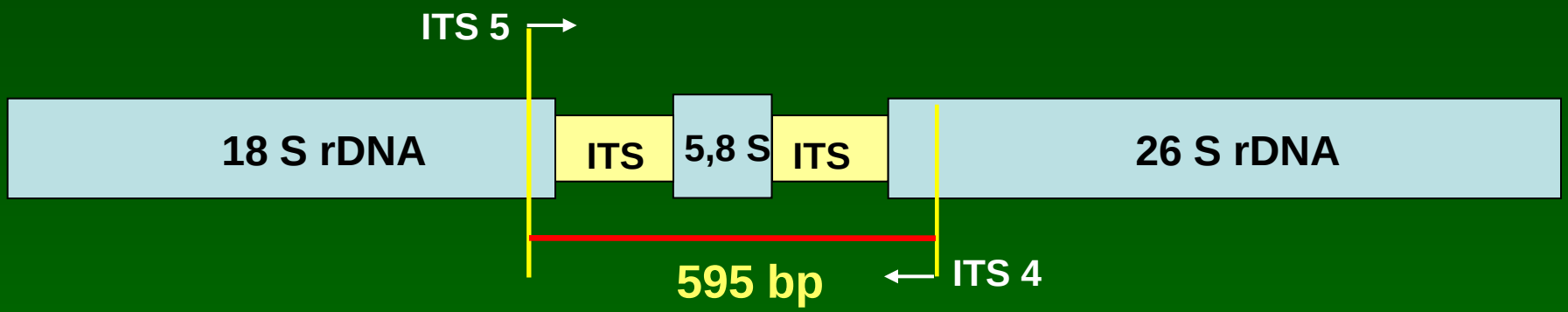
Locations of sampling sites



190 isolates from 7 locations were tested

Composition of species

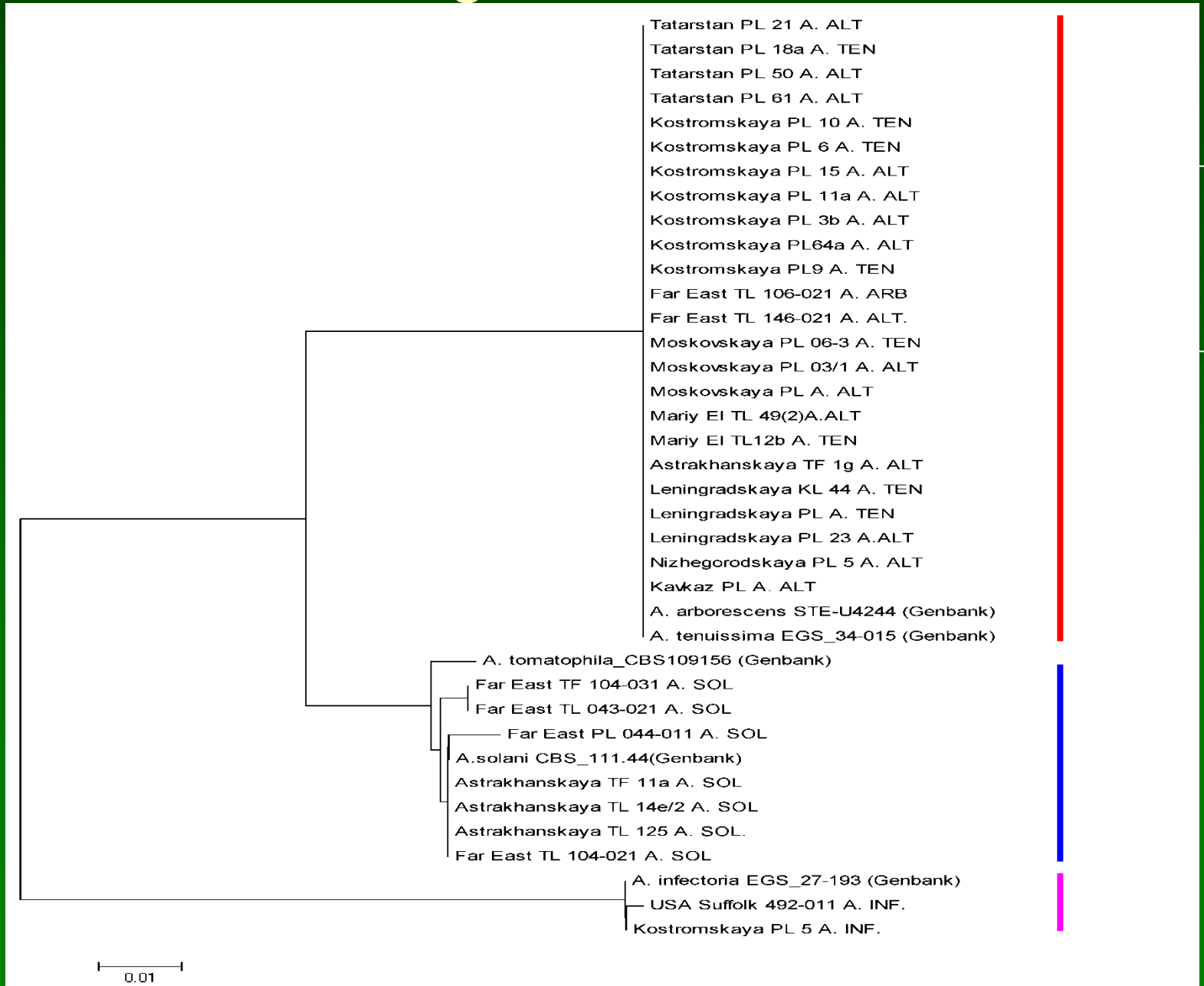
Location of the sequenced region and positions of primers ITS 5 and ITS 4



Name of primer	Sequence
Forward primer ITS 5 (White et al, 1990)	5' – GGAAGTAAAAGTCGTAACAAGG
Reverse primer ITS 4 (White et al, 1990)	5' – TCCTCCGCTTATTGATATGC

Sequence of this region allows to identify the small-spore species, A. solani, A. tomatophila, A. infectoria.

