

Biology, Monitoring and Control of Stripe Rust

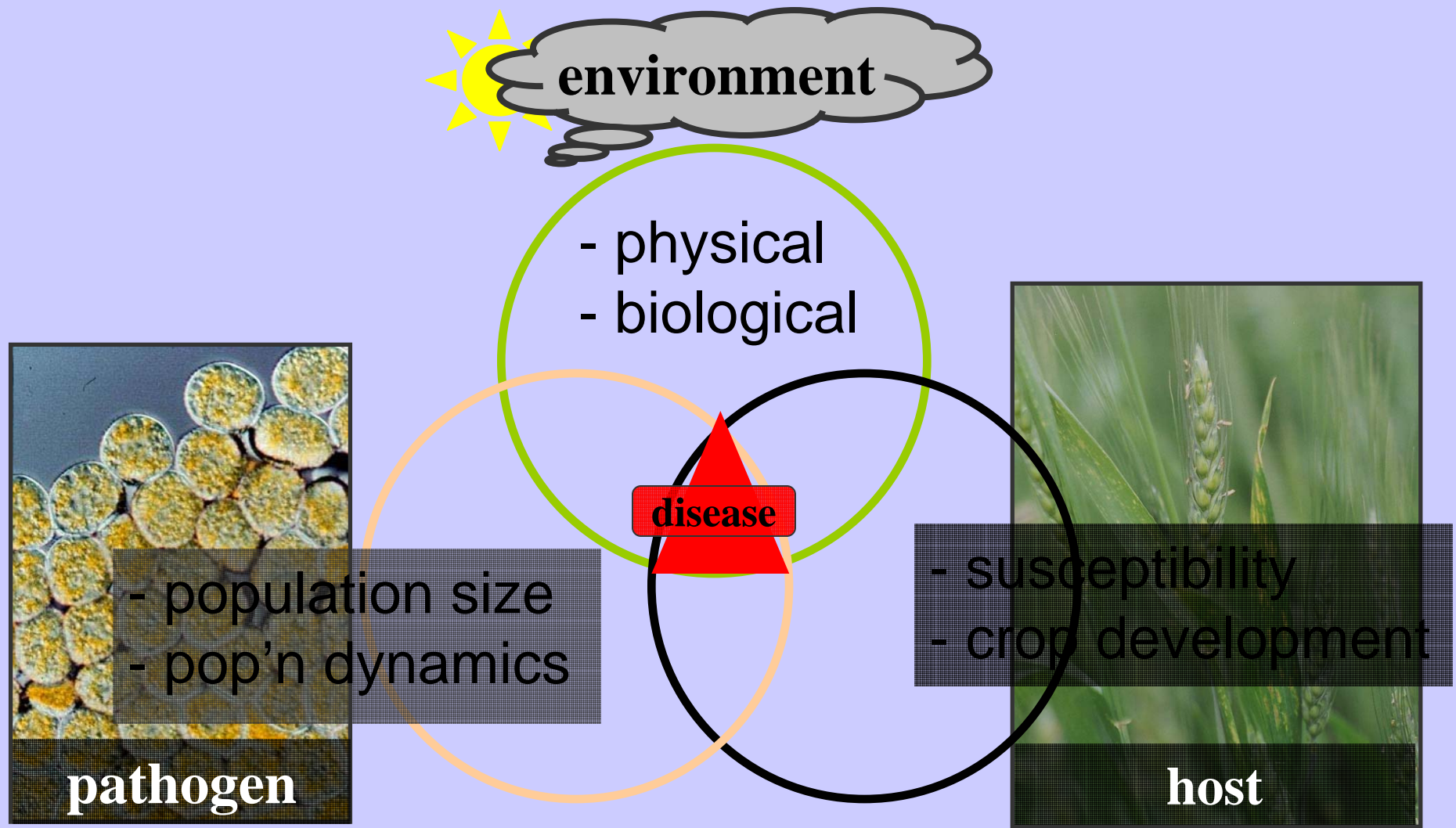


Dr. Curtis Thompson,

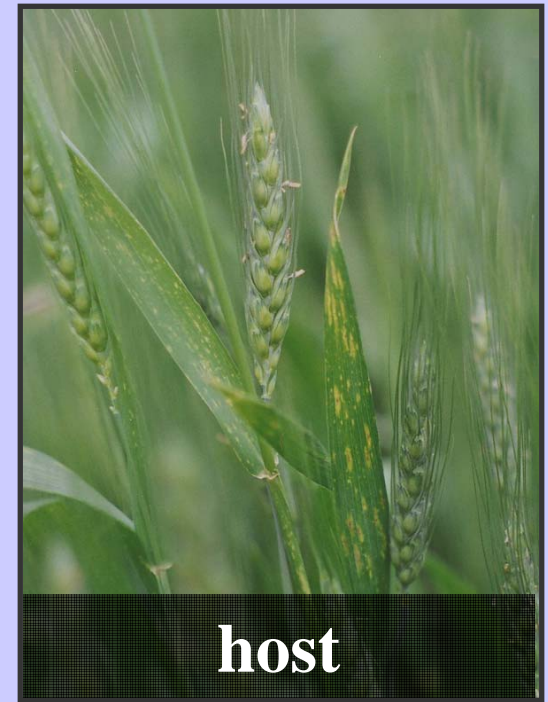
Professor of Extension Crops and Soils

K-State Southwest Kansas

Disease System Components



Disease System Components

