



# Plant Diseases

Influenced  
by  
Previous Crops

Research Results



# Cropping Systems Research

An aerial photograph of a large agricultural field. The field is divided into numerous rectangular plots of different colors, representing various crop sequences and residue treatments. A prominent feature is a long, narrow strip of trees running horizontally across the middle of the field. In the background, there's a small pond or reservoir. The sky is clear and blue. The overall scene is a well-organized research site for crop systems.

## Crop Sequence Project

A crop X crop residue matrix

10 crops on 10 residues, 100 combinations

No-till seeded for all crops

USDA-ARS-NGPRL, Mandan, ND

# Crop X Crop Residue Matrix, 10 crops

## One Replicate

809	819	829	839	849	859	869	879	889	899	<b>1</b>
808	818	828	838	848	858	868	878	888	898	<b>2</b>
807	817	827	837	847	857	867	877	887	897	<b>5</b>
806	816	826	836	846	856	866	876	886	896	<b>9</b>
805	815	825	835	845	855	865	875	885	895	<b>7</b>
804	814	824	834	844	854	864	874	884	894	<b>10</b>
803	813	823	833	843	853	863	873	883	893	<b>6</b>
802	812	822	832	842	852	862	872	882	892	<b>3</b>
801	811	821	831	841	851	861	871	881	891	<b>4</b>
800	810	820	830	840	850	860	870	880	890	<b>8</b>
<b>5</b>	<b>2</b>	<b>7</b>	<b>1</b>	<b>8</b>	<b>4</b>	<b>6</b>	<b>9</b>	<b>3</b>	<b>10</b>	

**Crop Matrix**

**1st year, ten crops seeded in strips**

**2<sup>nd</sup> year, ten crops seeded perpendicular over crop residue**



# Crop Sequence Project

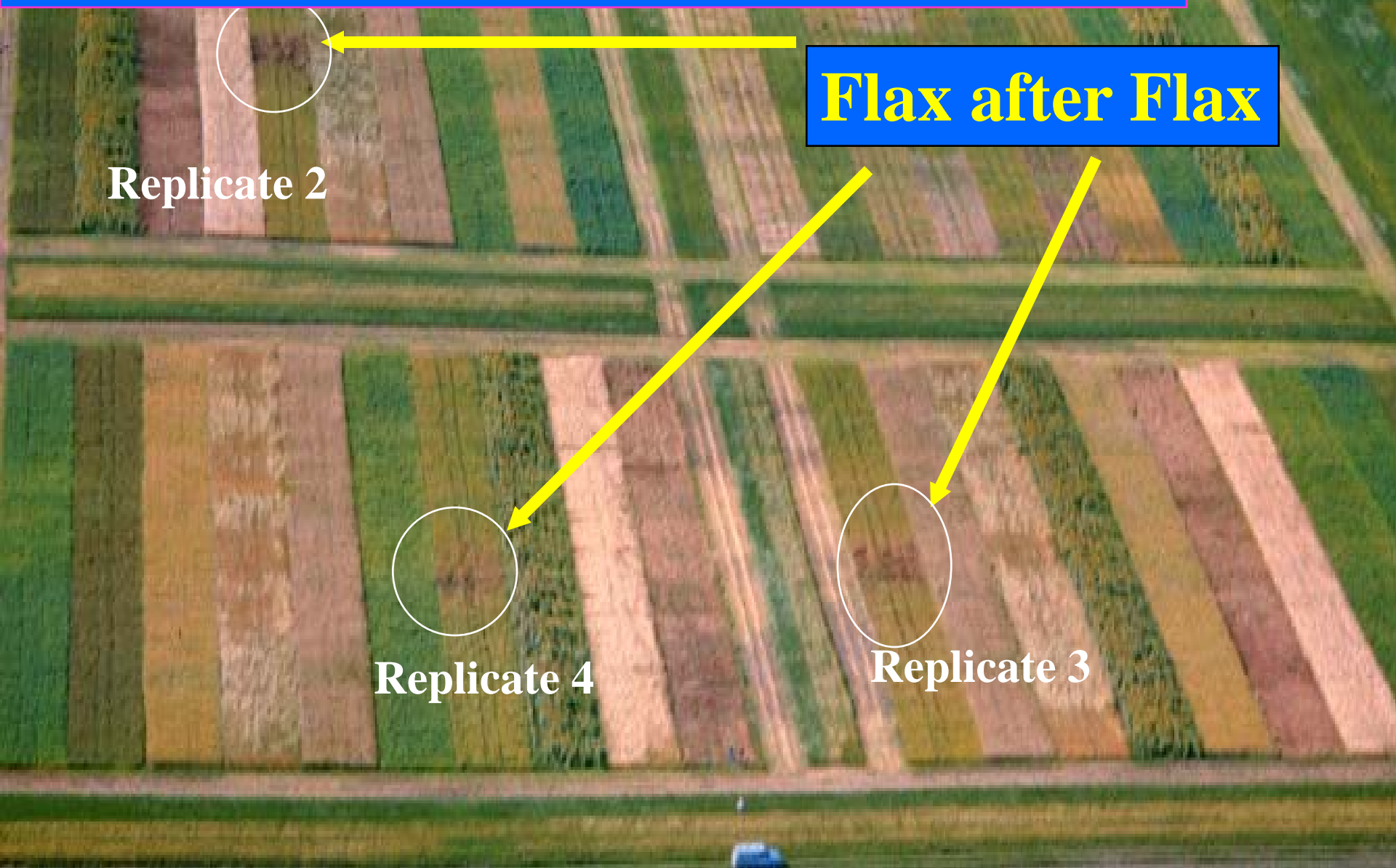
10 crops on 10 residues, 100 combinations