ITS 5 – ITS 4 regions of 33 strains were sequenced



Small-spore strains

Large-spore strains

A. infectoria

List of the identified species:

Alternaria solani Sorauer

A. infectoria E.G. Simmons

Group of small – spore species

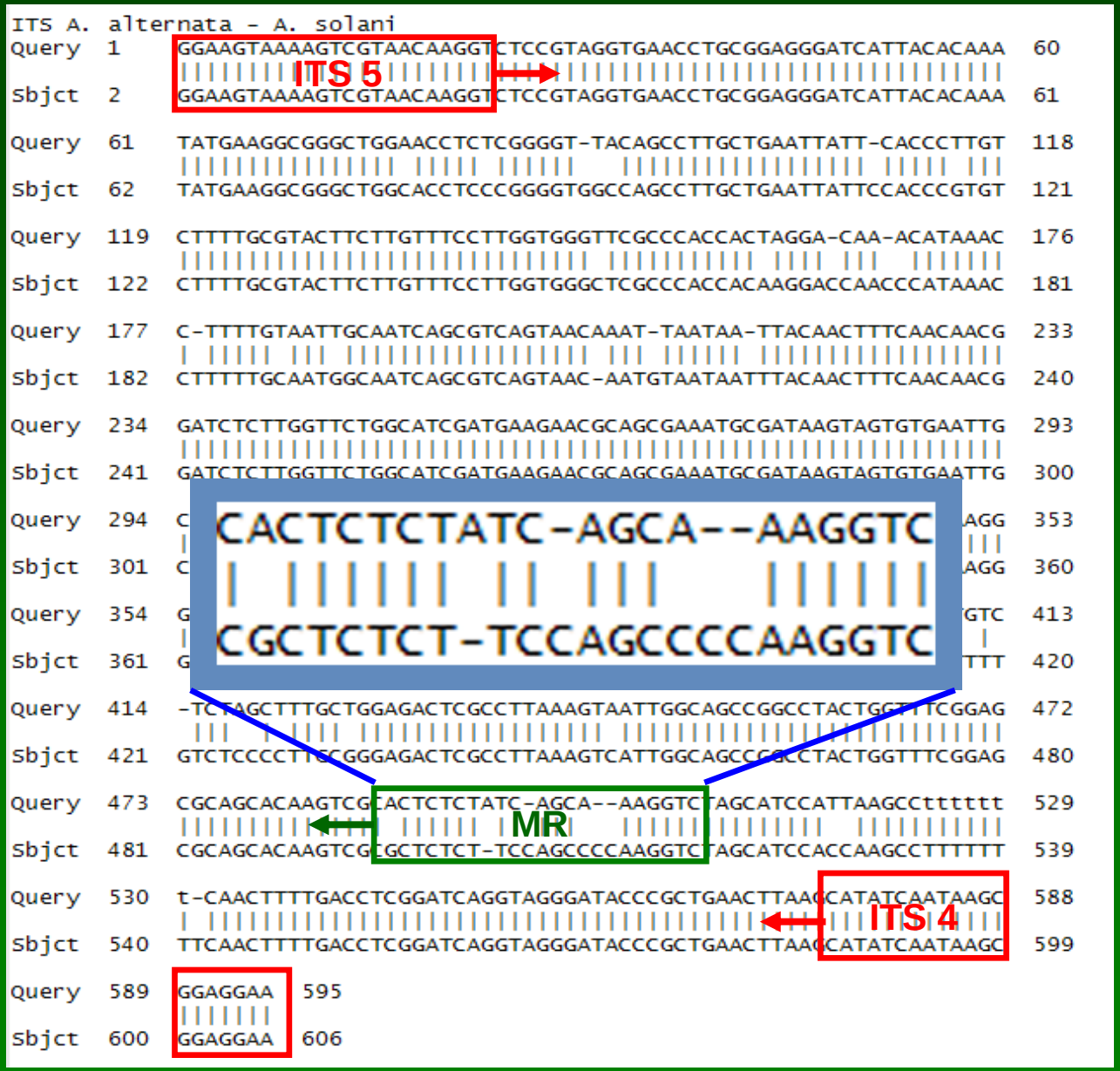
After morphological investigation this group was devoted to 3 species:

***A. alternata* (Fr.) Keissl.**

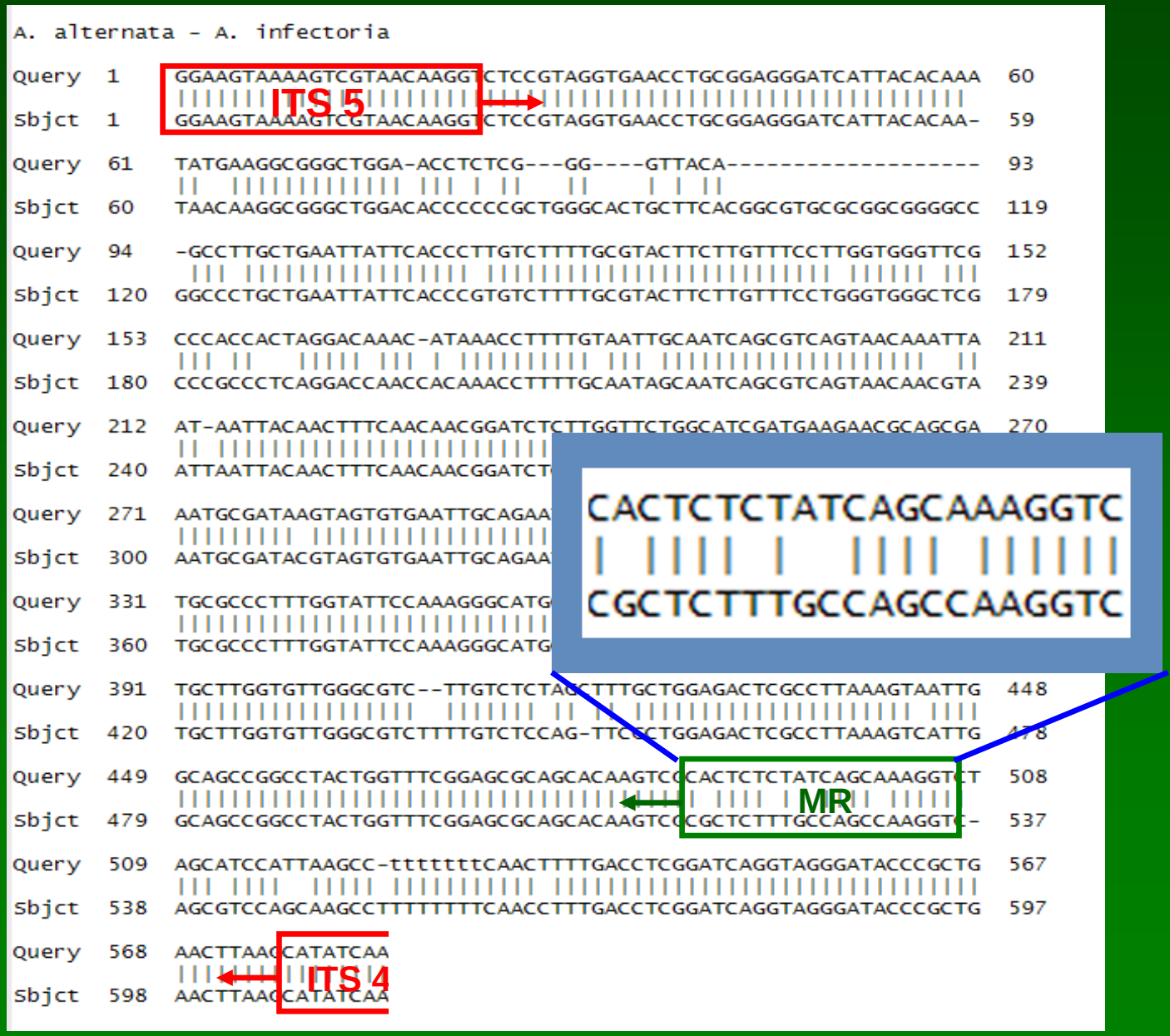
***A. infectoria* E.G. Simmons**

***A. tenuissima* (Kunze) Wiltshire**

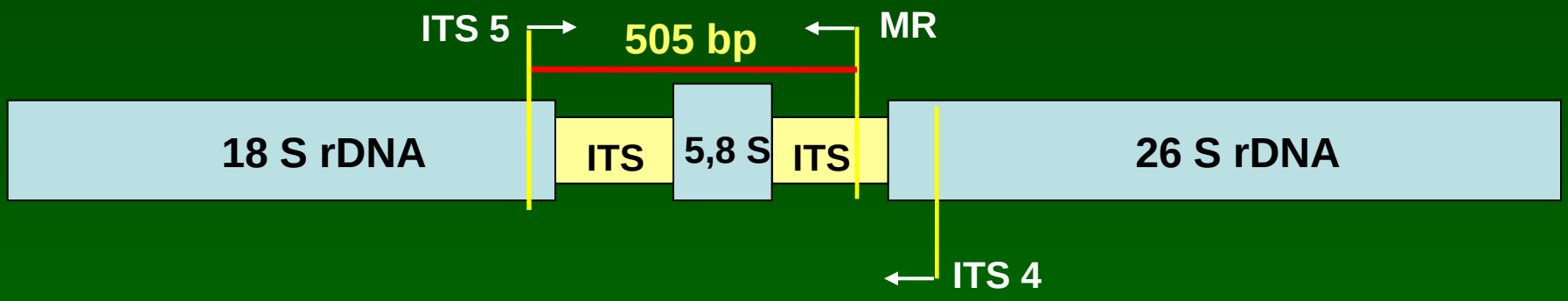
Comparison of ITS 4 – ITS 5 regions of A. alternata and A. solani