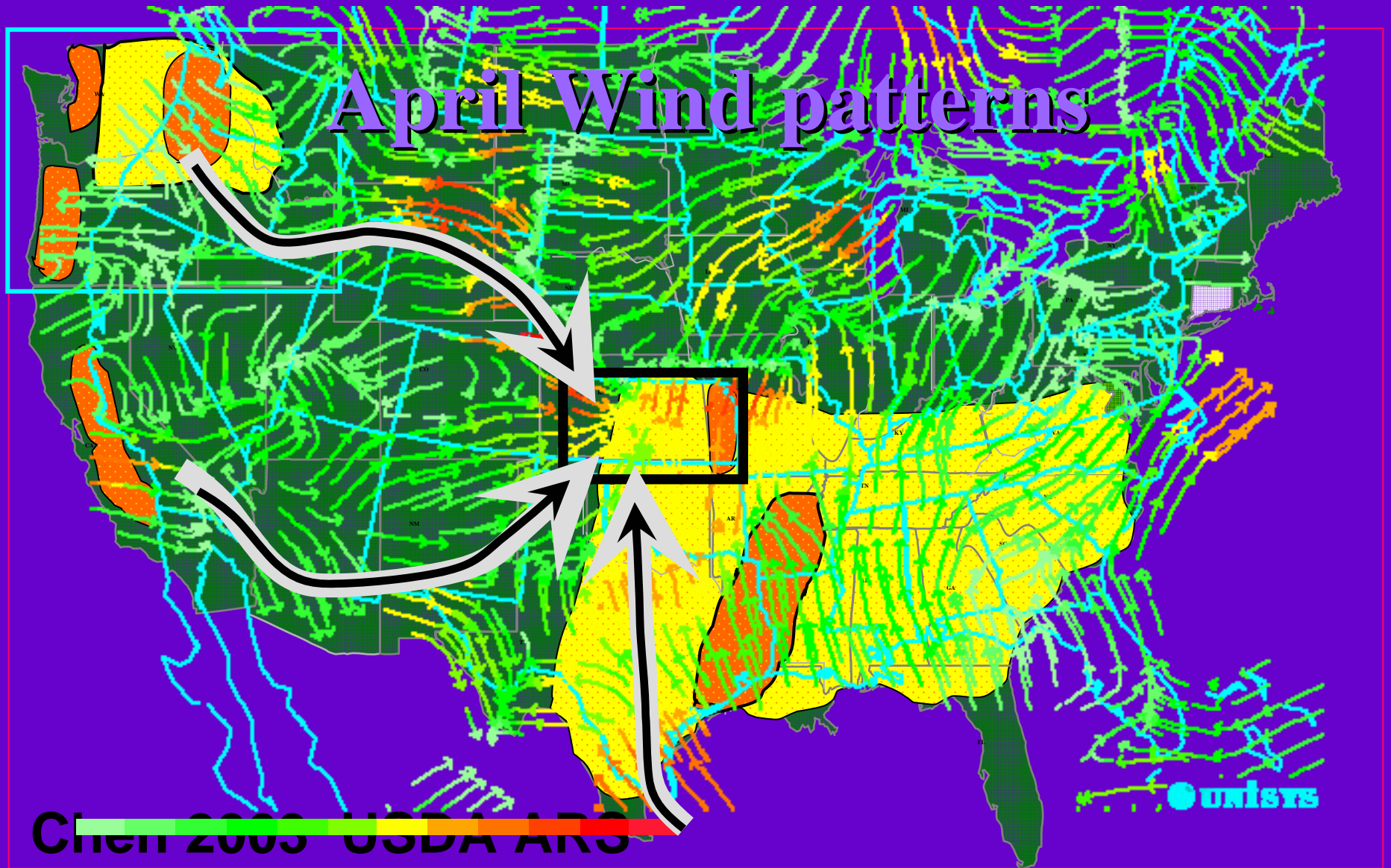




**Where did stripe
rust come from?**



April Wind patterns



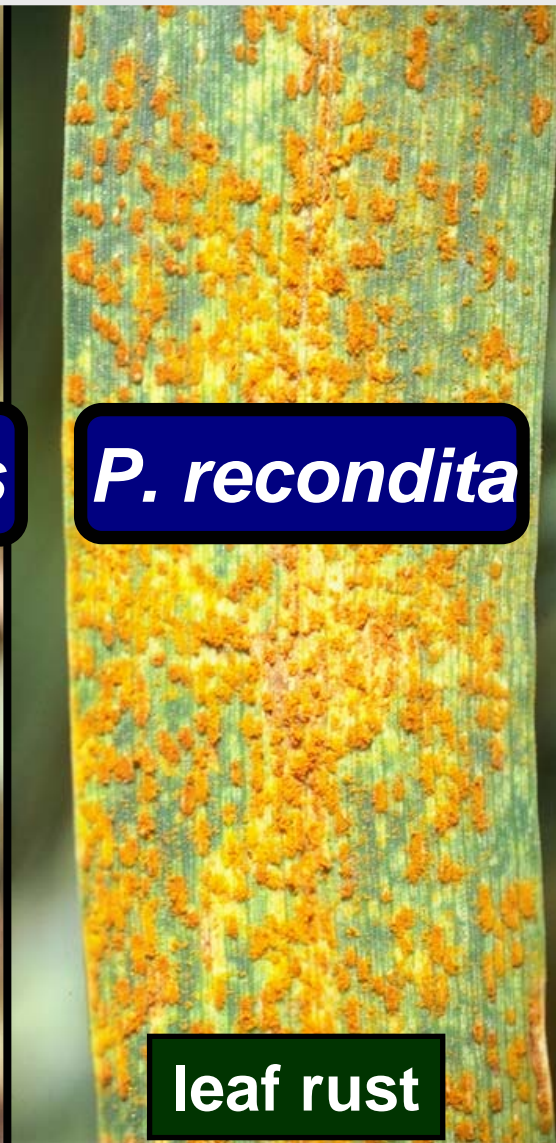
Chen 2003 USDA ARS

UNISYS

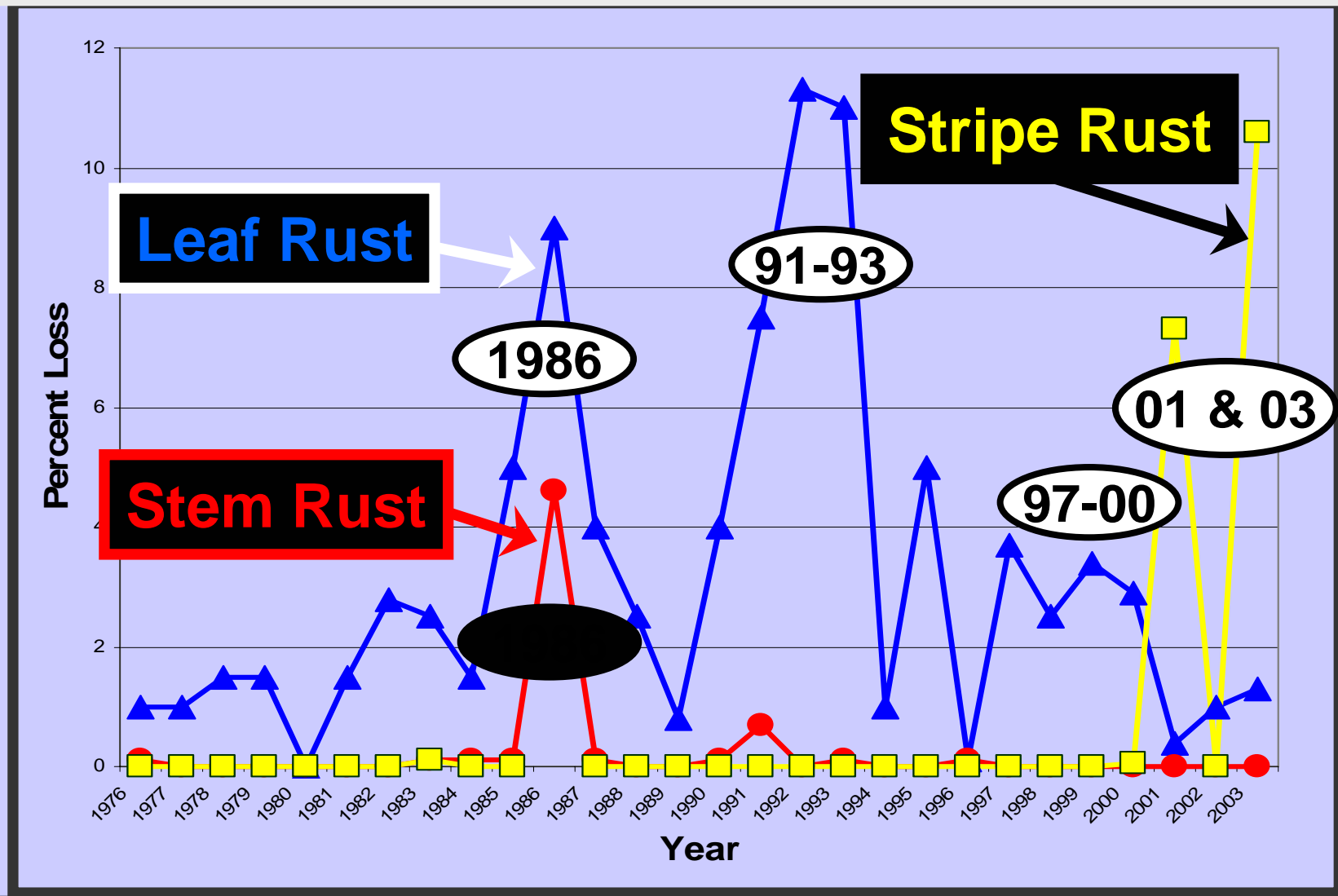
Biology

- **Stripe rust**
 - **Is different organism than leaf rust**