USDA-ARS-NGPRL, Mandan, ND



SB SF CA SW CR DB FX SN BR DP

**High disease severity when flax  
was seeded after flax (*Linum usitatissimum*).**



**Flax after Flax**

Replicate 2

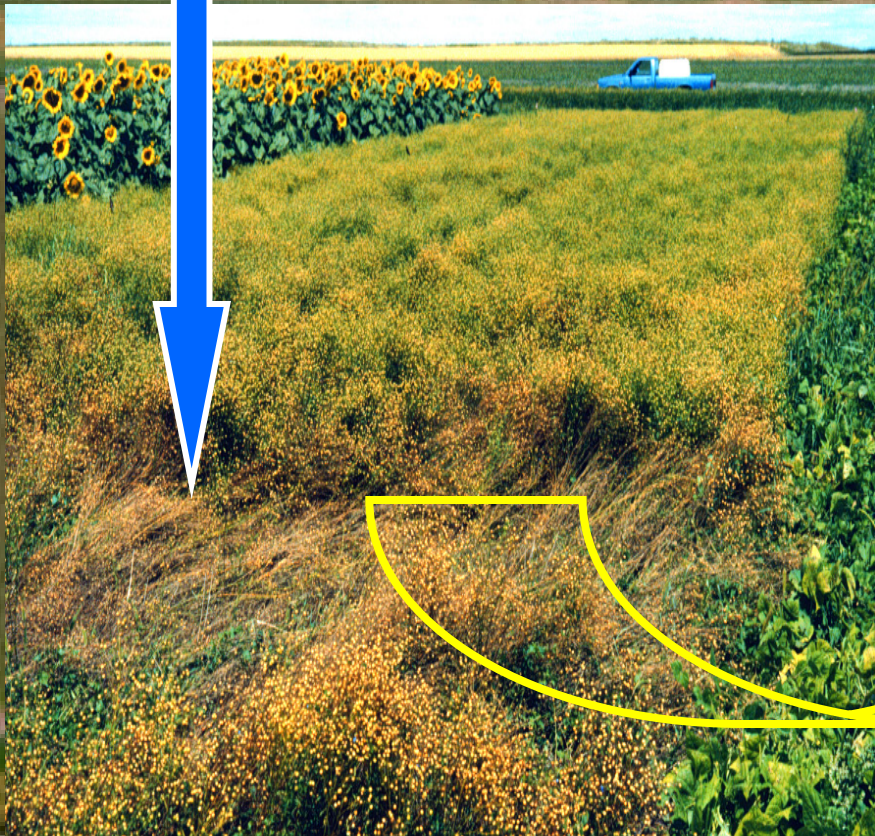
Replicate 4

Replicate 3