Comparison of ITS 4 – ITS 5 regions of A. alternata and A. infectoria



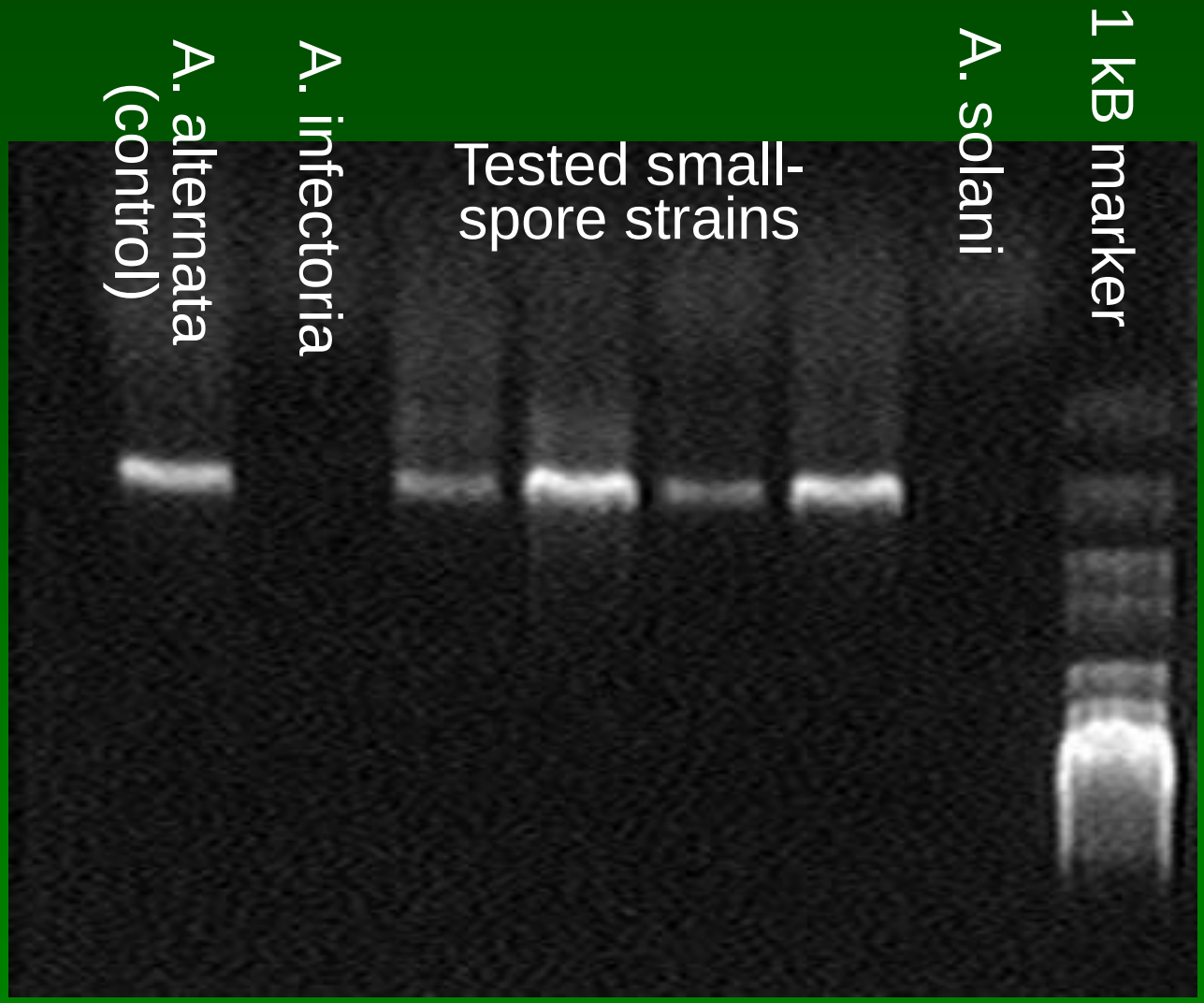
Location of the sequenced region and positions of primers ITS 5 and MR



Name of primer	Sequence
Forward primer ITS 5 (White et al, 1990)	5’ – GGAAGTAAAAGTCGTAACAAGG
Reverse primer MR	5’ – GACCTTTGCTGATAGAGAGTG

Pare of primers ITS 5 – MR allow to distinguish species with small spores from A. solani and A. infectoria

Application of primers ITS 5 and MR for Alternaria species identification



190 Alternaria sp. strains were tested

Identification of species

Isolation in pure culture

Extraction of DNA (CTAB method)