Three Rusts of Wheat



Impact of Rusts on Wheat in Kansas



Bill Bockus and Bob Bowden

Biology

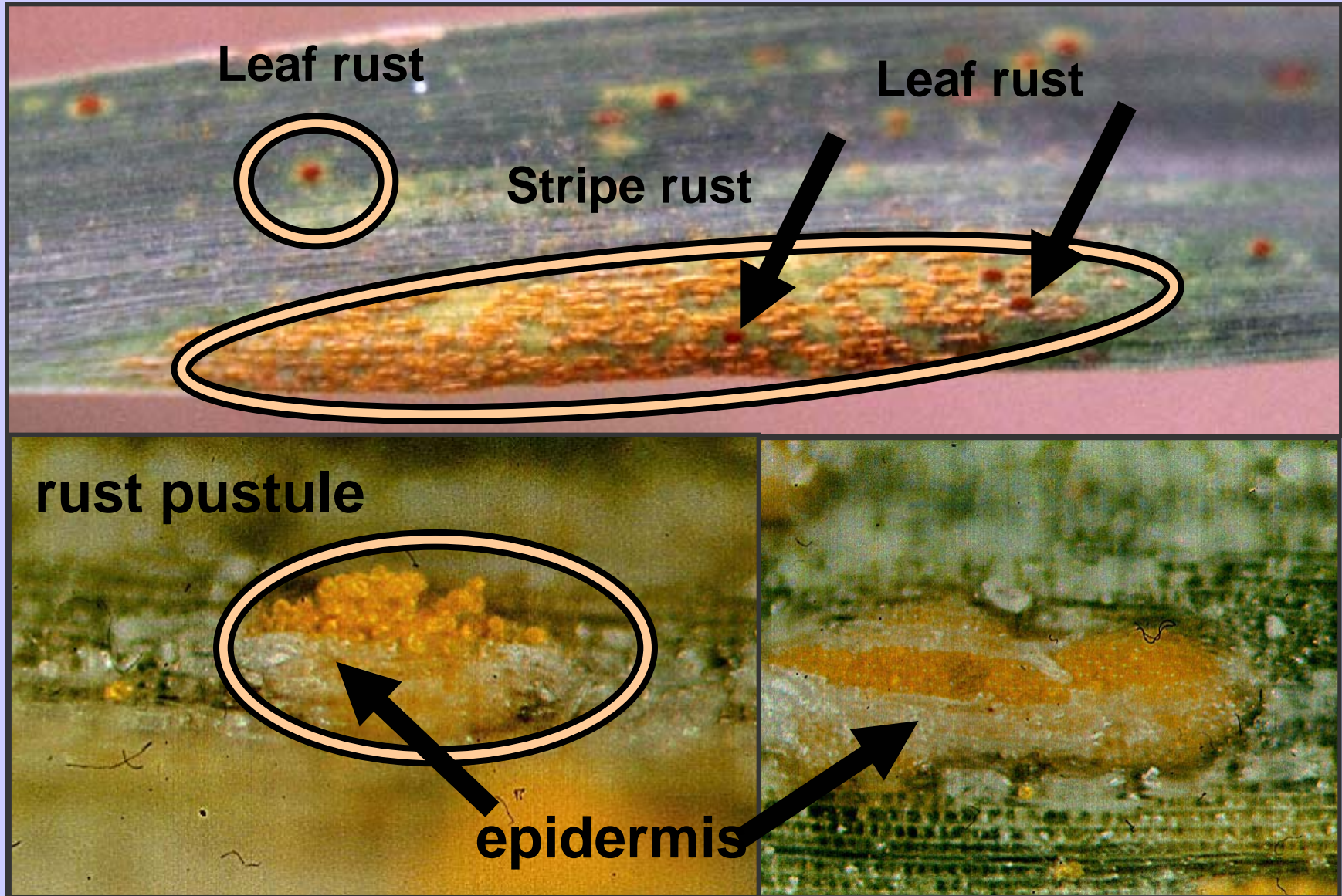
- **Stripe rust**
 - Is different organism than leaf rust
 - **Likely more detrimental to wheat than leaf rust - symptoms**

