



IMPROVING WHEAT STRIPE RUST RESISTANCE IN CENTRAL ASIA AND THE CAUCASUS

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BORLAUG GLOBAL RUST INITIATIVE

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Central Asia and the Caucasus Region

- **Central Asia**

1. **Kazakhstan**
2. **Kyrgyzstan**
3. **Tajikistan**
4. **Turkmenistan**
5. **Uzbekistan**

- **The Caucasus**

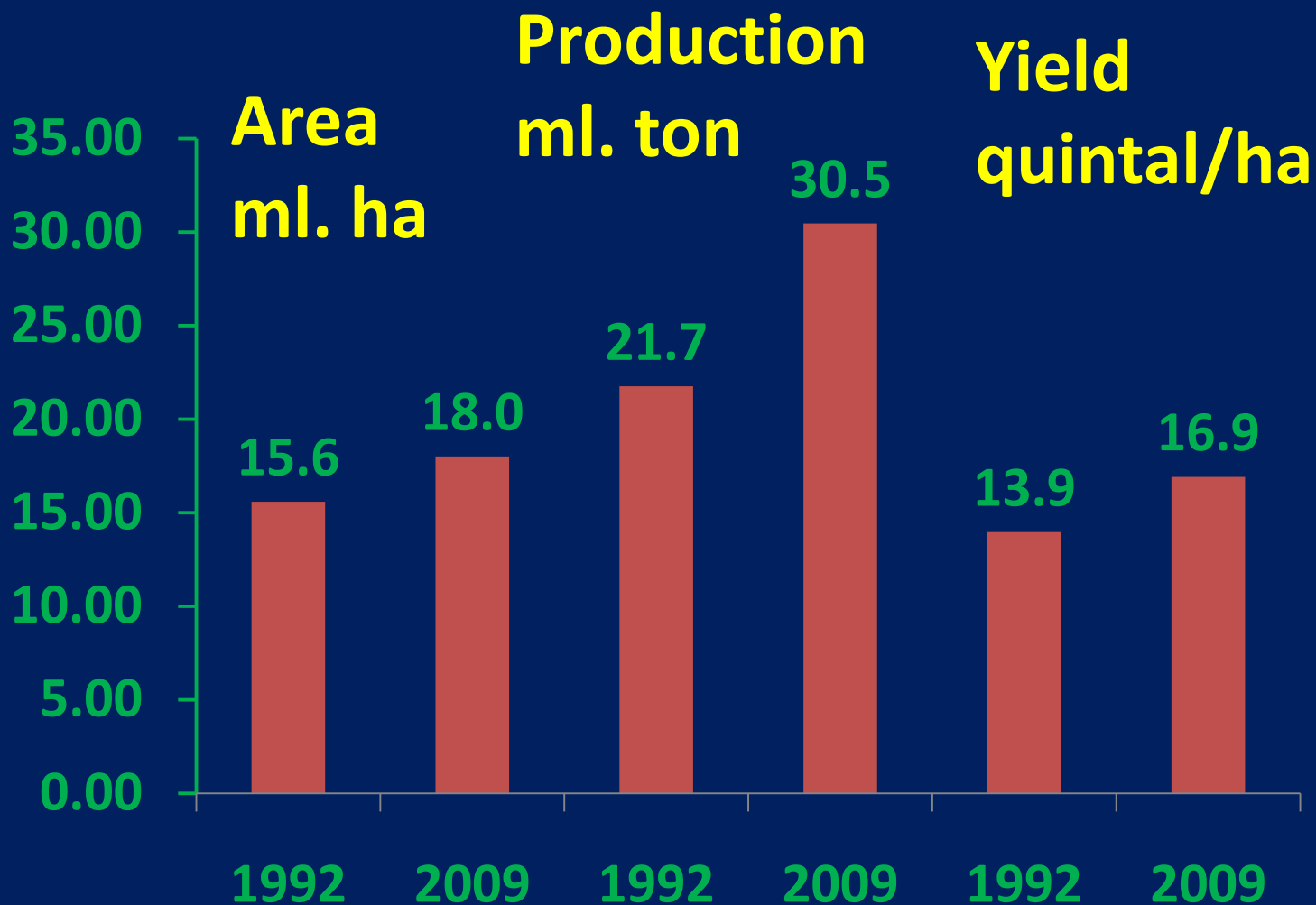
1. **Armenia**
2. **Azerbaijan**
3. **Georgia**