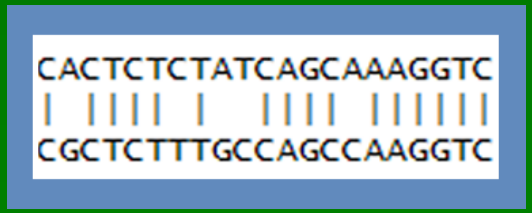
PCR with pare of primers ITS 5 - MR

Small-spore group

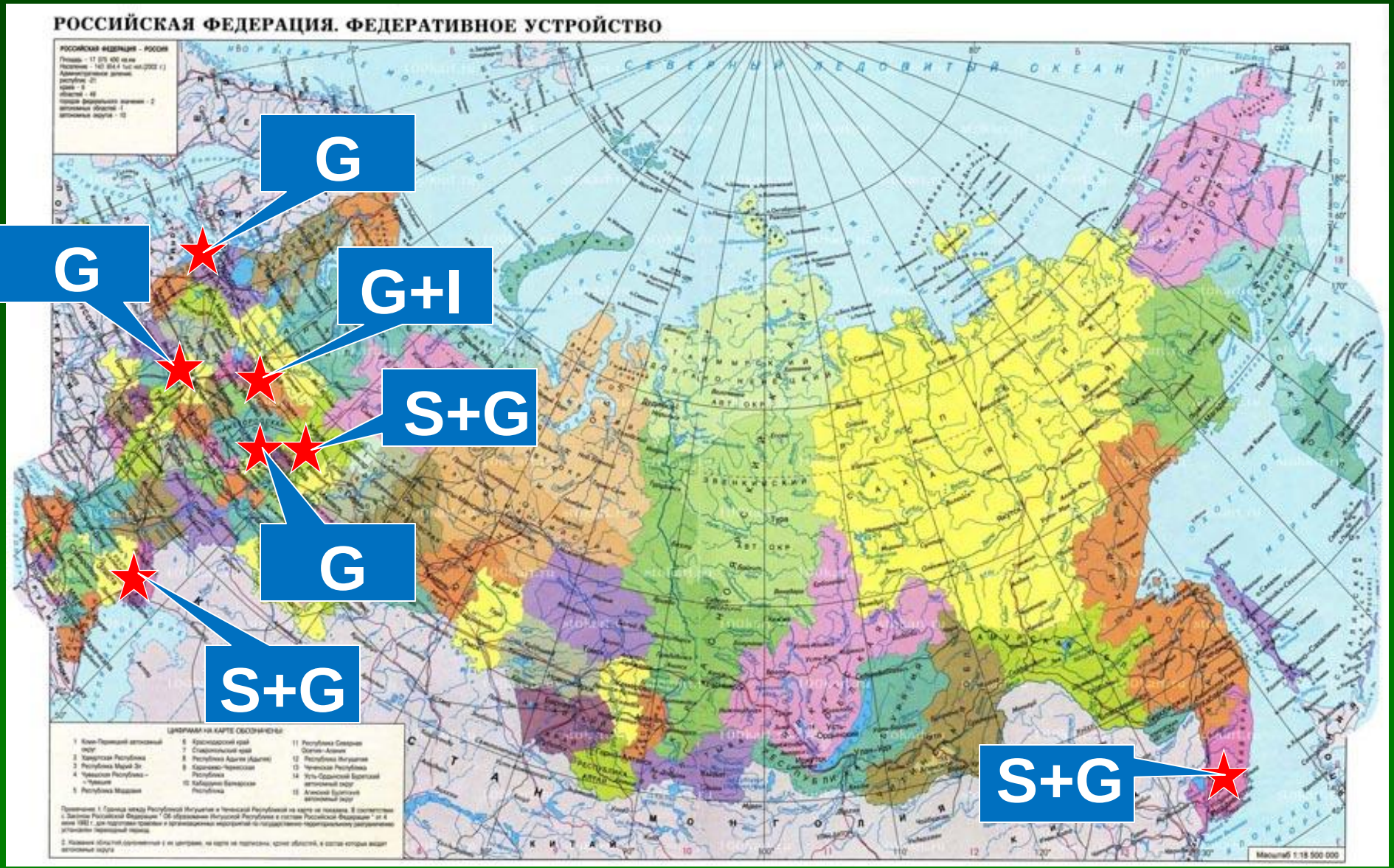
Not small-spore group

Morphological identification

Sequencing



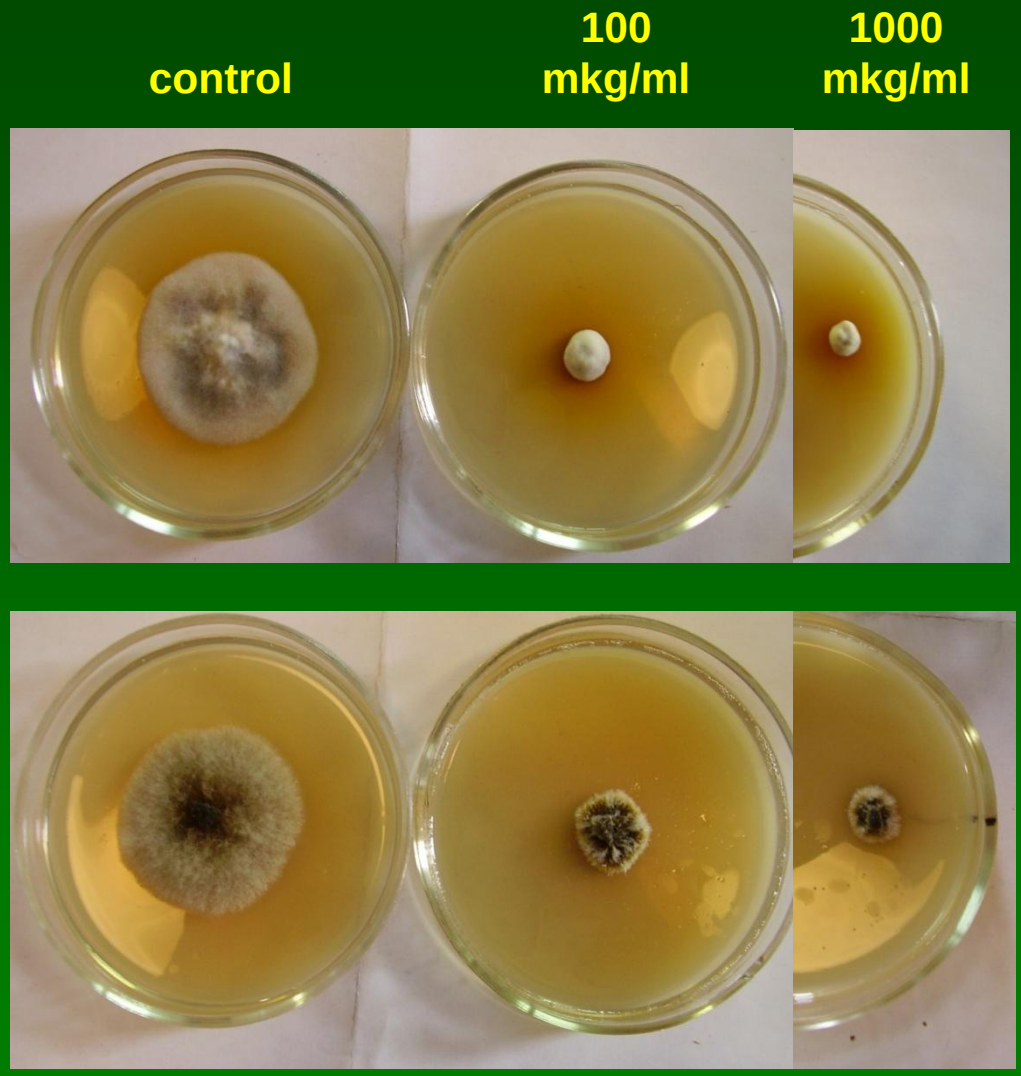
Species of Alternaria in different regions



