

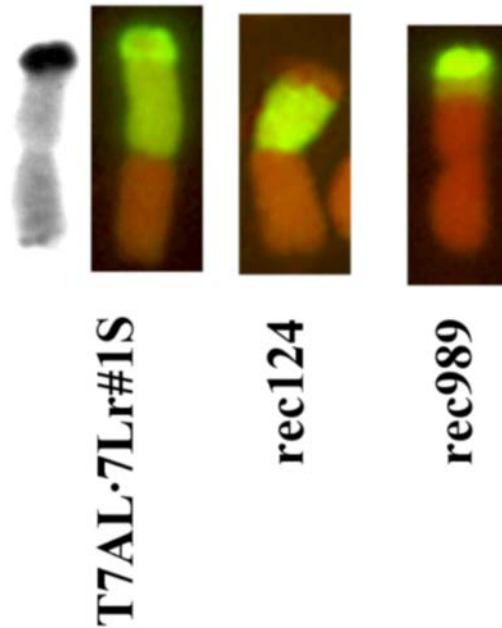
Novel sources of Fusarium head blight resistance derived from wild wheat relatives

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- Limited FHB resistance present in the primary and secondary gene pool of wheat
- To date, only 7 FHB resistance genes have been named and 3 were derived from the tertiary gene pool
- *Fhb3* derived from *Leymus racemousus* ($2n=4x=28$) [Qi et al. 2008]
- *Fhb6* derived from *Elymus tsukushiensis* ($2n=6x=42$) [Cainong et al. 2015]
- *Fhb7* derived from *Thinopyrum elongatum* ($2n=10x=70$) [Dr. Kong's group: Guo et al. 2015, Wang et al. 2020]

Fhb3 derived from *Leymus racemosus*

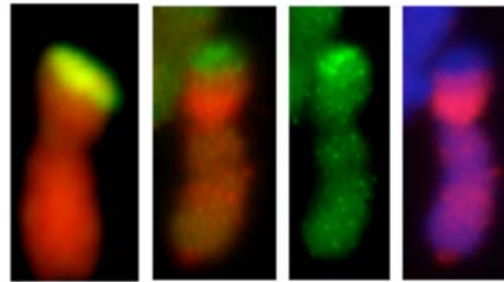


Qi et al. (2008) Theor Appl Genet 117: 155-1166

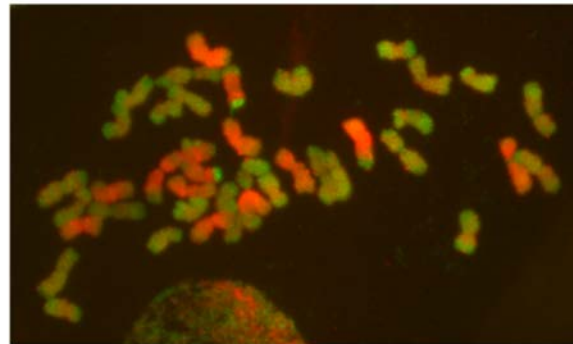
Fhb6 derived from *Elymus tsukushiensis*



KS14WGRC61



T1AL·1AS-1E^{ts}#1S



Cainong et al. (2015) Theor Appl Genet 128: 1019-1027

Greenhouse evaluation of *Fhb6* derivatives after point inoculation

Pedigree	Chromosome constitution	Genetic background	Average FHB rating (%)	Heads inoculated
Everest	Euploid (2n=42)	Everest	27.7	40
TA9107	Euploid (2n=42)	Overley	54.6	40
TA3008	Euploid (2n=42)	Chinese Spring	35.1	42
TA7684-2	DA1E ^{ts} #1	Chinese Spring	12.5	41
2011-56-3	Hom T1AL·1AS-1E ^{ts} #1S	Chinese Spring	4.2	40
2011-56-10	Hom T1AL·1AS-1E ^{ts} #1S	Chinese Spring	13.3	42
2011-56-13	Hom T1AL·1AS-1E ^{ts} #1S	Chinese Spring	8.9	51
2011-60-5-1	Hom T1AL·1AS-1E ^{ts} #1S	Chinese Spring	8.6	40
2011-56-4	No E. tsukushiensis chromatin	Chinese Spring	31.7	40
2011-60-5-2	No E. tsukushiensis chromatin	Chinese Spring	42.5	39

Field evaluation of BC₁F₆ *Fhb6* introgressions into Lyman and Overland backgrounds

