Jet Propulsion Laboratory
California Institute of Technology

Fusarium oxysporum isolates from the ISS represent a novel strain with possible virulence in humans

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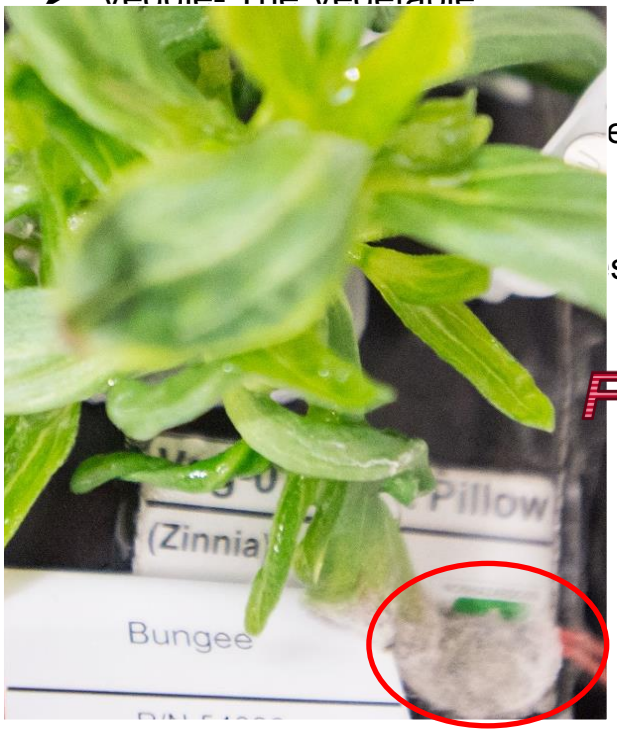
International Space Station Projects

- Are they all the same strain?
- Is there a contamination problem on the ISS?
- Are project related microbes, for whatever reason, not being contained from crew living environment

Purpose:

- Need to improve habitability on long duration space missions
- Veggie- The Vegetable



e

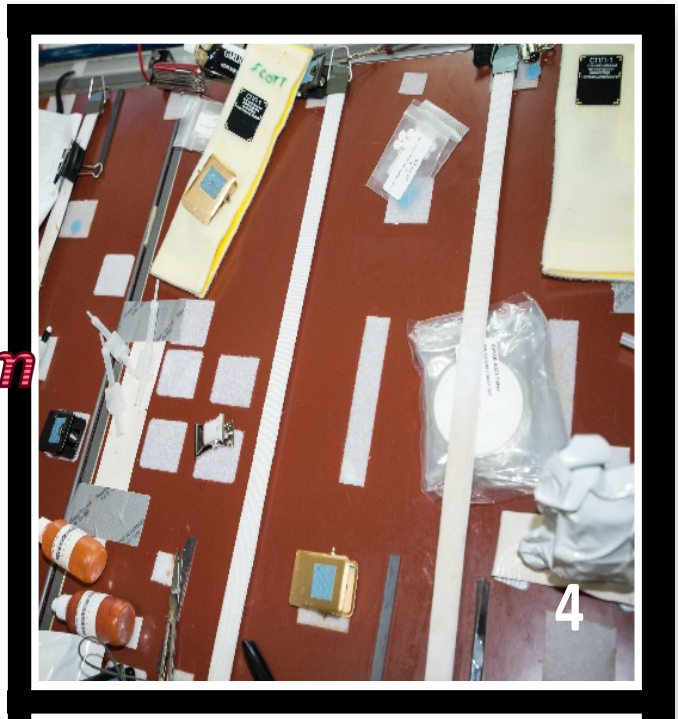
ss

Fungus

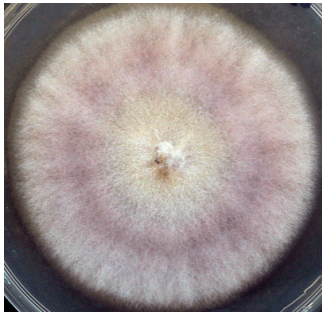
Fusarium oxysporum

Purpose:

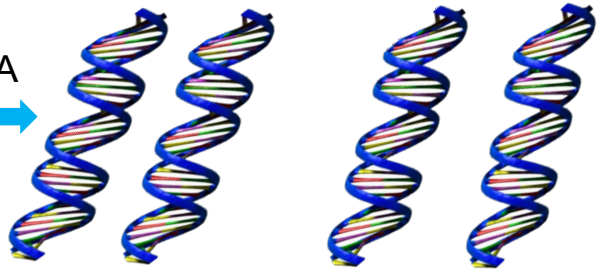
- Characterize airborne and surface-associated microbes



Methodology



Extract DNA



Zinnia Leaf "Leaf"

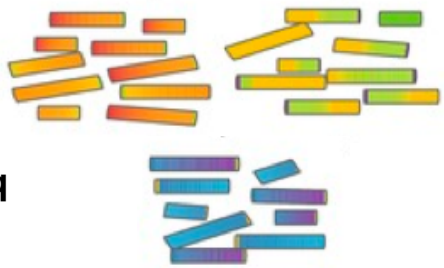
Zinnia Root "ASF164"

ISS dining table "F3"

ISS dining table "F4"