Stripe Rust Symptoms

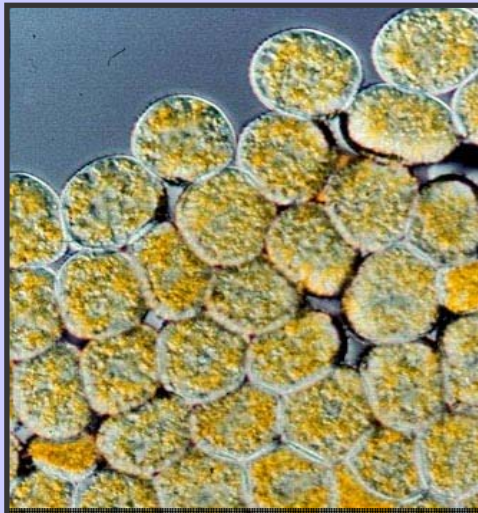
- Yellow linear pustules on leaves
- Usually appears before leaf rust



Rust of Wheat

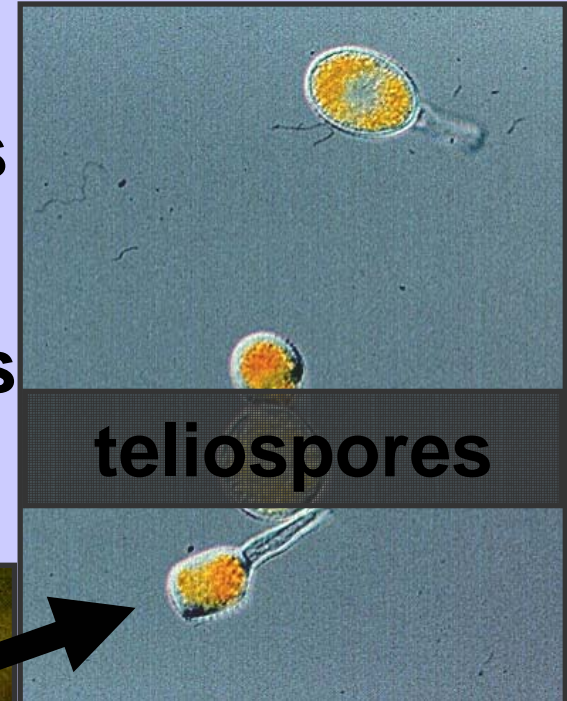


Stripe Rust of Wheat



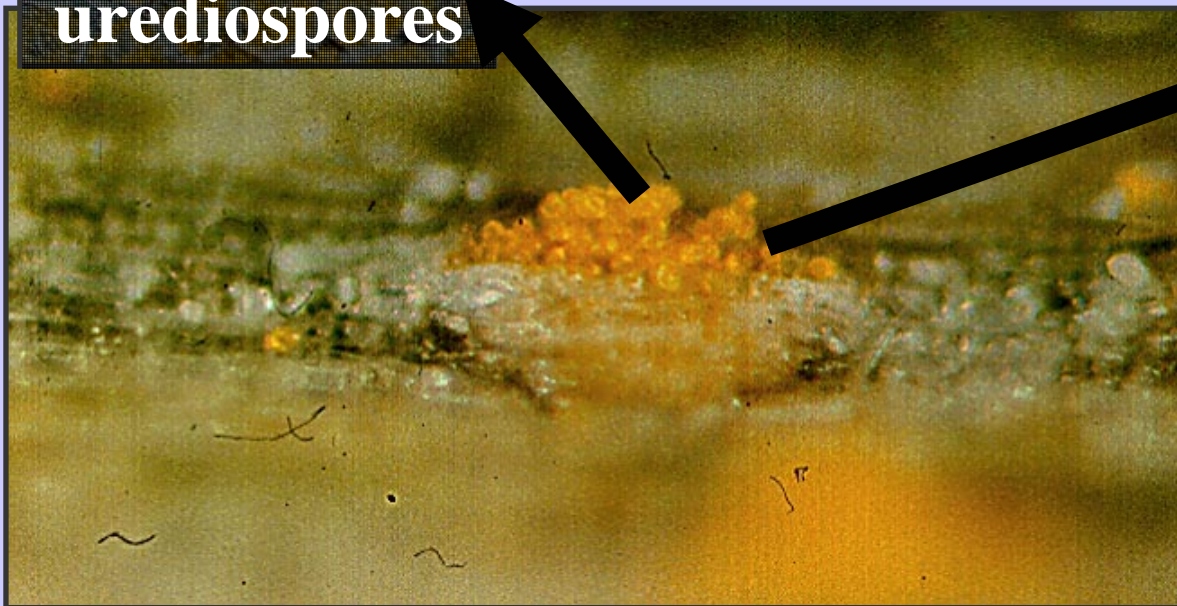
urediospores

- initiate infections
- secondary cycles



teliospores

- survival?



Stripe Rust Symptoms



Stripe Rust Symptoms

















Stripe Rust of Wheat

- **Reduces effective photosynthetic leaf area**
- **Increases transpiration through ruptures in epidermis**
- **Reduces root biomass**

Stripe Rust of Wheat

- **Reduces kernel weight**
- **Reduces kernel number/head**
- **Yield loss of 10 – 15% on moderately susceptible varieties**
- **Yield loss over 50% on very susceptible varieties**



Stripe rust in the wheat head

Stripe rust effect on wheat varieties, 2001.

Ford Co , Bowdon, Thompson and Hampton.

Variety	Yield (bu/a)		Test weight (lb/bu)	
	Tilt 4 oz	No Tilt	Tilt 4 oz	No Tilt
2137	45	22	59.1	54.2
Ike	47	35	57.7	55.7
Jagger	52	47	59.2	58.1
Lakin	47	17	57.8	50.5
Ogallala	49	35	58.7	57.3
Prairie Red	49	25	58.0	51.2
Stanton	56	35	56.9	53.1
Tam 110	50	30	58.4	52.6
Thunderbolt	46	36	58.0	56.6
Trego	56	25	57.9	53.7
Average	49	31	58.1	54.5
Susceptible avg.	49	25	58.2	52.4

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Intermediate avg	50	35	57.8	55.7

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Biology

- **Stripe rust**
 - Is different organism than leaf rust
 - Likely more detrimental to wheat than leaf rust - symptoms
 - **Is a cool season rust (?)**

Stripe Rust, Compendium of Wheat Diseases, 2nd Ed.