**High disease severity when flax was seeded after flax.**

**Flax after Flax**

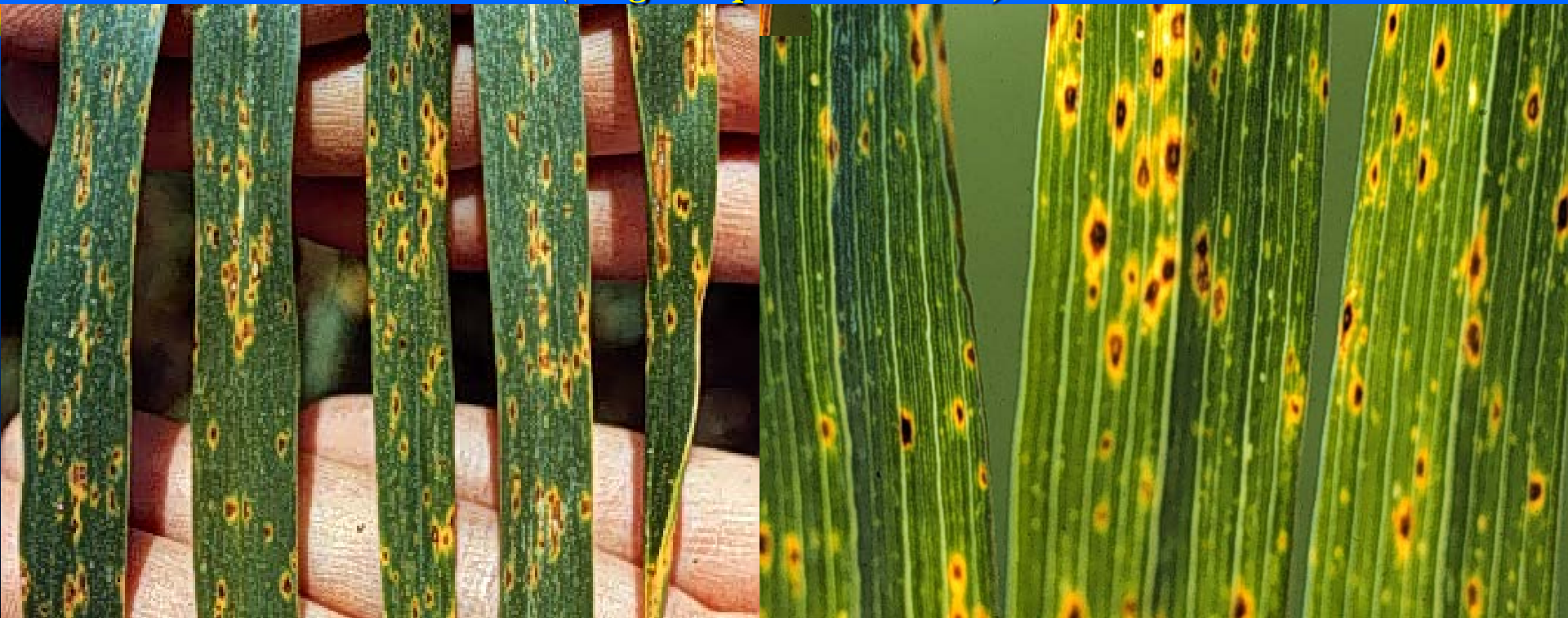






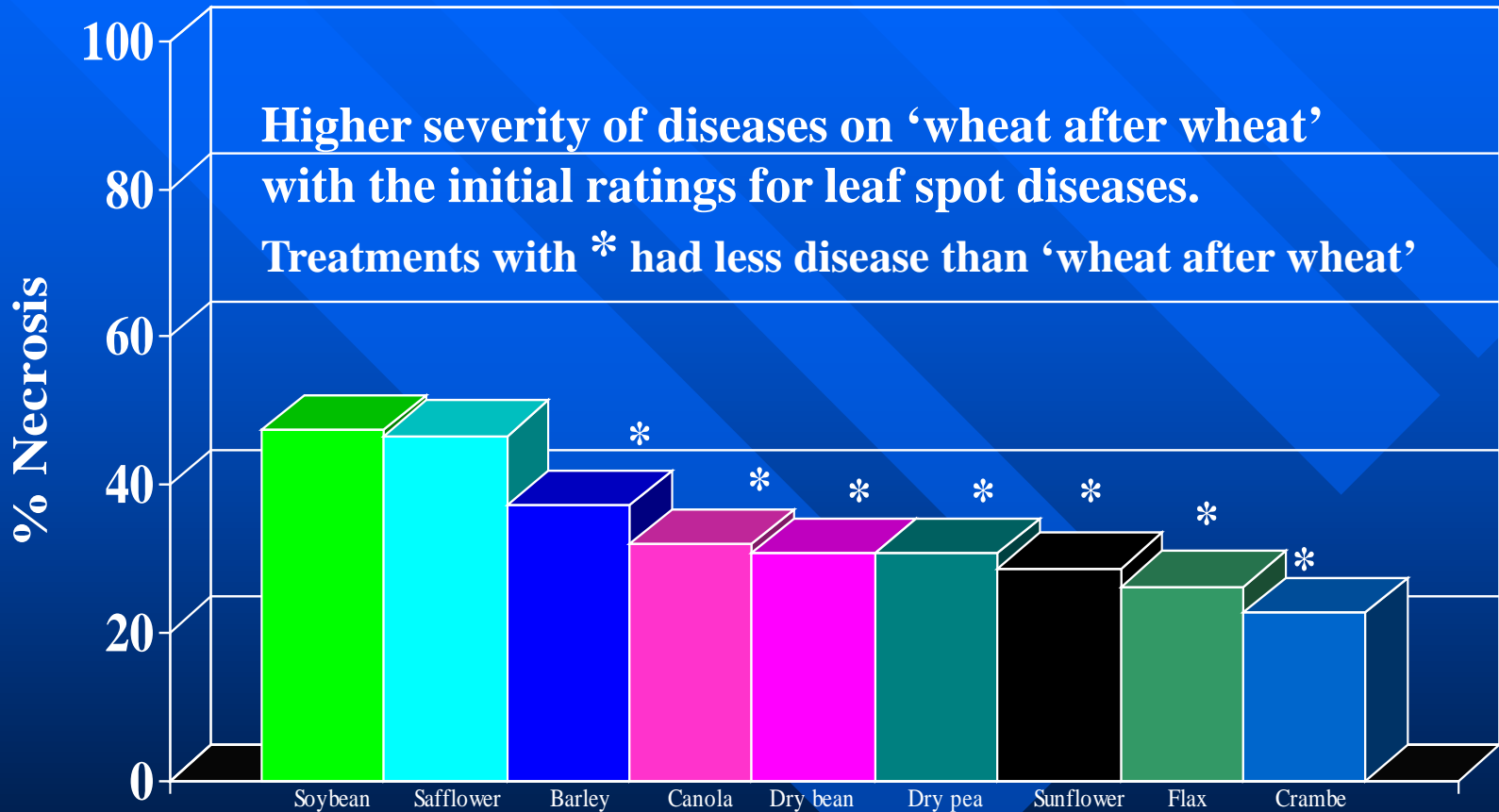
# Leaf Spot Diseases on Wheat (*Triticum aestivum*):

Tan spot (*Pyrenophora tritici*) and  
Stagonospora (Septoria) nodorum blotch  
(*Stagonospora nodorum*)