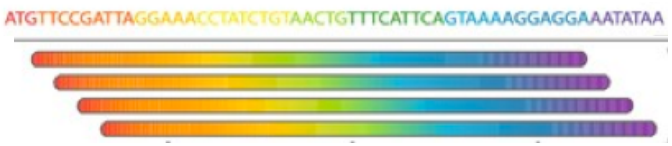
WGS

Illumina HiSeq

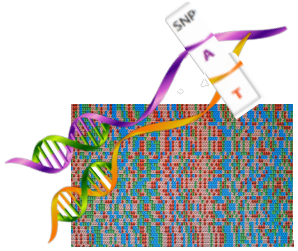


De novo assembly of reads

Tool: AbySS



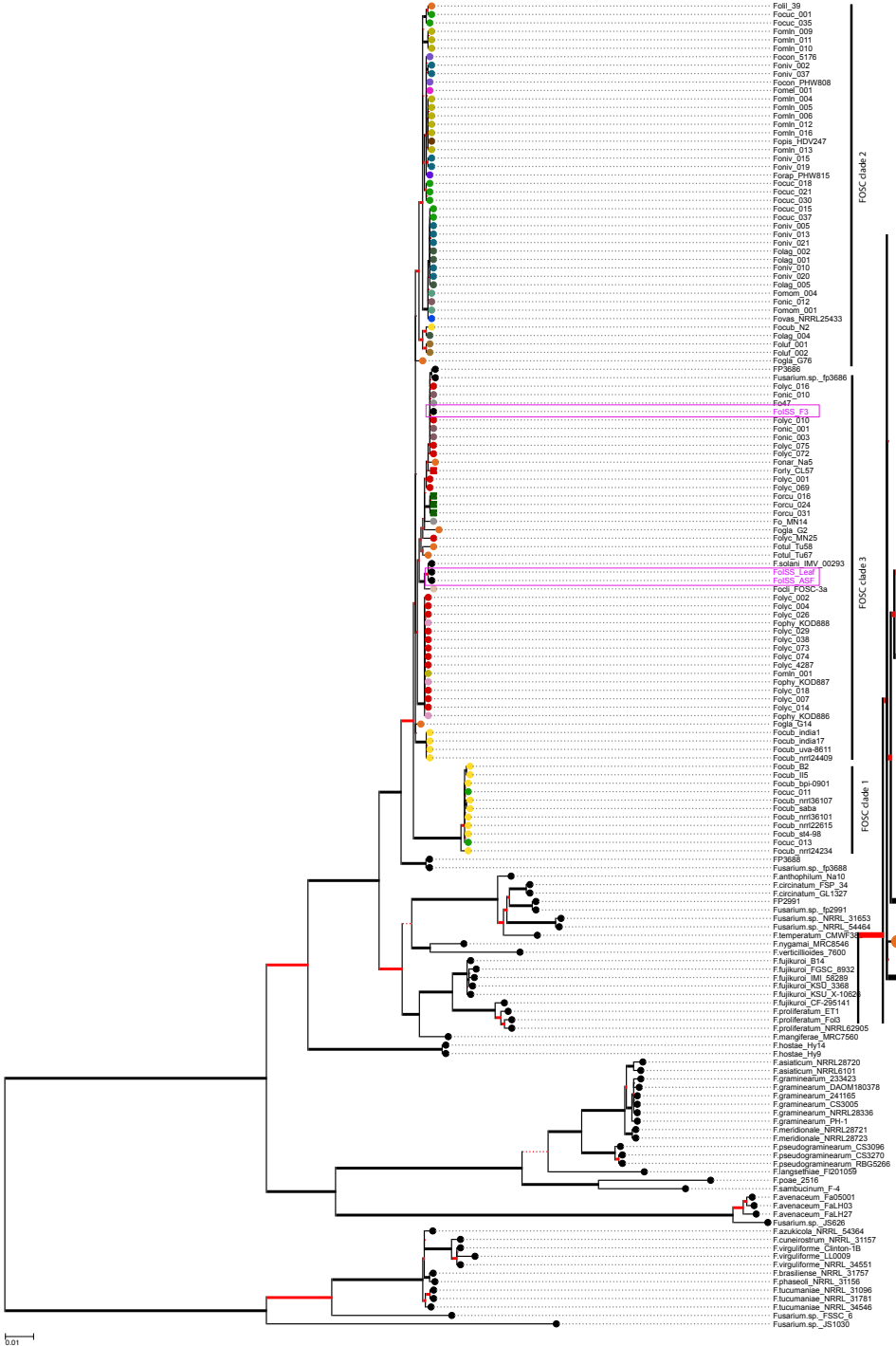
Comparative genomics

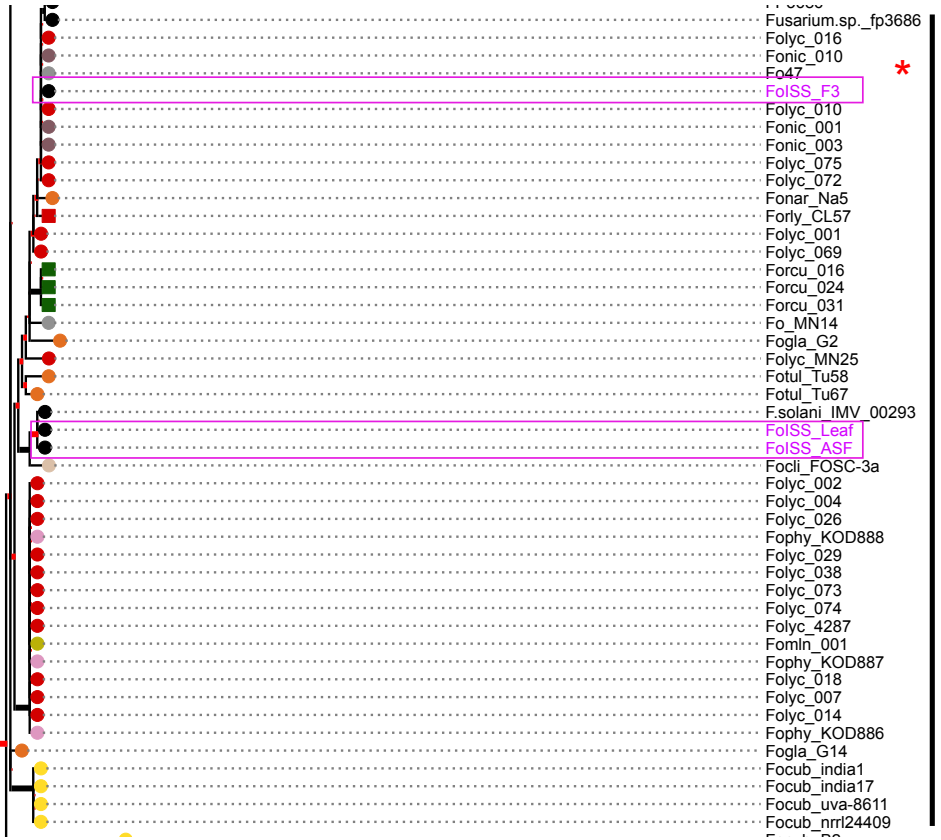


SNP analysis **Tool: PhaMe**