- **Remain viable at 23 F**
- **Urediospores begin to degrade at temps above 59F ???**
- **Optimum temps for spore germination 37F to 59F. Spores will germinate from 32F to 68F. ???**
- **Resemble a resistant reaction if night temperatures exceed 65F**



Biology

- **Stripe rust**
 - Is different organism than leaf rust
 - Likely more detrimental to wheat than leaf rust - symptoms
 - Is a cool season rust (?)
 - **Doesn't over winter in Kansas (?)**

Biology

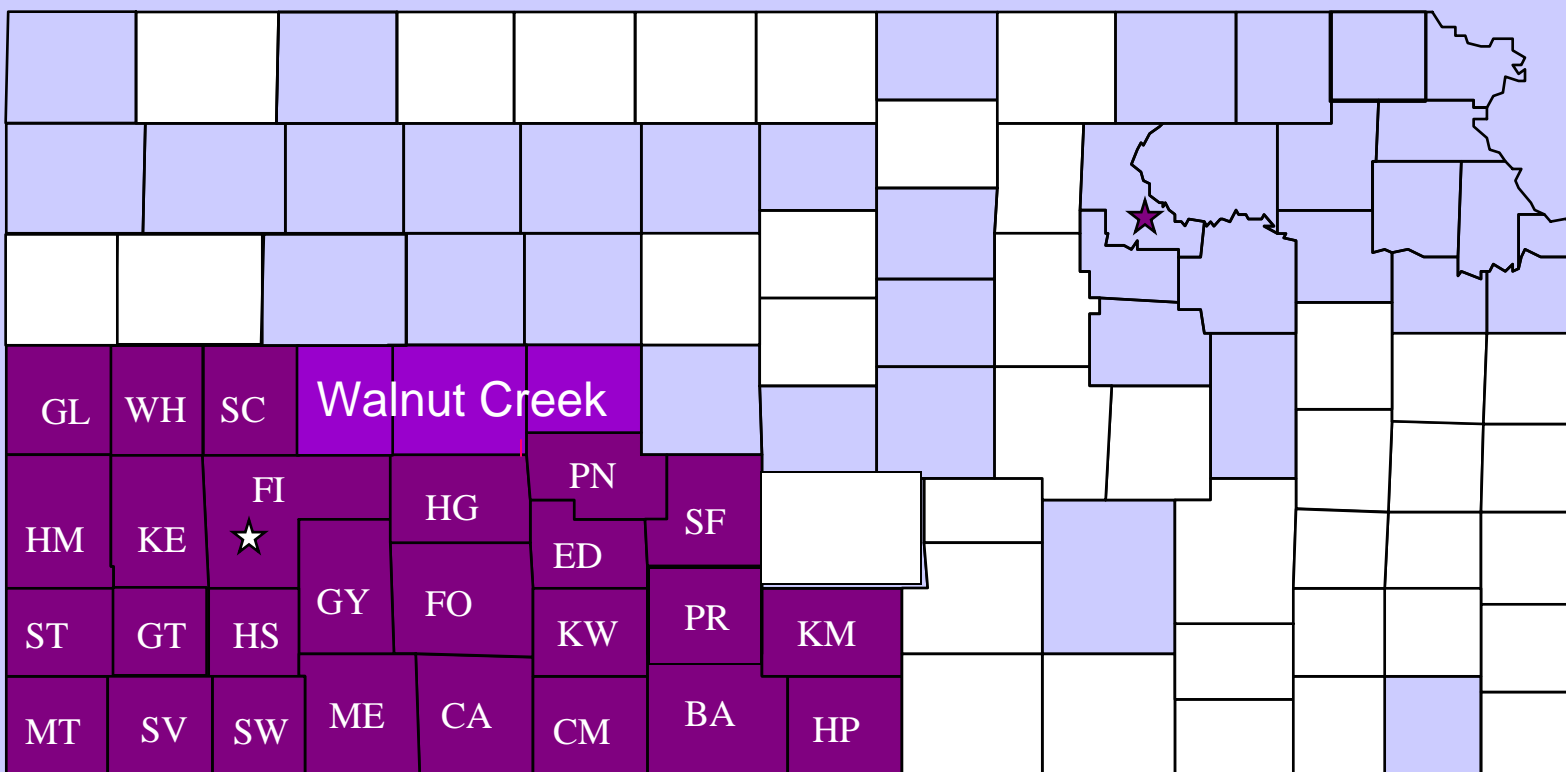
- **Stripe rust**
 - Is different organism than leaf rust
 - Likely more detrimental to wheat than leaf rust - symptoms
 - Is a cool season rust (?)
 - Doesn't over winter in Kansas (?)
 - **Stripe Rust races, some 39 exist.**
 - **IS THERE A NEW ONE??????**

IS THERE A NEW RACE?? 2005

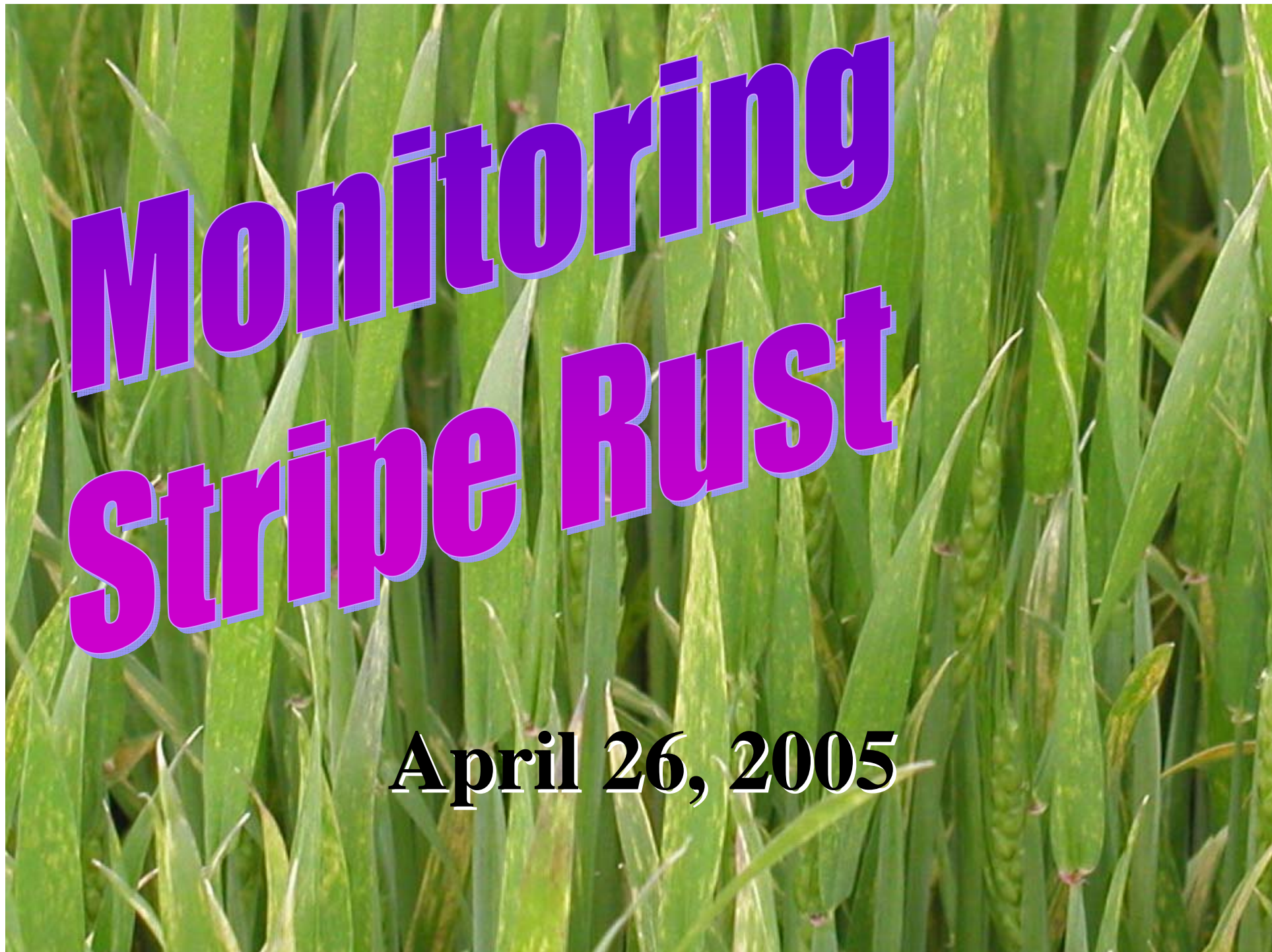
- **Rust remained active at 80 F temperatures and above**
- **Resistant varieties exhibited evidence of intermediate/susceptible reactions on leaves**
 - **Current sources of resistance are temperature sensitive, at very cold temps all varieties will exhibit some susceptibility**
 - **In 2005 some intermediate varieties were hit very hard**