Map of the CAC Region



Wheat Statistics in CAC

1992 vs. 2009



Wheat Rusts - CAC

	Occurrence	Crop stage	Damage without spray
Stripe Rust	Every year	Early	High (70%)
Leaf rust	Once in 5 years	Mid-way	Lower than YR (15-20%)
Stem rust	Seldom	Late	Negligible

Wheat Rust Epidemics in CAC 1999-2010

Prior 1999:	Leaf Rust more common
1999 :	Stripe Rust
2001:	Stripe Rust
2005:	Stripe Rust + Leaf Rust
2009:	Stripe Rust
2010:	Stripe rust

Wheat Rust Epidemics in Uzbekistan

- Prior to 1999
 - Leaf rust epidemics were common
 - Varieties from Krasnodar were introduced as resistant to leaf rust, but were found susceptible to yellow rust
 - Varieties from Krasnodar occupied large area in Uzbekistan in 1999
 - **First major stripe rust epidemic occurred in 1999**



Stripe Rust Epidemics in Uzbekistan - 1999

- Stripe rust epidemic – 1999
 - Huge loss occurred due to unpreparedness to handle the epidemic
 - Variety Yuna (Krasnodar): occupied 70% area in Uzbekistan
 - Uzbekistan made a strategic decision
 - Grow 7 or more different varieties in each region

Stripe Rust Epidemic in Uzbekistan - 2009

- Unique in terms of so many wheat varieties showing high susceptibility for the first time
- 22 of 24 commercial varieties found susceptible
- High yielding varieties showing high susceptibility .Kroshka, Polovchanka, Pamyat, Andijon-2, Fortuna, Celianka
- 6 of 8 the recent varieties from Krasnodar introduced as stripe rust resistant were found susceptible



Kroshka

Stripe Rust Epidemic in Uzbekistan – 2010

- Epidemic started in southern Uzbekistan earlier than normal due to mild winter conditions
- Like 2009 epidemics, most commercial varieties showed susceptibility
- Also, varieties resistant in 2009 showed higher severity in 2010



Pamyat

Stripe Rust Epidemic in Tajikistan - 2010

- Epidemics started in April due to continuous rain
- Most commercial and candidate varieties showed high susceptibility



Nota



Norman



Alex

Stripe Rust Epidemic in Azerbaijan - 2010

- Among major varieties, only Gobustan is reported to be resistant



Varietal Susceptibility to Stripe Rust - CAC

Country	Variety	YR	Country	Variety	YR
Azerbaijan	Azamatli-95	70S	Georgia	Bezostaya 1	70S
	Nurlu 99	70S		Krasnodarskaia-99	80S
	Azeri	80S		Pobeda 50	90S
	Akinchi	40S	Kazakhstan	Krasnovodopadskya	20S
	Bezostaya 1	80S		Oktyabrina	80S
Armenia	Bezostaya 1	40S		Pamyat	80S
Tajikistan	Norman	80S		Steklovidnya 24	20S
	Alex	50S			

Released or candidate varieties reported resistant to stripe in the epidemic year 2009

Country	Variety / Cross	Origin
Georgia	Armenukum	Armenia
Kazakhstan	Mereke	Kazakhstan
	Tungish	IWWIP†
	BWKLDN-33	Unknown
	MK-3732	Unknown
	MK-3796	Unknown
Tajikistan	Alex *	IWWIP
	Norman *	IWWIP
	Orman	IWWIP
	Prina/Star	Mexico
	Shark/F4.105W2.1	IWWIP
	Vorona/Kauz//1D13.1/Mlt	Mexico
Uzbekistan	Essaul +	Russia
	Zamin 1 +	Uzbekistan