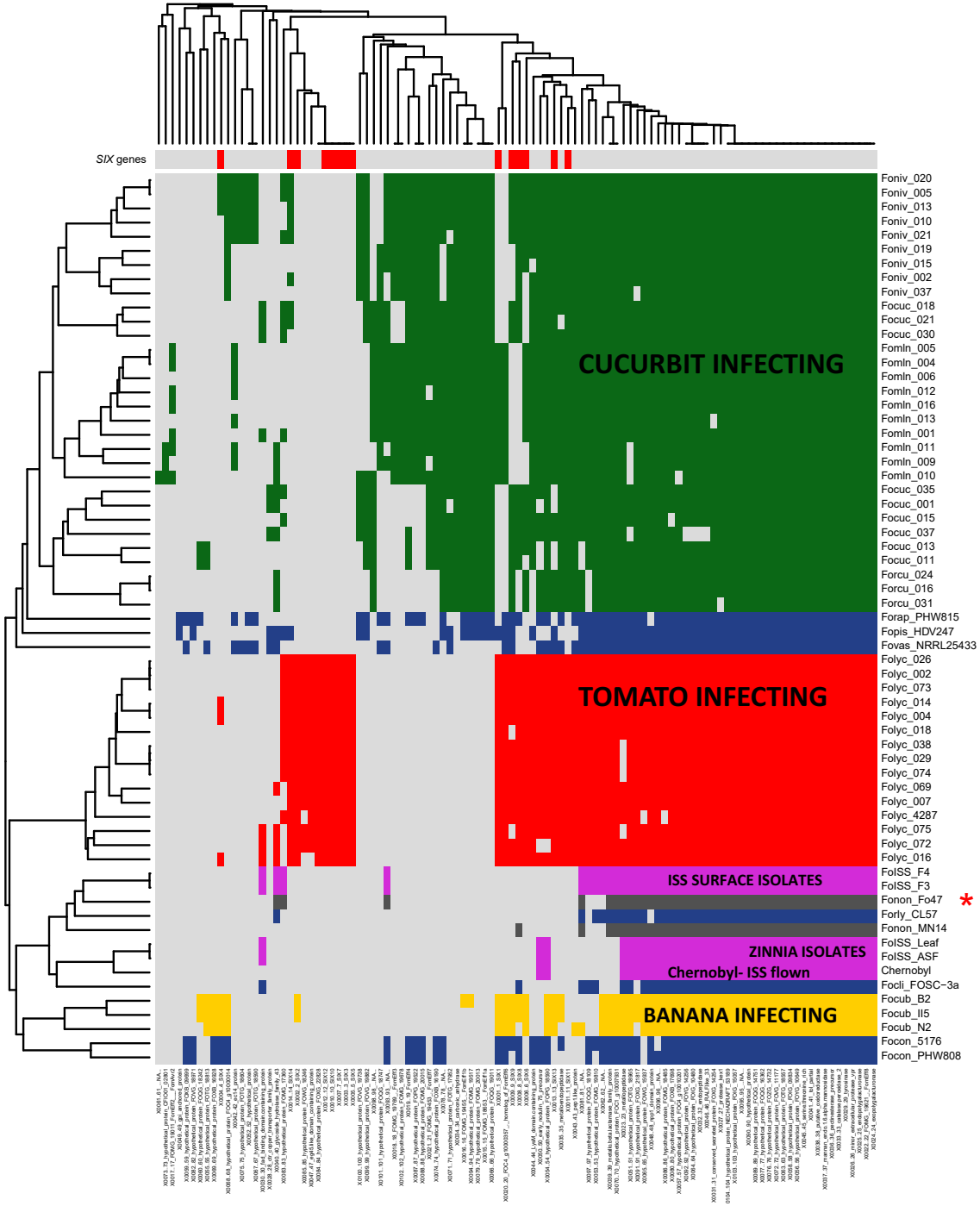
MLST

Identification with MLST

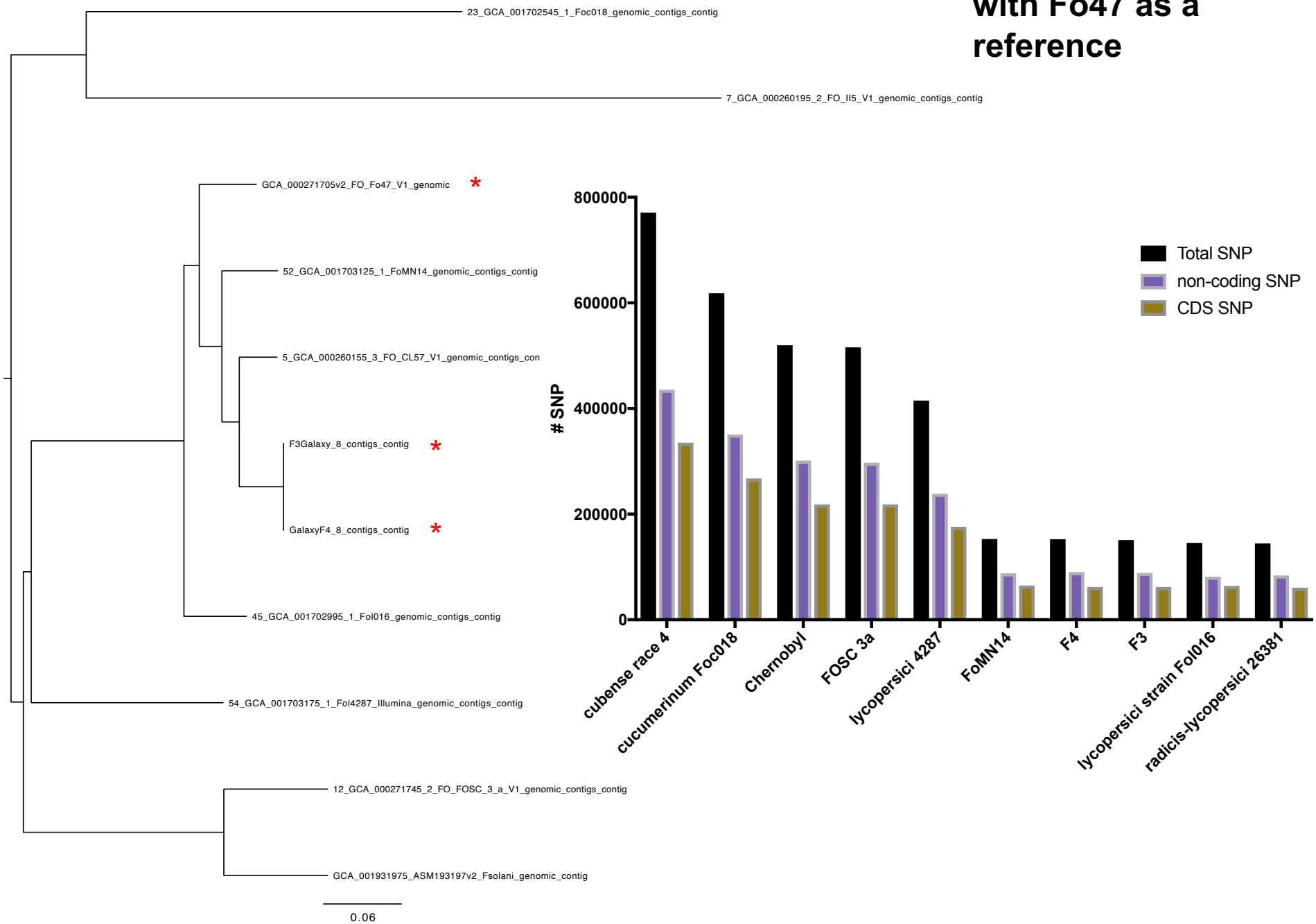