K-State Research and Extension Southwest Area

* Lane, Ness, and Rush Counties comprise the Walnut Creek Extension District



My experiences are primarily from this area of Kansas!



Monitoring Stripe Rust

April 26, 2005

A close-up photograph of green grass blades. Some blades show signs of damage, including yellowing and small holes, likely from insect feeding. The background is a soft-focus green.

Variety will make a difference!

**What are the forecasted
temperatures?**

What is happening in other areas?



OVERLEY





JAGALENE





TREGO







LAKIN







JAGGER



A close-up photograph of a white, textured surface, possibly a piece of equipment or a container. The number "2137" is printed in a large, bold, black sans-serif font. The surface has a slightly grainy texture and a small dark speck is visible above the number. The background is out of focus, showing green foliage and a dark, possibly metallic, structure. The lighting is bright, creating some highlights on the surface.

2137







STANTON







ABOVE





Disease Management Options

- **Cultural practices**
- **Host plant resistance**
- **Chemical management**

Cultural practices

- **Crop rotation will NOT help an infection that develops from wind carried spores.**
- **Planting date and rate will likely have little or no effect on disease intensity since this is an early infection from wind carried spores**

Disease Management Options

- **Cultural practices**
- **Host plant resistance**
- **Chemical management**

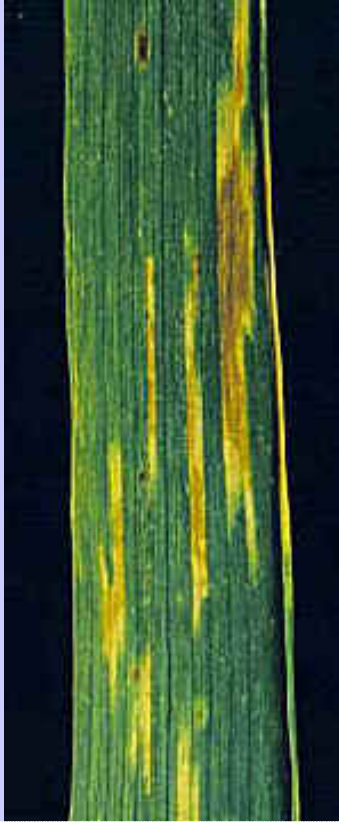
Stripe Rust of Wheat



Resistant

Susceptible

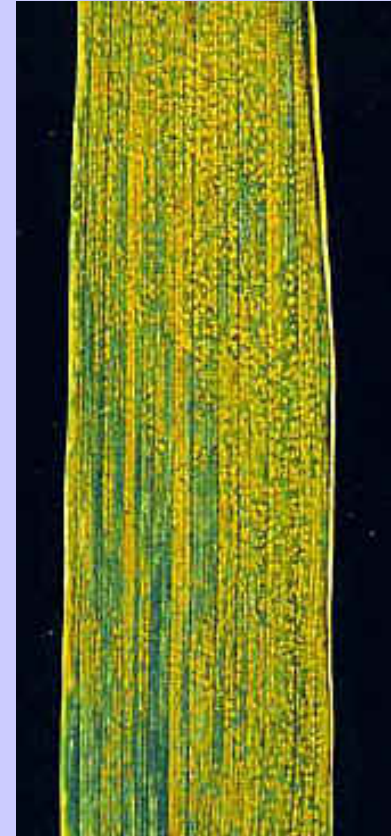
Stripe Rust of Wheat



**moderately
resistant**



**moderately
susceptible**



very susceptible

Resistance to Stripe Rust

- **Resistant**: Alliance, Jagger, Karl 92, Larned, Millenium, Overley, Vista, Wesley, Windstar, Arlin (W), Betty (W), Heyne (W), NuFrontier (W), NuHorizon (W), Infinity CL, Hatcher, Protection, Tam 111 (Nothing bullet proof)
- **Moderate**: 2145, 2174, Akron, Ankor, Arapahoe, Mankato, Thunderbolt, Intrada (W)
- **Susceptible**: 2137, Trego, Avalanche, Lakin, Prairie Red, Above, Bond CL, Platte, Tam 110

Disease Management Options

- **Cultural practices**
- **Host plant resistance**
- **Chemical management**

Chemical Management of Stripe Rust

- **Seed treatment fungicides protect plant until 4-5 leaf stage**
- **Fungicides applied up to flowering increase kernels/head and kernel weight**
- **Fungicides applied up to heading increase yield**

Chemical Management of Stripe Rust

- **Top three leaves are sample unit**
- **Begin scouting in April**
- **# tillers with rust on 10 consecutive tillers in a row**
- **Sample 10 times along a W pattern**
- **Determine the total # tillers with rust**