# Leaf spot disease on Wheat (FL-2), Early rating.

Crop Sequence Study, July 6, 2000  
NGPRL, Mandan, ND



Wheat Grown on Different Crop Residues

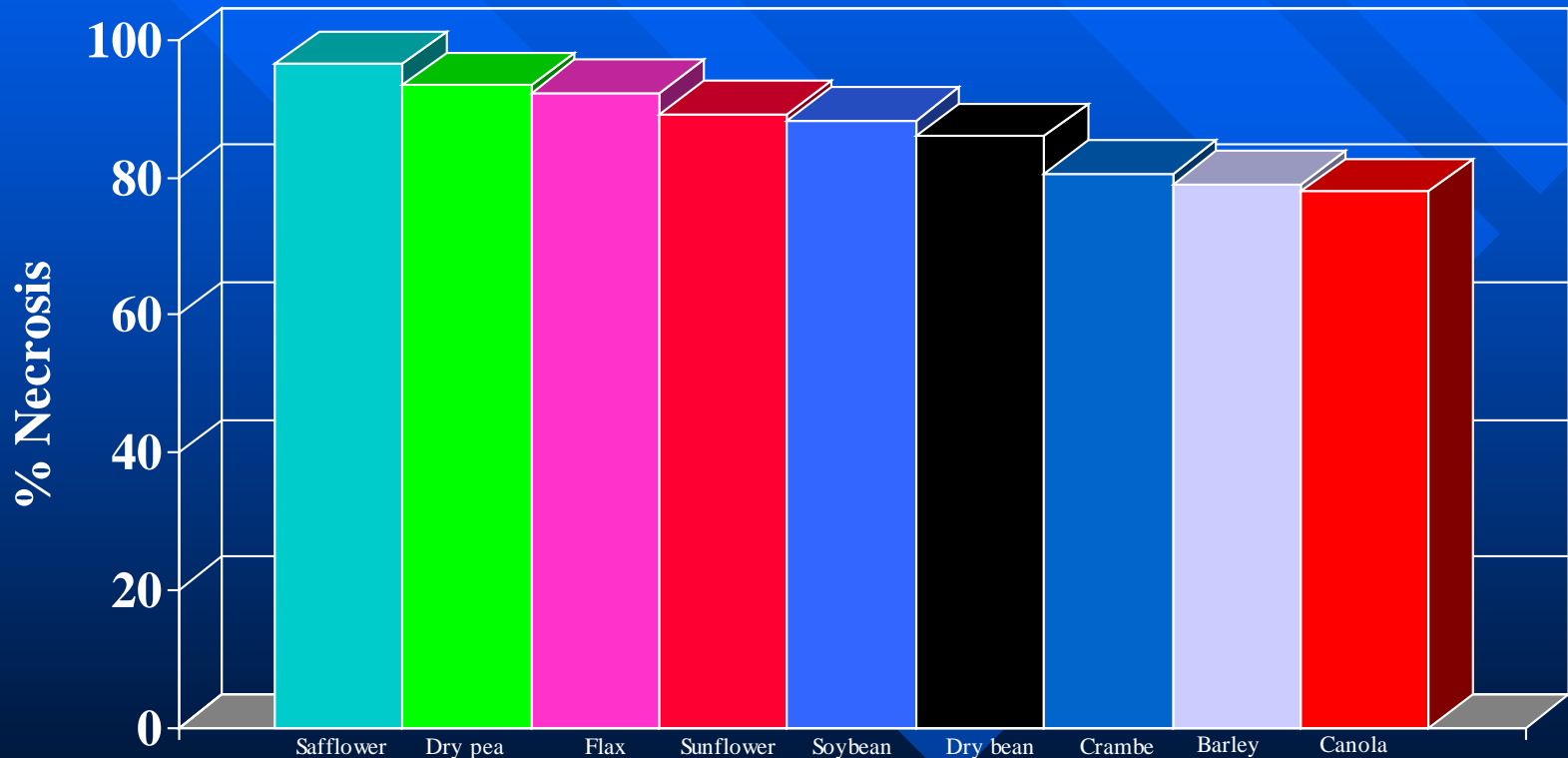


# Leaf spot disease on Wheat (FL), Late Rating.

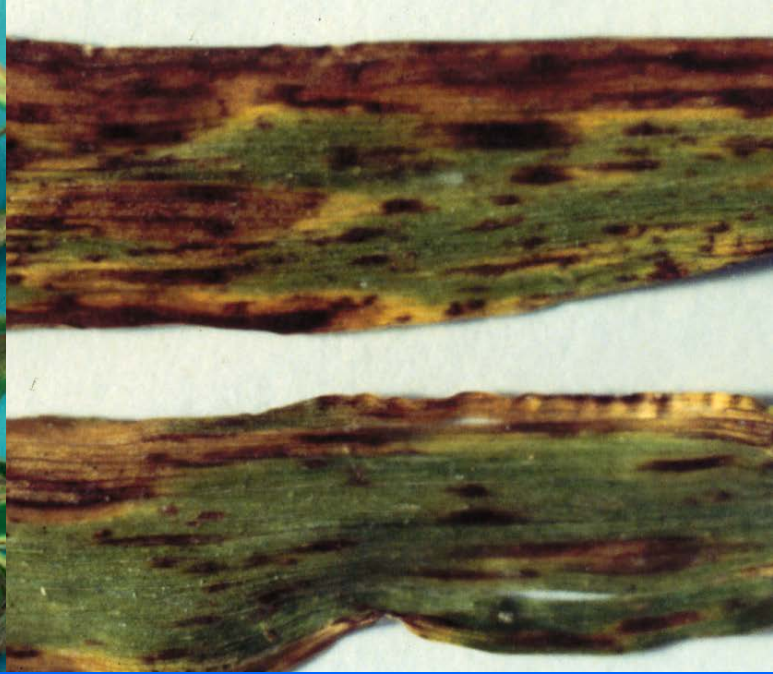
Crop Sequence Study, July 31, 2000

NGPRL, Mandan, ND