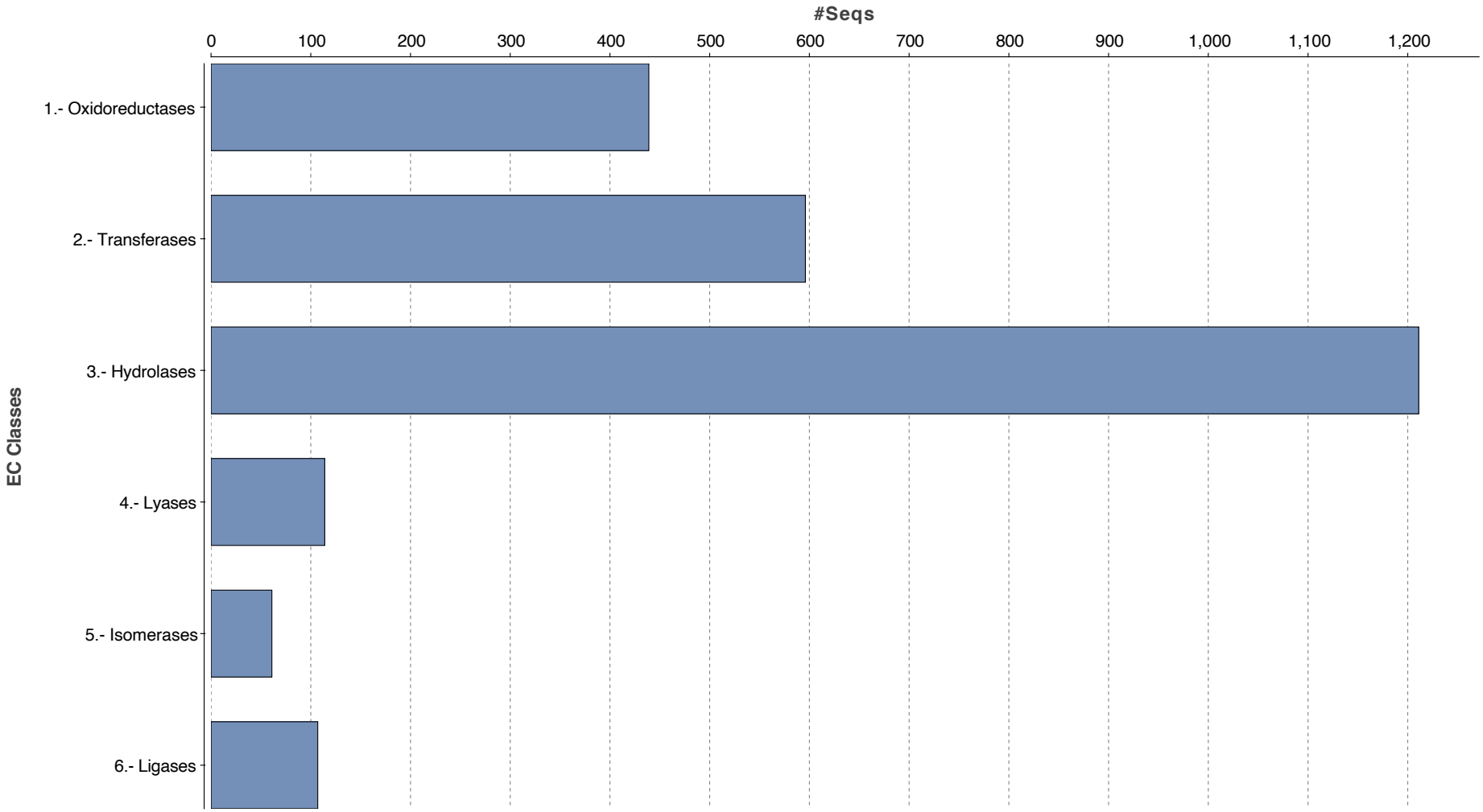
Effector/virulence profiles



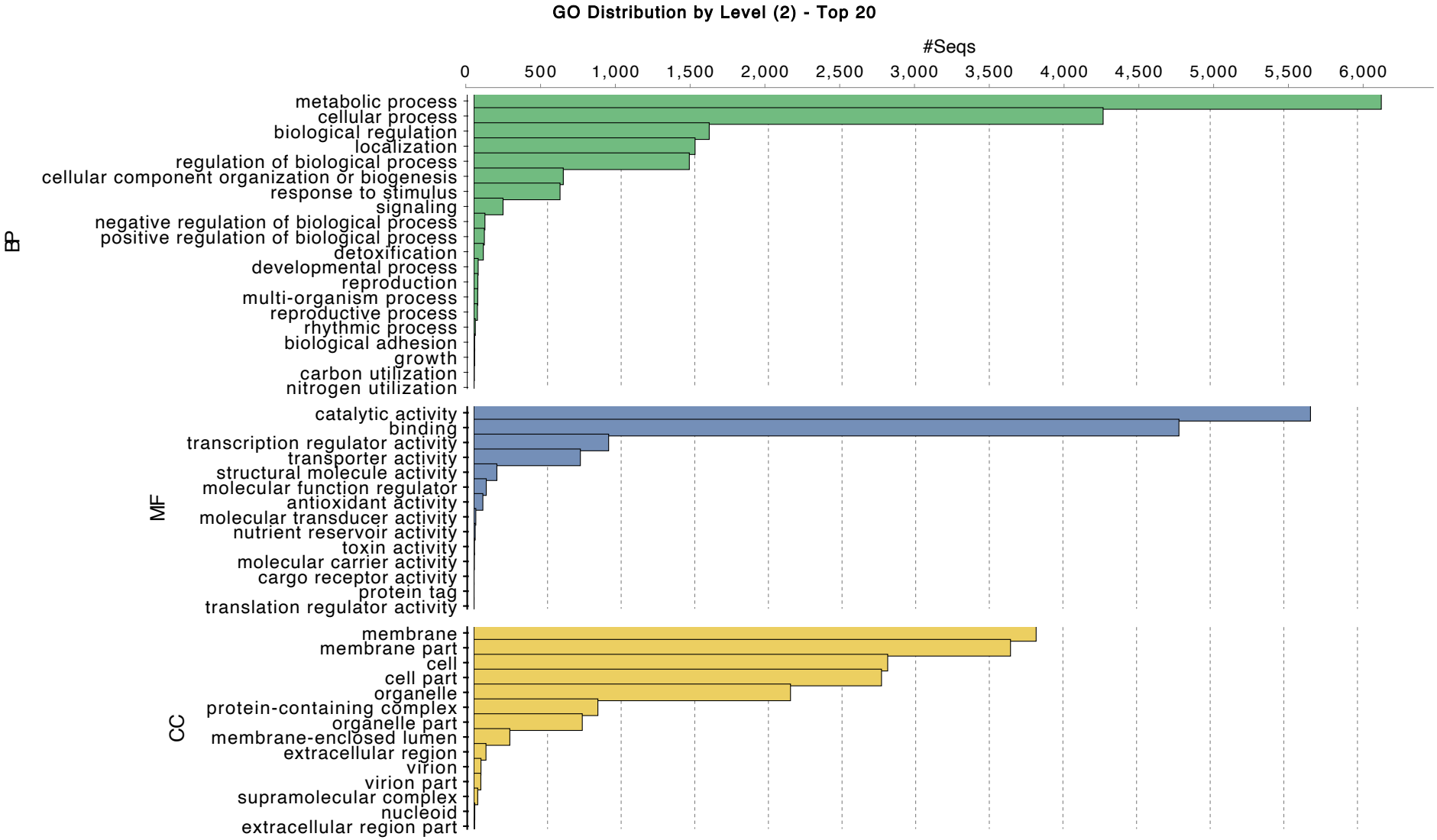
SNP analysis of CDS with Fo47 as a reference