Sampling

top three leaves

1

10 tillers

- 100 tillers
- # tillers w

10

9

7

8

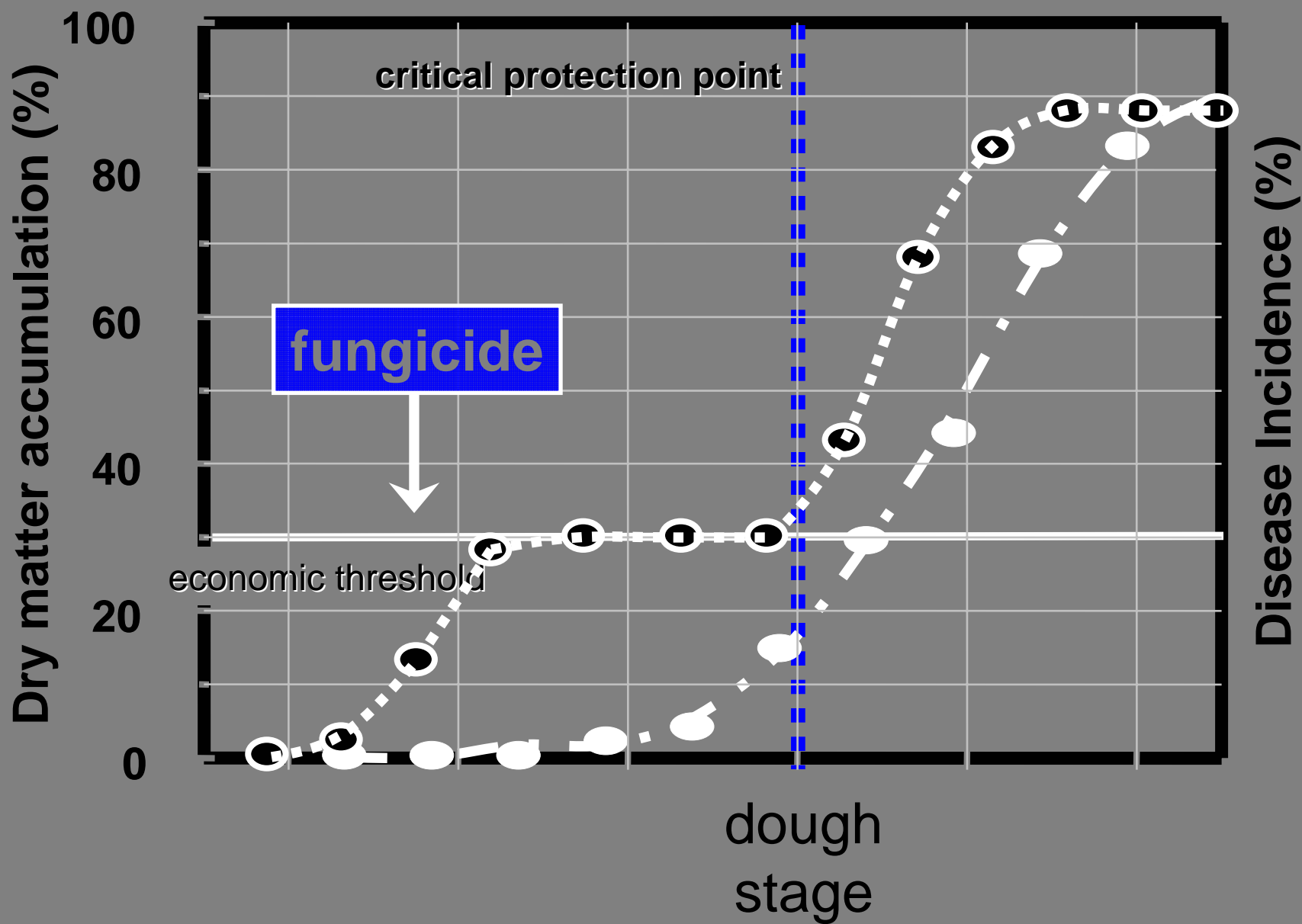
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Chemical Management of Stripe Rust

- If less than lower limit: **STOP** then resample in 7 days

Ave: 7 minutes/field & 11 samples

- If between limits continue to sample
- After 40 tillers: **STOP** and apply fungicide then resample in 3 weeks



Fungicide Management

Fungicide*	Tan Spot	Rust	Septoria	Powdery Mildew
• Tilt:	G	VG	VG	VG
• Quadris:	VG	E	VG	F
• Headline:	VG	E	VG	VG
• Stratego:	G	E	VG	VG
• Quilt:	VG	E	VG	VG

* Generic fungicides with the same active ingredient may exist.

Fungicide Management

Fungicide	application window	product cost/acre*
• Tilt:	➤ 10.5	
• Quadris:	➤ 10.5	
• Headline:	➤ 10.5	
• Stratego:	➤ 10.5	
• Quilt	➤ 10.5	

*Application cost not included.

Wheat Rusts



untreated



Headline @ 6 oz/A

Oklahoma State University test: 2003

Wheat Rusts



untreated



Tilt @ 4 oz/A

Oklahoma State University test: 2003

Fungicide Management

fungicide	chem	mech	resistance risk
• Tilt:	triazole	SBI	mod
• Quadris:	strobilurin	RI	high
• Headline:	strobilurin	RI	high
• Stratego:	mix	mix	high
• Quilt	mix	mix	mix

SBI = Sterol Biosynthesis Inhibitor, RI = Respiratory Inhibitor

Results of Fungicide Tests, 2005.

**Wheat variety response to fungicide, 2005.
Clark, Comanche, and Stevens Co, Thompson,
Rickabaugh, and Gold.**

Resistant	Yield		Test weight	
Variety	F	NF	F	NF
Cutter	45	40	56.3	56.3
Jagalene	48	38	57.4	57.1
Jagger	44	39	55.2	54.9
Overley	53	46	55.9	55.4
T81	40	35	56.7	55.8
Tam 111	53	50	56.9	56.6
Average	47	41	56.4	55.9

Overall Average

43

35

56.3

55.4

**Wheat variety response to fungicide, 2005.
Clark, Comanche, and Stevens Co , Thompson,
Rickabaugh, and Gold.**

Intermediate	Yield		Test weight	
Variety	F	NF	F	NF
2145	43	38	56.6	56.3
2174	40	33	57.1	55.6
Stanton	42	34	55.8	54.1
Thunderbolt	40	33	57.1	57.1
Average	41	34	56.7	55.8

Overall Average 43 35 56.3 55.4

**Wheat variety response to fungicide, 2005.
Clark, Comanche, and Stevens Co , Thompson,
Rickabaugh, and Gold.**

Susceptible	Yield		Test weight	
	F	NF	F	NF
2137	42	28	56.4	54.6
Above	35	30	55.2	53.7
Lakin	33	22	53.7	52.0
OK102	46	40	57.4	56.5
Trego	44	33	57.0	55.8
Average	40	31	55.9	54.5