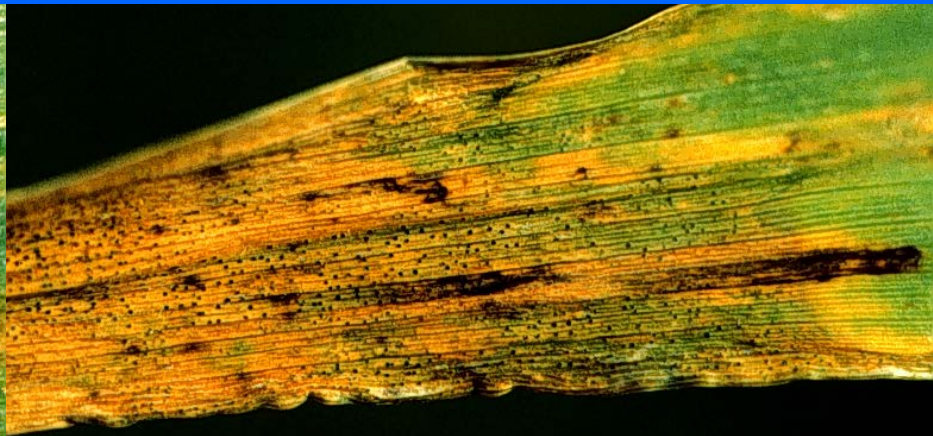
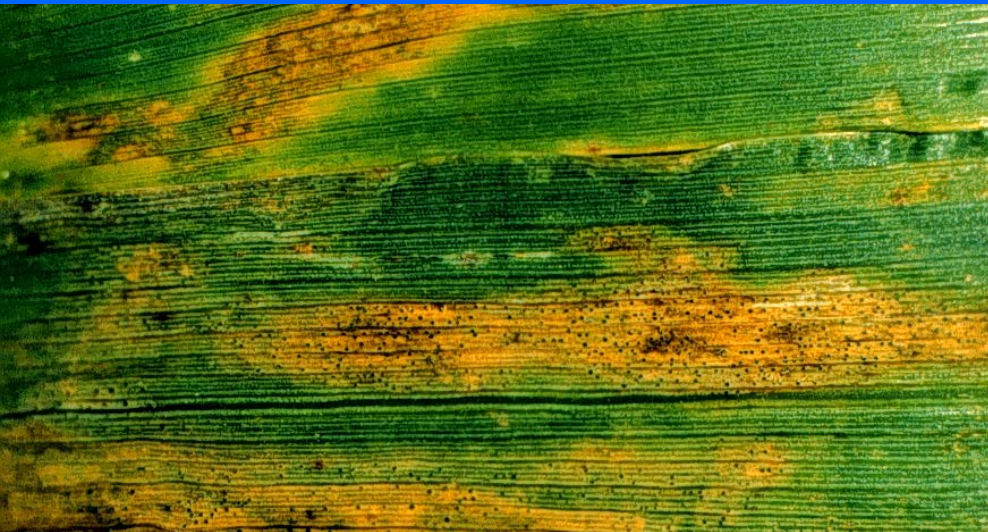
All treatments are similar with later ratings



Wheat Grown on Different Crop Residues



# Leaf Spot Diseases on Barley (*Hordeum vulgare*)





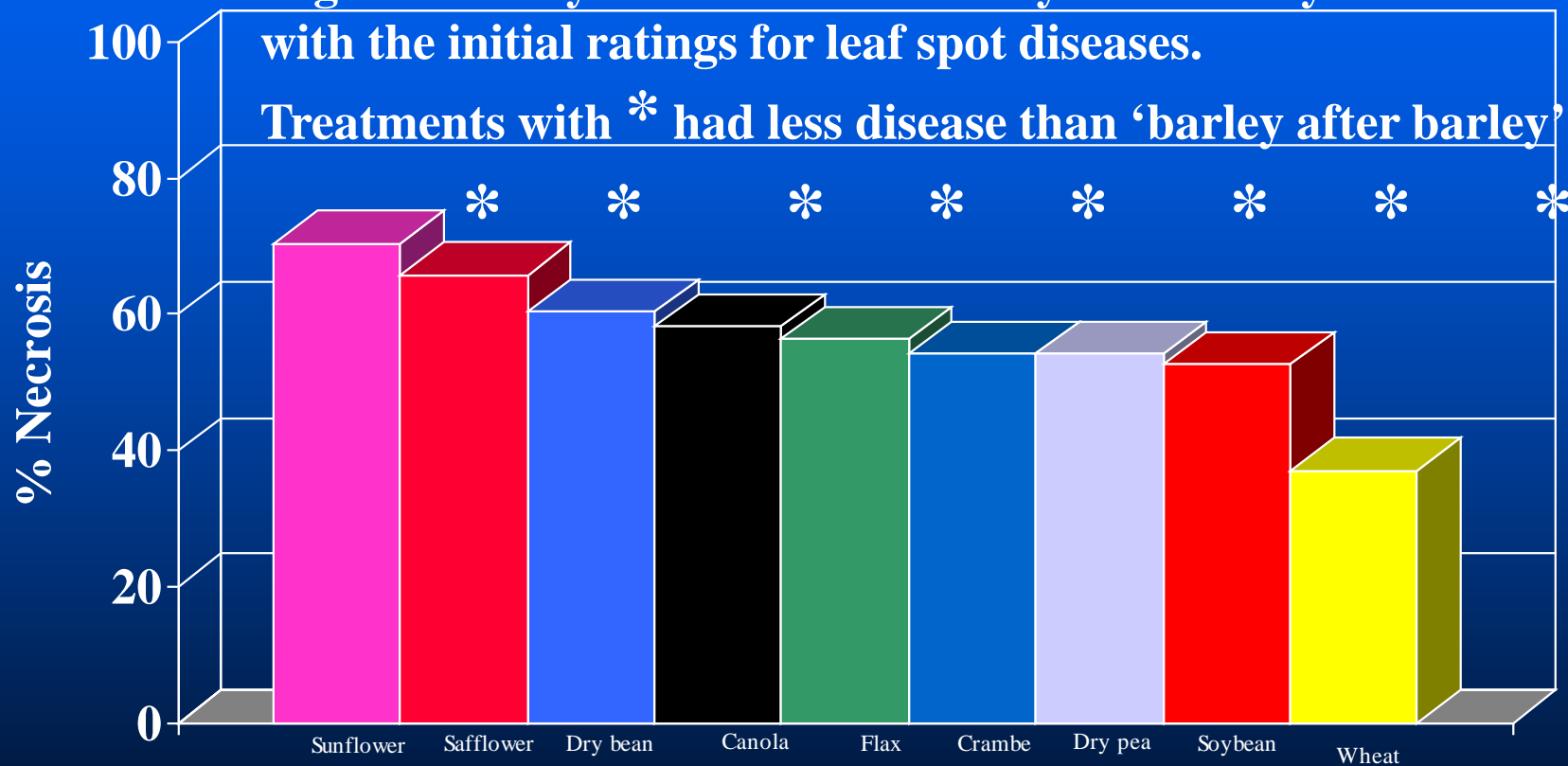
# Leaf spot disease on Barley (FL-3), Early rating.