Enzyme Distribution ISS_F3 and ISS_F4



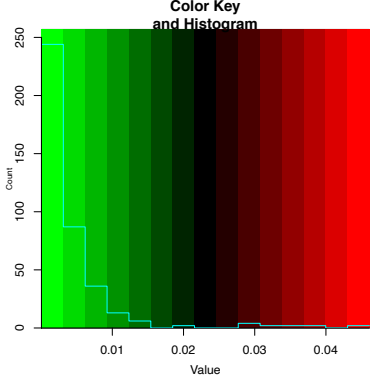
Gene Ontology Distribution ISS_F3 and ISS_F4

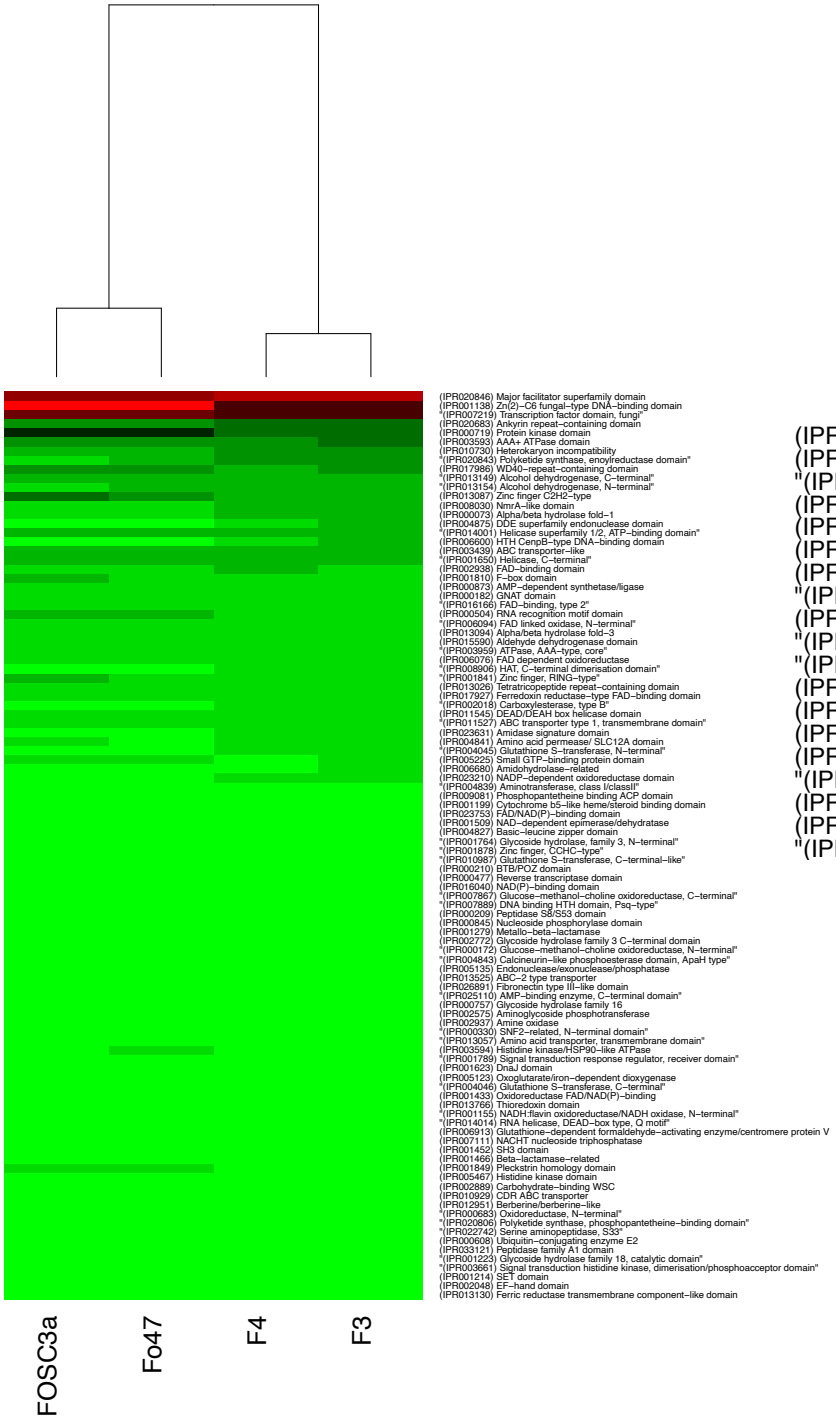


Presence/absence of polyketide synthases in *Fusarium oxysporum*

Gene	F3	F4	FoZG	FoYG	FoXG	FoXB	FoQG	FoTG	FoMG	FoIG	FoCG	FoWG	FoVG	FoPG	Product
PKS2															
PKS3															Fusarabin
PKS5															
PKS7															
PKS8															
PKS16															Bikaverin
PKS17															Depudecin
PKS18															Equisetin
PKS19															Fujikurins
PKS20															
PKS21															Fusaric acdi
PKS22															
PKS27															
PKS28															
PKS50															
PKS51															