* Susceptible in 2010

+ Showed higher severity

Major Yr genes showing susceptibility in 2010

Yr 1

Yr 9

Yr 27



Yr 1

Yr genes showing resistance in 2010

Yr 5

Yr7

Yr 8

Yr 10

Yr 15

Yr Sp



International winter wheat nurseries in 2010

- 13 IWWYT IR (40 entries)
- 12 IWWYT SA (35 entries)
- 17 FAWWON IR (145 entries)
- 17 FAWWON SA (100 entries)
- CWA-WFYT IR (40 entries)
- 10 AYT IR (75 entries)
- 10 YT IR (100 entries)
- C18 FAWWON-TCI (100 entries)
- C18 FAWWON-INT (269 entries)



Total = 904

Stripe rust resistant lines in International Winter Wheat Nurseries, 2009, Uzbekistan

CROSS	Stripe rust Severity (%)	Grain yield (t/ha)	Days to heading	Plant Height (cm)	1000-kernel Weight (g)	Leaf rust Severity (%)	Powdery Mildew (%)
Mv17//Attila/Bcn	0	4.88	125	111	44.0	20	50
Attila/3/Agri/Nac//Mlt	0	6.20	129	104	42.0	0	60
Attila/3/Agri/Nac//Mlt	0	5.10	127	113	41.0	0	60
Zander-10//Bow/Nkt	0	5.65	125	105	40.5	60	70
Pyn/Bau//F6038W12-1	0	6.70	130	100	36.0	60	50
Agri/Bjy//Vee/3/BUL6687.12	0	5.73	125	110	40.5	50	30
Tast/Sprw//Zar/5/Yuandong3/4/PPB8-68/Chrc/3/Pyn//TAM101/Amigo	0	6.13	125	98	36.0	30	25
Tast/Sprw//Zar/5/Yuandong3/4/PPB8-68/Chrc/3/Pyn//TAM101/Amigo	0	6.74	125	98	35.0	50	70
Vorona/HD2402//Albatross Odesskiy	10	6.75	131	110	33.5	15	40
Unumli							
Bugday/3/Agri/Bjy//Vee/4/Agri/Bjy//Vee	10	5.90	125	128	44.5	10	70
338-K1-1//Aab/Buc/3/	10	6.70	123	110	42.5	50	60
Kinaci (Check)	25	5.93	131	110	35.5	0	20
Katia (Check)	80	4.68	127	125	35.5	0	40
Unumli Bugday (Local check)	100	3.25	127	120	35.0	0	35
LSD _{0.05}	22	1.60	4	8	3.7	32	35

Stripe rust resistance – 2010

Nursery	No. of lines	No. of resistant lines
13th IWWYT-IR (Tajikistan)	35	6
17 th FAWWON-IR (Tajikistan)	167	15
CWA-WFYT (Uzbekistan)	37	18
1 st WWSRRN (Tajikistan)	95	33