S – A. solani, I – A. infectoria, G – group of small spore species

Resistance to fungicides

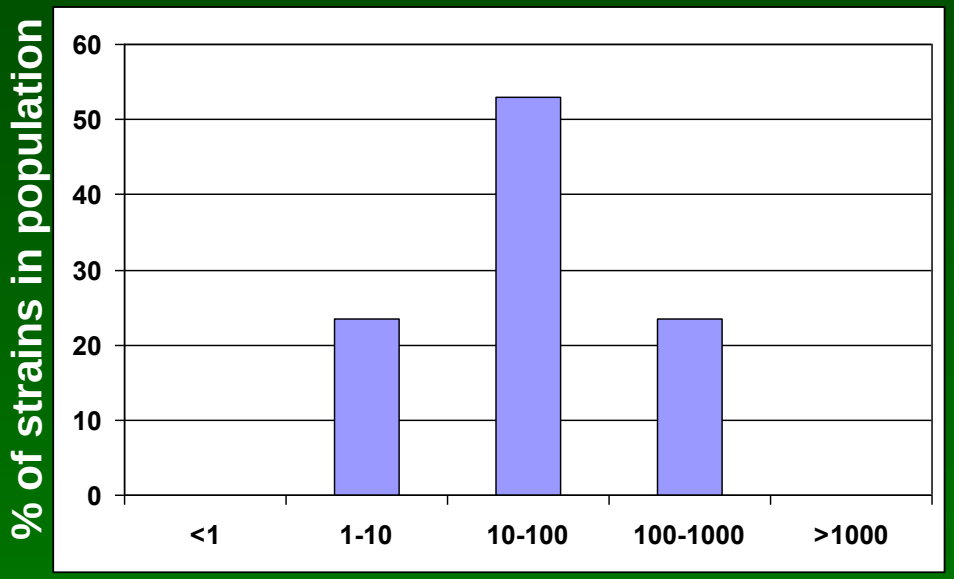
Testing of the resistance to fungicides



EC_{50} – concentration of the fungicide in agar media twice decreasing the growth rate of the colony. Concentrations 0,1; 1; 10; 100; 1000 mkg/ml were used for testing.