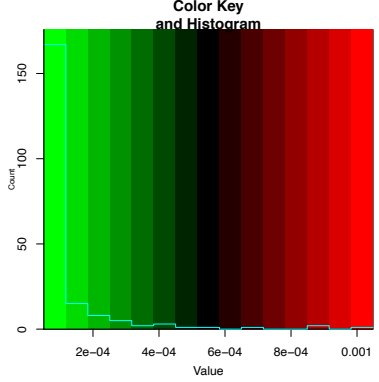
Comparison of relative abundances of protein domains





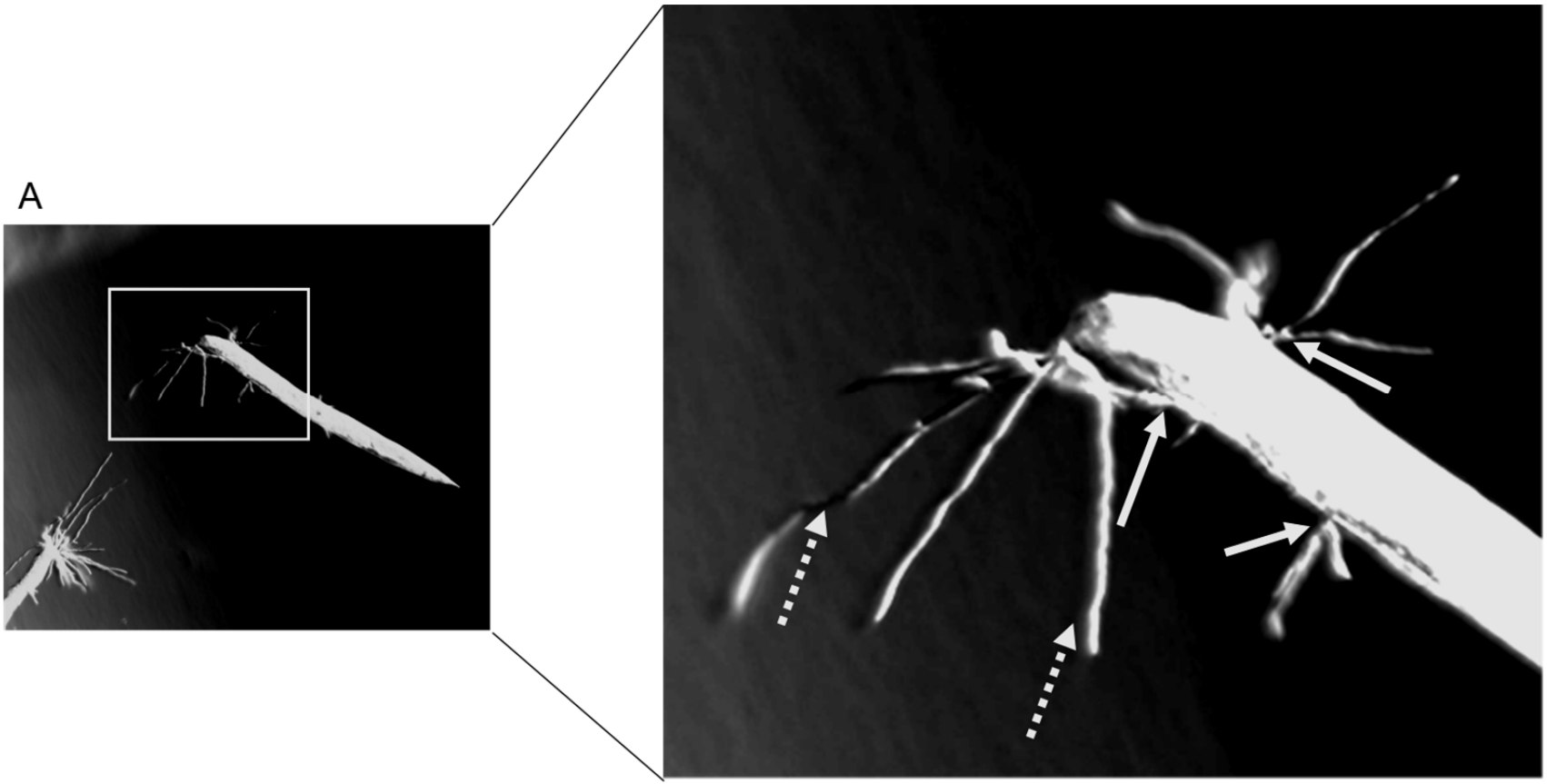
(IPR020846) Major facilitator superfamily domain
(IPR001138) Zn(2)−C6 fungal−type DNA−binding domain
"(IPR007219) Transcription factor domain, fungi"
(IPR020683) Ankyrin repeat−containing domain
(IPR000719) Protein kinase domain
(IPR003593) AAA+ ATPase domain
(IPR010730) Heterokaryon incompatibility
"(IPR020843) Polyketide synthase, enoylreductase domain"
(IPR017986) WD40−repeat−containing domain
"(IPR013149) Alcohol dehydrogenase, C−terminal"
"(IPR013154) Alcohol dehydrogenase, N−terminal"
(IPR013087) Zinc finger C2H2−type
(IPR008030) NmrA−like domain
(IPR000073) Alpha/beta hydrolase fold−1
(IPR004875) DDE superfamily endonuclease domain
"(IPR014001) Helicase superfamily 1/2, ATP−binding domain"
(IPR006600) HTH CenpB−type DNA−binding domain
(IPR003439) ABC transporter−like
"(IPR001650) Helicase, C−terminal"