Stripe rust resistant lines in CWA-WFYT Karshi, Uzbekistan, 2010

Cross / Variety	YR score
VEE#8//JUP/BJY/3/F3.71/TRM/4/BCN/5/KAUZ/6/163HAMIDIYE//VEE/KOEL/6/TAM200/KAUZ (TCI992192-030YE-0E-1E-0E-2E-0E)	0
GANSU-1//PTZ NISKA/UT1556-170 WRB860365 (TCI-02-486-0AP-0AP-25AP-0AP-5AP-0AP)	0
AMSEL/TUI//BLUEGIL-2//SHARK/F4105W2.1 (TCI012034-030YE-30E-10E-0E-5AP-0AP)	0
ZOLOTAVA/3/PYN/BAU//MILAN (CMSW01WM00459S-030YE-30E-1E-0E-1AP-0AP)	0
4WON-IR-257/5/YMH/HYS//HYS/TUR3055/3/DGA/4/VPM/MOS (TCI-02-80-0AP-0AP-5AP-0AP-3AP-0AP)	0
YMH/HYS//HYS/TUR3055/3/DGA/4/VPM/MOS/5/5/TAM200/KAUZ (TCI-02-138-0AP-0AP-7AP-0AP-5A-0AP)	0
CADET/6/YUMAI13/5/NAI60/3/14.53/ODIN//CI13441/CANON (TCI-02-417-0AP-0AP-1AP-0AP-5A-0AP)	0
CATBIRD//CNO79*2/HE 1	0
ZANDER//ATTILA/3*BCN	0
MILAN/KAUZ//HD29/2*WEAVER (CMSS97M00541S-020Y-030M-040SY-020M-27Y-010M-0Y-0SY)	0
VEE#8//JUP/BJY/3/F3.71/TRM/4/BCN/5/KAUZ/6/163HAMIDIYE//VEE/KOEL/6/TAM200/KAUZ	0
CRR/TIA.2//FDL490/3/IRNERIA/MUKKAB HIB (TCI-02-398-0AP-0AP-34AP-0AP -2E-0E)	0
LUFER-1/ZERNOGRADKA8 (TCI-02-449-0AP-0AP-16AP-0AP -2E-0E)	0
LUFER-1/ZERNOGRADKA8 (TCI-02-449-0AP-0AP-14AP-0AP-1AP-0AP)	0
DORADE-5//KS82117/MLT (TCI-02-88-0AP-0AP-4AP-0AP-1AP-0AP)	0

Summary

- Stripe rust is endemic to the Central Asia and the Caucasus region
- The leading commercial varieties of winter wheat in the CAC region are susceptible to stripe rust
- *Yr* genes in the resistant cultivars are not known
- Stripe rust resistant improved germplasm are available through the international nurseries tested in the region

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- **BGRI**
- **Cornell University**
- **ICARDA**
- **CIMMYT**

Thank you for attention

30th ESWYT – 2010, Tajikistan

EN	Cross / Variety	YR	EN	Cross / Variety	YR
101	LOCAL CHECK (Navruz)	80S	126	WHEAR/VIVITSI/3/C80.1/3*BATAVIA//2*WBLL1	20MR
102	PBW343	10R	127	WHEAR/KUKUNA/3/C80.1/3*BATAVIA//2*WBLL1	0
103	WAXWING	10R	128	WHEAR/KUKUNA/3/C80.1/3*BATAVIA//2*WBLL1	0
104	PRL/2*PASTOR	80S	129	WHEAR/KURUKU/3/C80.1/3*BATAVIA//2*WBLL1	10MR
105	SERI.1B*2/3/KAUZ*2/BOW//KAUZ	100S	130	CNDO/R143//ENTE/MEXI_2/3/AE.SQ.(TAUS)/4/WEAVER/5/2*KAUZ/6/PRL/2*PASTOR	80S
106	WAXWING*2/KIRITATI	20R	131	PRL/2*PASTOR/4/CHOIX/STAR/3/HE1/3*CNO79//2*SERI	60S
107	KIRITATI//2*PBW65/2*SERI.1B	40MS	132	PRL/2*PASTOR/4/CHOIX/STAR/3/HE1/3*CNO79//2*SERI	40MS
108	KIRITATI/4/2*SERI.1B*2/3/KAUZ*2/BOW//KAUZ	40MS	133	PRL/2*PASTOR/4/CHOIX/STAR/3/HE1/3*CNO79//2*SERI	40MS
109	KIRITATI/2*WBLL1	20MR	134	PFAU/MILAN/5/CHEN/AEGILOPS SQUARROSA (TAUS)//BCN/3/VEE#7/BOW/4/PASTOR	0
110	KIRITATI//2*SERI/RAYON	20MR	135	CIRCUS/ELVIRA//PFAU/WEAVER	20MR
111	WEAVER/TSC//WEAVER/3/WEAVER/4/2*WAXWING	0	136	CHEN/AE.SQ//2*OPATA/3/TILHI/4/ATTILA/2*PASTOR	40MS
112	WAXWING//PFAU/WEAVER	10R	137	ELVIRA/5/CNDO/R143//ENTE/MEXI75/3/AE.SQ/4/2*OCI/6/VEE/PJN//KAUZ/3/PASTOR	20MR
113	HUW234+LR34/PRINIA//PFAU/WEAVER	40MS	138	CNDO/R143//ENTE/MEXI_2/3/AEGILOPS SQUARROSA (TAUS)/4/WEAVER/5/2*KAUZ/6/FRET2	20MR
114	PBW343*2/KUKUNA//KIRITATI	40MS	139	PFAU/SERI.1B//AMAD/3/WAXWING	0
115	INQALAB 91*2/KUKUNA//KIRITATI	20MR	140	WAXWING*2/VIVITSI	10R
116	SAAR/WAXWING	10R	141	KIRITATI//PBW65/2*SERI.1B	20MR
117	SAAR/WBLL1	20MR	142	BABAX/LR42//BABAX*2/3/VIVITSI	0
118	SERI.1B*2/3/KAUZ*2/BOW//KAUZ/4/PBW343*2/KUKUNA	20MR	143	WAXWING*2/4/SNI/TRAP#1/3/KAUZ*2/TRAP//KAUZ	60S
119	SERI.1B*2/3/KAUZ*2/BOW//KAUZ/4/PBW343*2/KUKUNA	20MR	144	WAXWING*2/4/SNI/TRAP#1/3/KAUZ*2/TRAP//KAUZ	40MS
120	PBW343*2/KUKUNA/5/CNO79//PF70354/MUS/3/PASTOR/4/BAV92	10R	145	WAXWING*2/VIVITSI	20MR
121	WHEAR/VIVITSI//WHEAR	40MS	146	FRET2*2/BRAMBLING	30MR
122	WHEAR/KUKUNA//WHEAR	20MR	147	WBLL1*2/BRAMBLING	20MR
123	WHEAR/TUKURU//WHEAR	10R	148	WBLL1*2/KIRITATI	50S
124	WHEAR/TUKURU//WHEAR	30MR	149	KIRITATI//SERI/RAYON	30MS
125	WHEAR/KIRITATI/3/C80.1/3*BATAVIA//2*WBLL1	20MR	150	WBLL1*2/KIRITATI	20MR