Line	2020 ID	2019 ID	FHB Incidence		Heading		Height 2020	1000 tkw 2020	DON 2019
			2020	2019	<u>2020</u>	<u>2019</u>			
Lyman	RF20FH0011, B4	RF19FH0041, B14	80	80	5/20	5/30	101	23.4	12.7
Overland	RF20FH0034, A12	RF19FH0013, A5	80	80	5/21	5/30	91	19.6	22.7
Lyman/ <i>Fhb6</i>	RF20Fh0010, A4	RF19FH0032, B11	80	60	5/17	5/26	114	23.9	11.7
Overland/ <i>Fhb6</i>	RF20FH0006, C2	RF19FH0014, B5	50	40	5/21	5/31	104	26.3	not tested
Overland/ <i>Fhb6</i>	RF20FH0009, C3	RF19FH0014, B5	60	40	5/18	5/31	108	24.8	not tested
Overland/ <i>Fhb6</i>	RF20FH0033, C11	RF19FH0014, B5	60	40	5/21	5/31	98	24.1	not tested
Overland/ <i>Fhb6</i>	RF20FH0004, A2	RF19FH0010, A4	60	50	5/16	5/29	114	28.3	10.2
Overland/ <i>Fhb6</i>	RF20FH0035, B12	RF19FH0011, B4	70	30	5/19	5/29	109	26.3	12.6