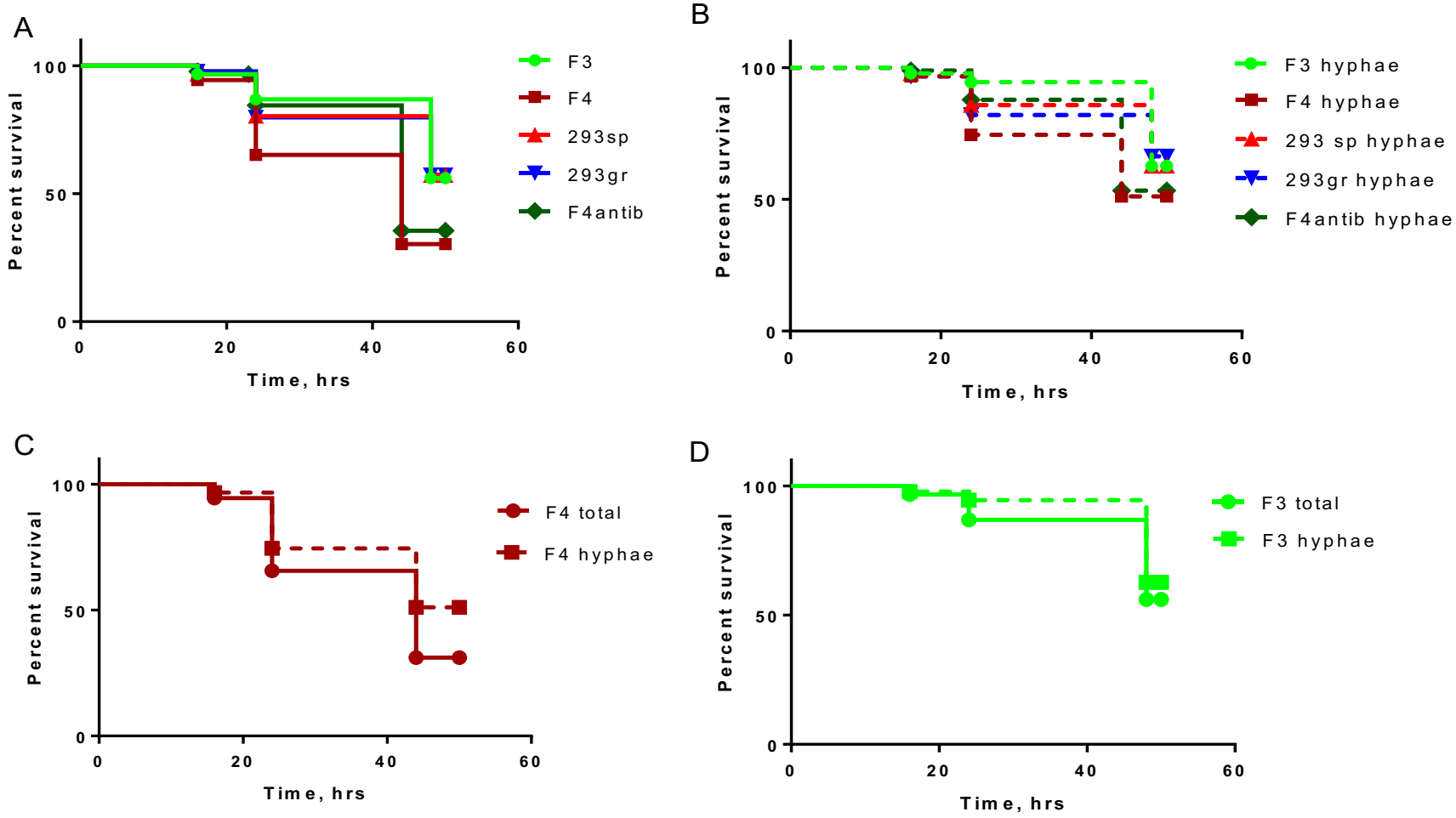
Presence/absence profile of protein domains



Grey= not present in the genome

Virulence assay in a *C.elegans* invasive fusariosis model




A
Percent survival
100
50
0
0
20
40
60
Time, hrs
F3
F4
293sp
293gr
F4antib
B
Percent survival
100
50
0
0
20
40
60
Time, hrs
F3 hyphae
F4 hyphae
293 sp hyphae
293gr hyphae
F4antib hyphae
C
Percent survival
100
50
0
0
20
40
60
Time, hrs
F4 total
F4 hyphae
D
Percent survival
100
50
0
0
20
40
60
Time, hrs
F3 total
F3 hyphae

Acknowledgements

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