Stripe rust infection on commercial winter wheat cultivars in Uzbekistan, 2009

Wheat Variety	Origin	Year of release	Yellow rust severity (%)‡
Polovchanka		1999	100
Kroshka		2000	100
Umanka		2000	60
Chillaki		2002	80
Andijon 2		2003	60
Saidaziz		2004	20
Starshina		2004	30
Zamin 1		2004	20
Dustlik	IWWIP†	2005	40
Bobur		2006	60
Krassnodar 99		2006	60
Kuma		2006	60
Pamyat		2006	100
Tanya		2006	60
Fortuna		2007	100
Moskvich		2007	60
Nota		2007	40
Turkistan		2007	30
Vostorg		2007	40
Andijon 1		2008	80
Essaul		2009	0
Karshi 1		-¶	40

†International Winter Wheat Improvement Program, Kinaci 97.

¶Candidate cultivar

‡Average values based on disease severity observations in the farmers' fields

WEATHER CONDITIONS IN CENTRAL ASIA DURING THE VEGETATION PERIOD OF WINTER WHEAT

Country, meteorological station	Air temperature (C)					Precipitation amount, mm				
	January	April	May	June	July	January	April	May	June	July
Gissarckaya, Tad-tan	+1,1	14,8	19,9	29,6	28,2	80	101	60	5	4
Bishkek Kyrgyzstan	-5,2	11,5	16,9	21,4	24,3	23	72	64	39	20
Krasnovodopad RS, Kazakhstan	-1,7	14,4	20,0	25,1	28,1	48	61	37	10	3
Shymkent Kazakhstan	-	12,8	18,7	23,2	26,1	60	78	42	17	7
Almaty Kazakhstan	-10,8	11,4	16,4	21,4	24,1	19,8	78,6	83,1	54	31,6
Tashkent Uzbekistan	0,2	12,6	19,9	24,4	27,5	36	72	45,6	16,3	3,8