Crop Sequence Study, July 6, 2000

NGPRL, Mandan, ND

Higher severity of diseases on 'barley after barley'  
with the initial ratings for leaf spot diseases.

Treatments with \* had less disease than 'barley after barley'

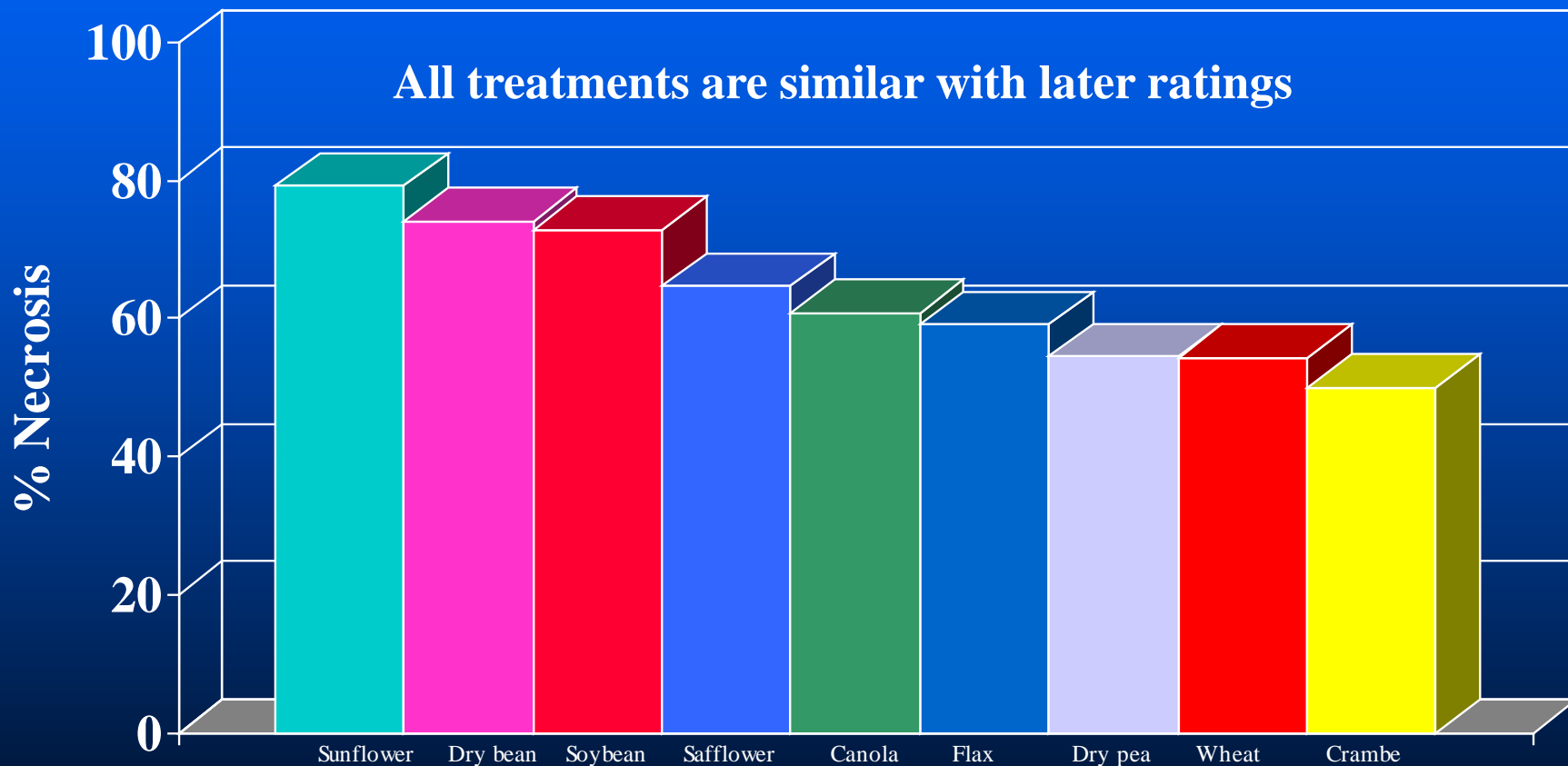


Barley Grown on Different Crop Residues

# Leaf spot disease on Barley (FL), Late rating.

Crop Sequence Study, July 19, 2000

NGPRL, Mandan, ND



**Barley Grown on Different Crop Residues**



# Sclerotinia

(*Sclerotinia sclerotiorum*)