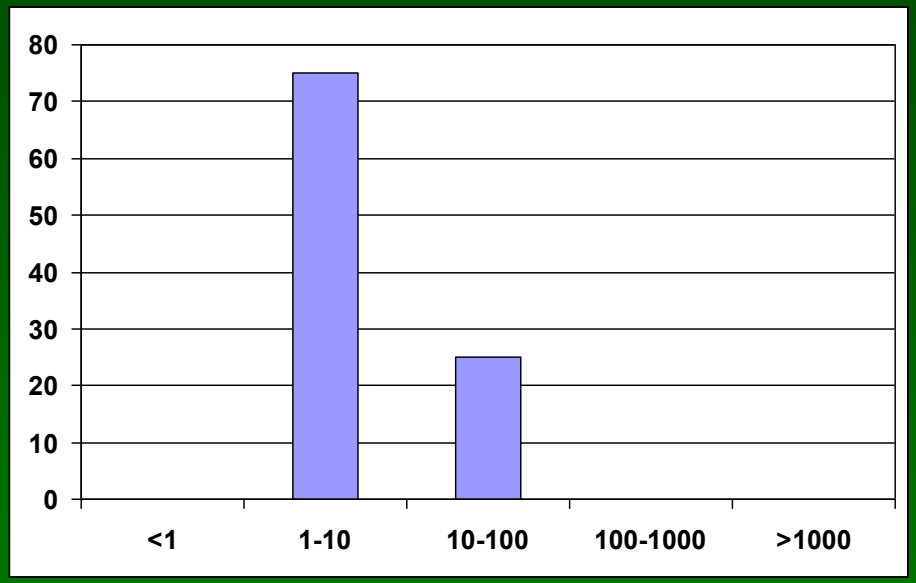
Resistance to mancozeb

Small spore species



EC_{50} range

A. solani

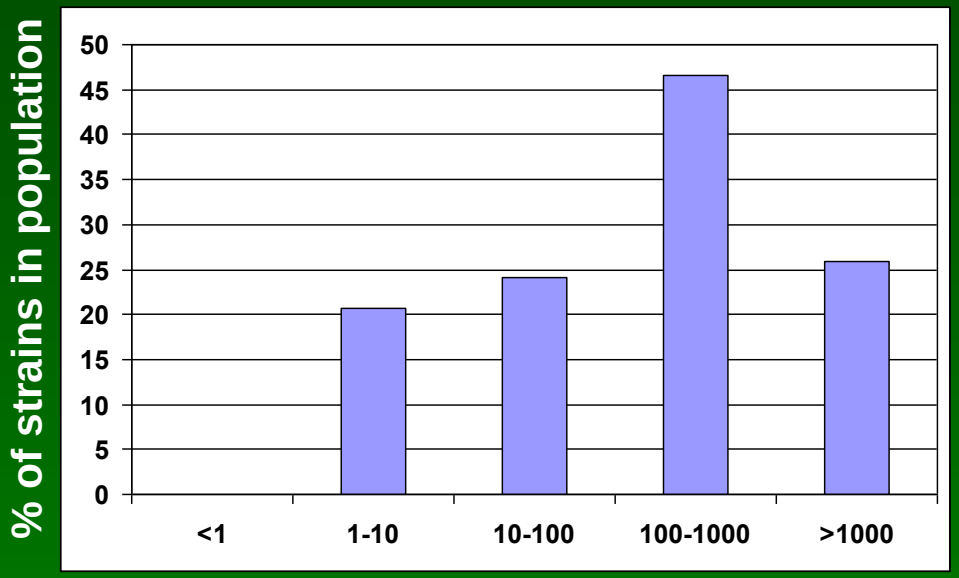


EC_{50} range

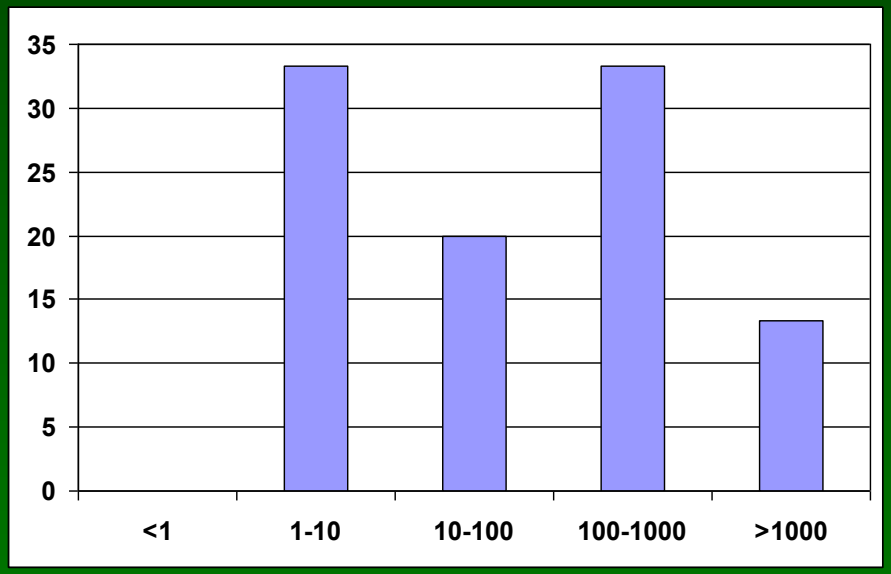
There were no highly resistant *A. solani* strains to mancozeb in all tested field populations.

Resistance to chlorothalonil

Small spore species



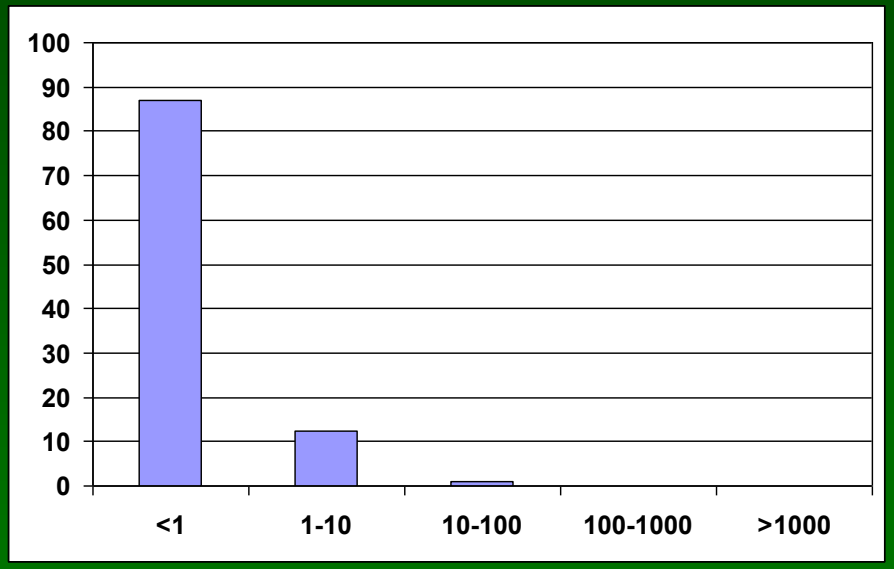
A. solani



There were no differences in resistance of *A. solani* and small spore species to chlorothalonil. Highly resistant strains were found in all tested field populations.