Seed characteristics of *Fhb6* Lyman introgressions

Lyman/Fhb6
RF19FH0032
Don: 11.7

Lyman
Don: 12.7



2018/19 growing season



2019/20 growing season

2018-19 and 2019-20 | Rocky Ford Scab Nursery | Manhattan KS

Seed characteristics of *Fhb6* Overland introgressions



Overland/*Fhb6*
RF19FH0010
DON: 10.2

Overland
DON: 22.7

Overland/*Fhb6*
RF19FH0011
DON: 12.6

2018-19 | Rocky Ford Scab Nursery | Manhattan KS

Seed characteristics of *Fhb6* Overland introgressions

2019/20 growing season
Overland



Overland/*Fhb6*

Overland/*Fhb6*

Overland/*Fhb6*

2019-20 | Rocky Ford Scab Nursery | Manhattan KS

Novel source of FHB resistance

- HSD2-32 produced at Harbin Normal University by Yanming Zhang

- F7 derivative of Ganmei8

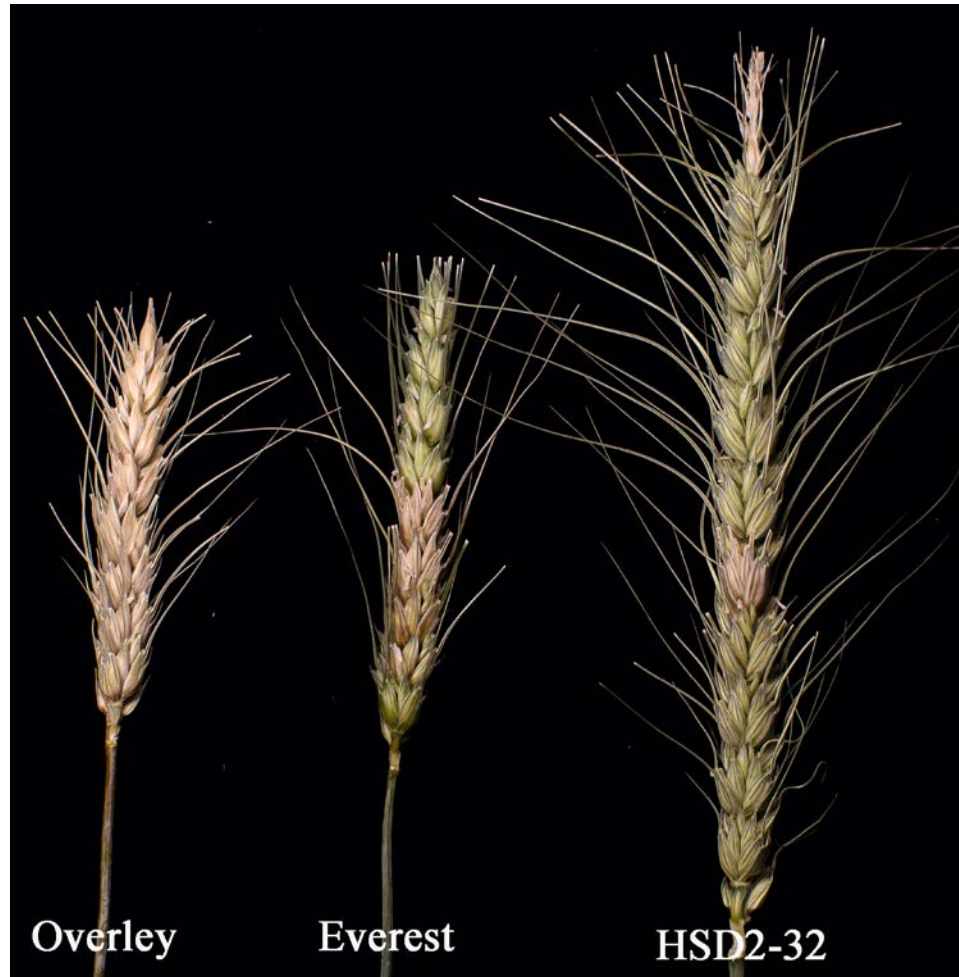