## on Canola

(*Brassica napus*)



**White stems, infected with  
Sclerotinia after harvest**



# Sclerotinia on Canola

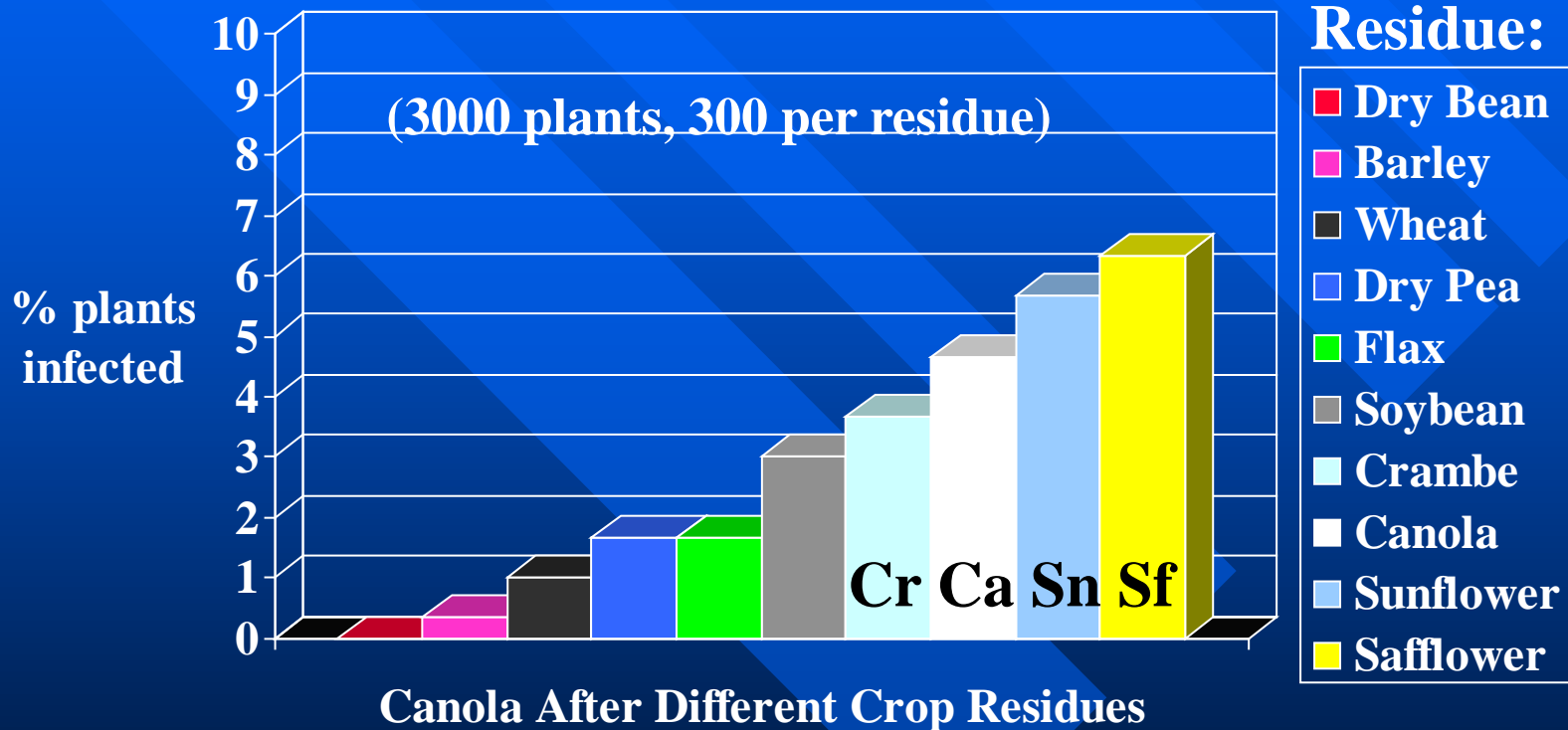


Sclerotia



# Canola with Sclerotinia, 1999

Crop Sequence Project, NGPRL, Mandan, ND

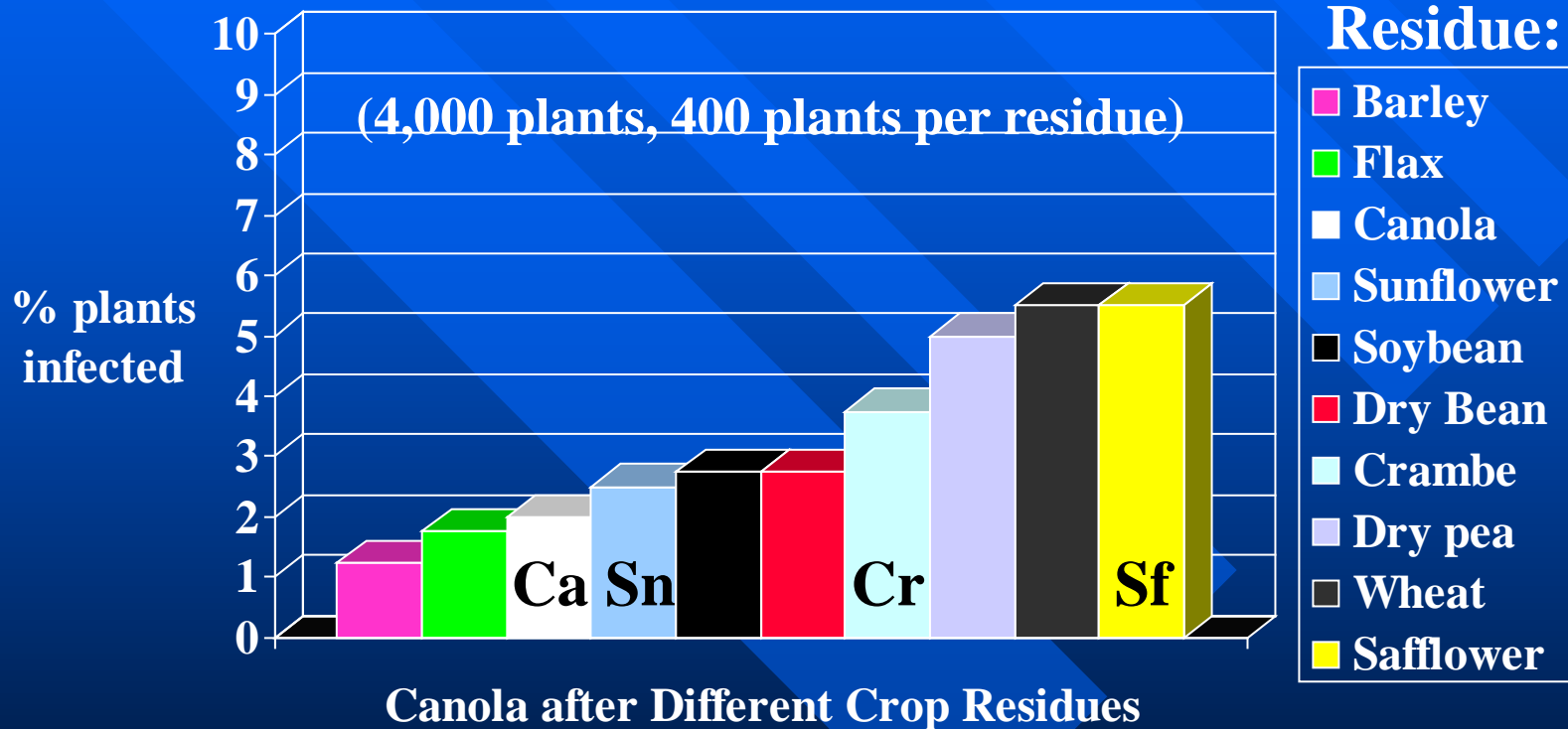