Overall Average 43 35 56.3 55.4

**Wheat variety response to fungicide, 2005.
Clark, Comanche, and Stevens Co , Thompson,
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	Yield		Test weight	
Variety	F	NF	F	NF
Resistant	47	41	56.4	55.9
Intermediate	41	34	56.7	55.8
Susceptible	40	31	55.9	54.5

Overall Average 43 35 56.3 55.4

**Jagger response to fungicides, 2005.
SWREC, Garden City, KS, Thompson.**

Fungicide	Yield	Testwt	Stripe R.	Leaf R.
	bu/a	lb/bu	-----(% of Flagleaf)-----	
Untreated	57	59.5	4	9
Headline 6oz FLE	54	59.8	2	3
Headline 6oz Boot	55	60.2	2	2
Tilt 2 oz Boot	55	59.8	2	2
Tilt 4 oz Boot	57	59.5	2	1
LSD (0.05)	NS	0.3	1	3

**Thunderbolt response to fungicides, 2005.
Comanche Co., KS, Thompson and Rickabaugh.**

Fungicide	Yield	Testwt	Stripe R.
	bu/a	lb/bu	(% of Flg)
Untreated	45	61.6	6
Headline 6oz Boot	45	62.0	4
Tilt 4 oz Boot	41	62.1	4
Quadris 6.2 oz Bt	44	62.1	4
Quilt 14 oz Boot	44	62.0	4
LSD (0.05)	NS	NS	1

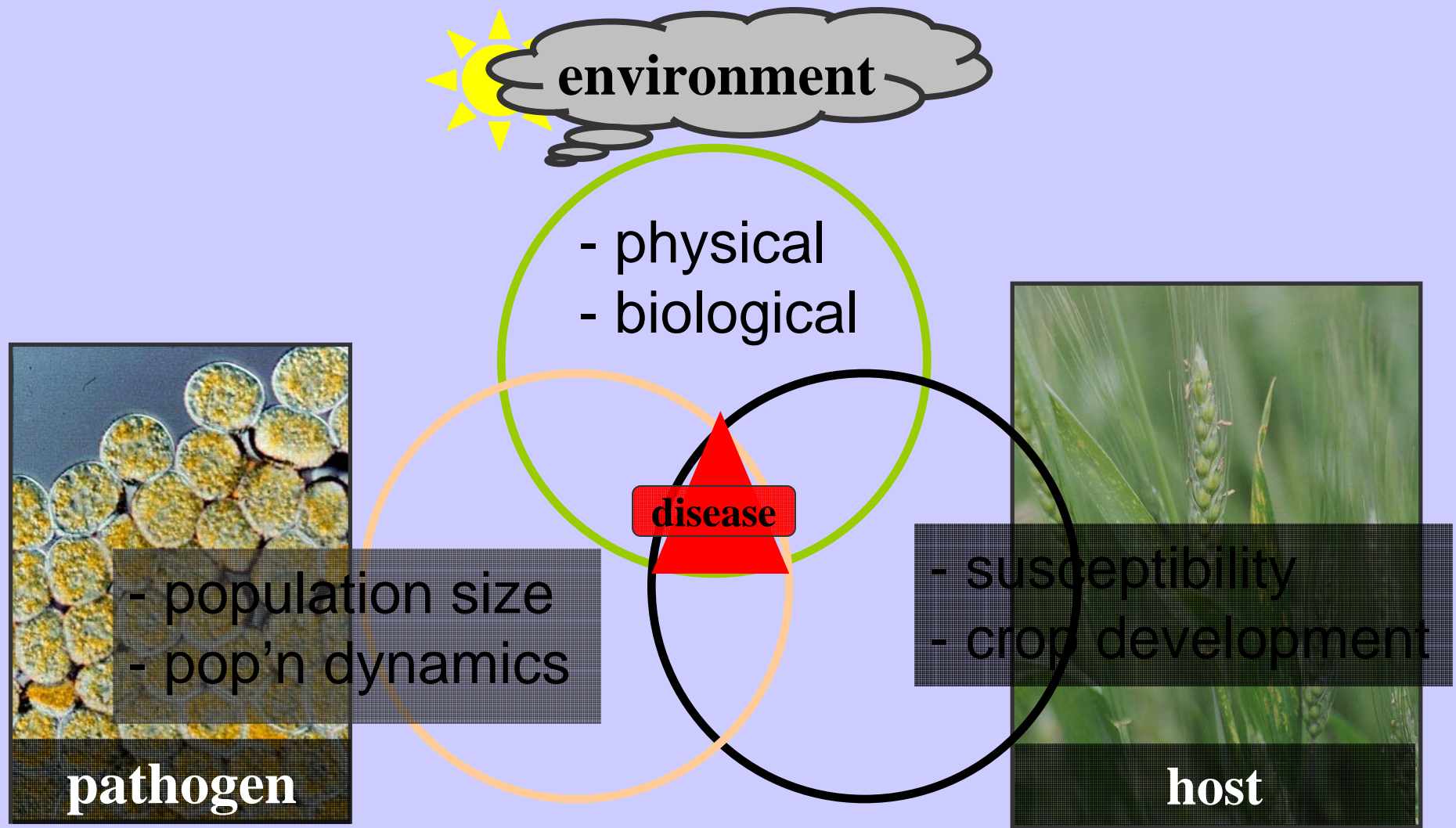
**Stanton response to fungicides, 2005.
SWREC Garden City, KS, Thompson.**

Fungicide	Yield	Testwt	Stripe R.
	bu/a	lb/bu	(% of Flg)
Untreated	39	62.6	44
Headline 6oz Boot	45	62.2	13
Tilt 4 oz Boot	45	62.3	19
Quadris 6.2 oz Bt	36	62.3	19
Quilt 14 oz Boot	43	62.3	16
LSD (0.05)	NS	NS	NS

Stripe Rust Summary

- **Stripe rust is a cool season rust infecting wheat earlier in the season than leaf rust and thus has the potential to reduce yield more than does leaf rust**
- **Fungicides are not an absolute return on your money!**
 - Consider variety, temperature/forecast (Colorado maybe cooler)
- **Fungicides can provide a huge return!**
 - Stripe rust should command a lot of respect (2001 KS data)
- **Certified seed production**
 - If disease is present and quality is essential to receive benefit/payment – TREAT!

Disease System Components



Acknowledgements:

Special thank you to Dr. Jim Stack, Extension Plant Pathologist, Kansas State University for the major contributions to this presentation.



K-State Research and Extension

*Knowledge
for LIFE*



Questions