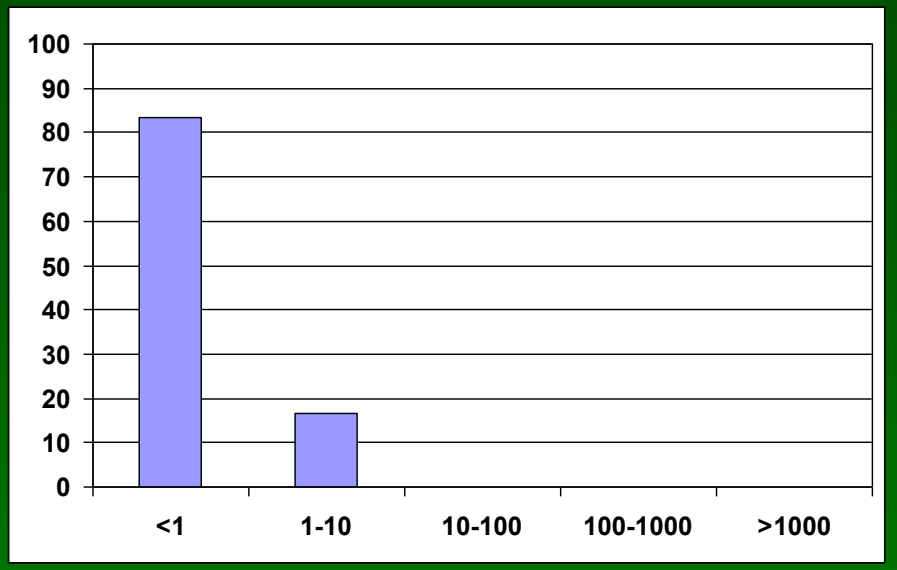
Resistance to fludioxonil

Small spore species



EC_{50} range

A. solani

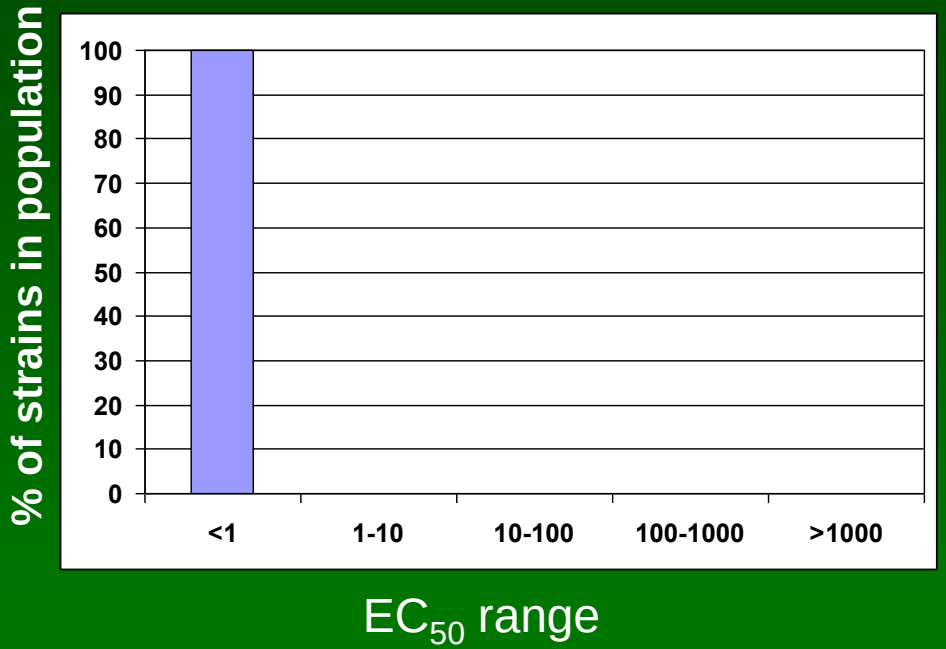


EC_{50} range

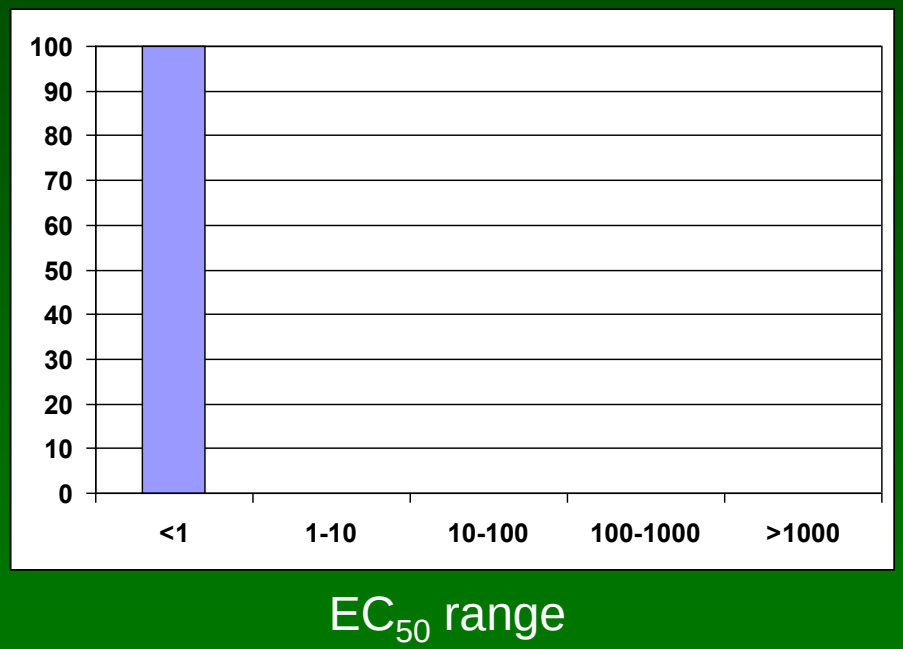
All tested strains were very sensitive to fludioxonil.

Resistance to difenoconazole

Small spore species



A. solani



All tested strains were very sensitive to difenoconazole

Conclusions

Species with small spores (morphologically identified as *A. alternata*, *A. tenuissima*, and *A. arborescens) were found in all tested populations,*

A. solani *was found in Astrakhan region, Mari-El, and Far East,*

A. infectoria *was found only one strain in Kostroma region.*

All tested strains were highly sensitive to **fludioxonil** and **difenokonazole**

All tested A. solani strains were sensitive to **mankozeb**, but there was many resistant strains between small-spored Alternaria.

Majority of strains were resistant to **chlorothalonile**.

Thank you for your attention!