Trielytrigia, 2n=56, AABBDEE

X

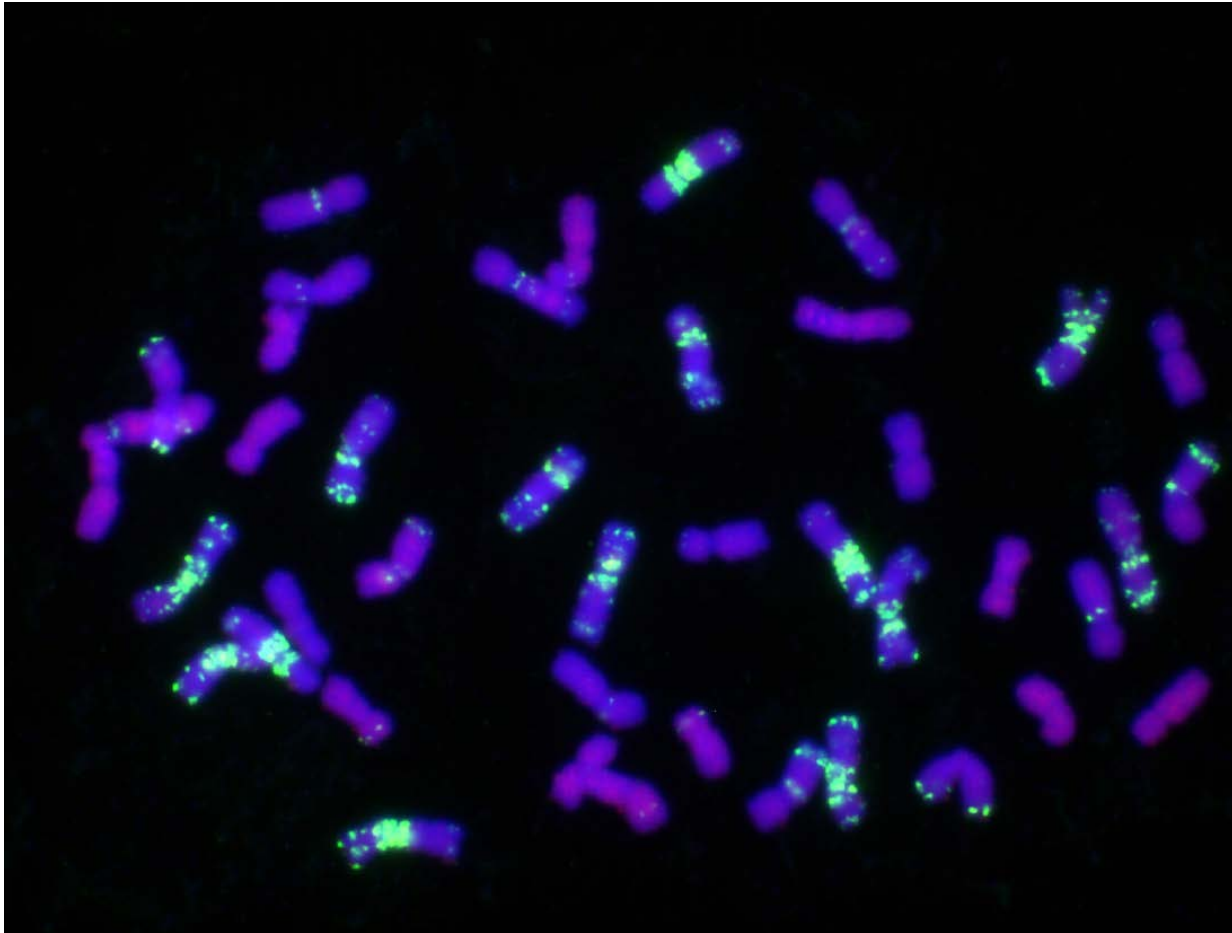
Th. intermedium, 2n=42, JJJ^SJ^SSS

- HSD2-32 has 2n=42 chromosomes but its genome constitution remains unknown

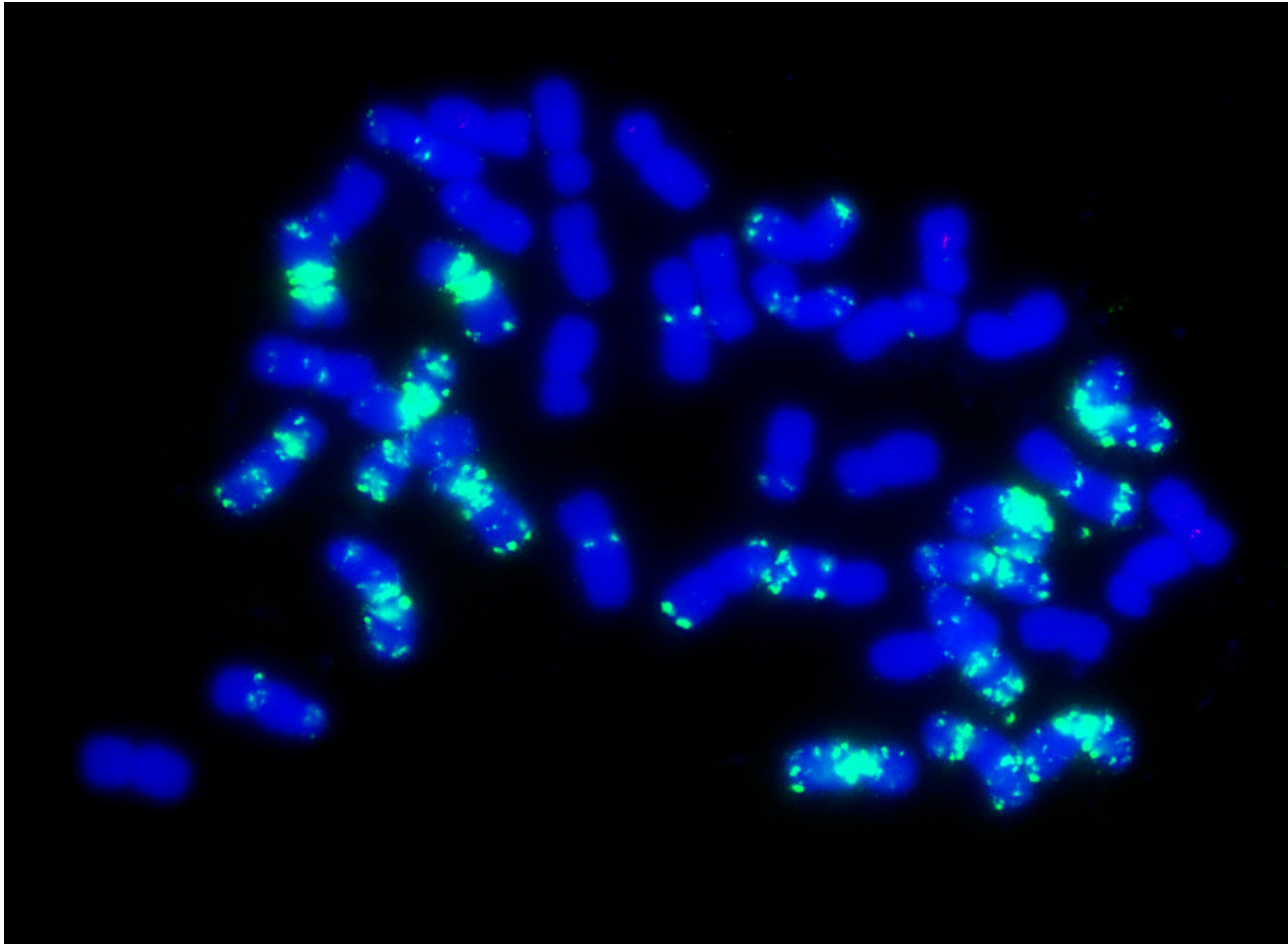
Point inoculation of HSD2-32



GAA FISH [green] and *Th. intermedium* GISH [red] of HSD2-32



GAA FISH [green] and *Th. elongatum* GISH [red] of HSD2-32



Future work

- Continue to backcross HSD2-32 into adapted winter wheat cultivars
- Evaluate backcross progenies under greenhouse and field conditions for FHB resistance and DON accumulation
- Use molecular marker analysis to determine source of FHB resistance
- Initiate directed chromosome engineering to produce agronomically useful introgression lines

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