**NS**

NS = No significant difference at  $P \leq 0.05$

# Canola with Sclerotinia, 2000

Crop Sequence Project, NGPRL, Mandan, ND

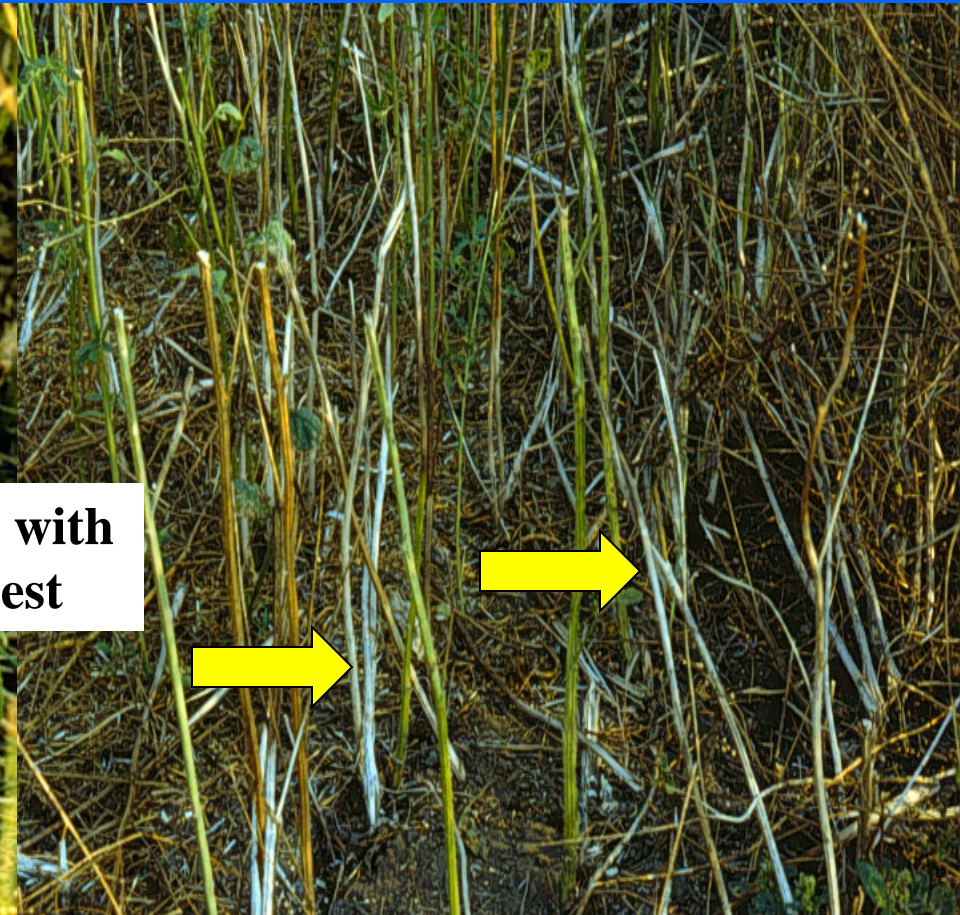


**NS**

NS = No significant difference at  $P \leq 0.05$



# Sclerotinia on Crambe (*Crambe abyssinica*)

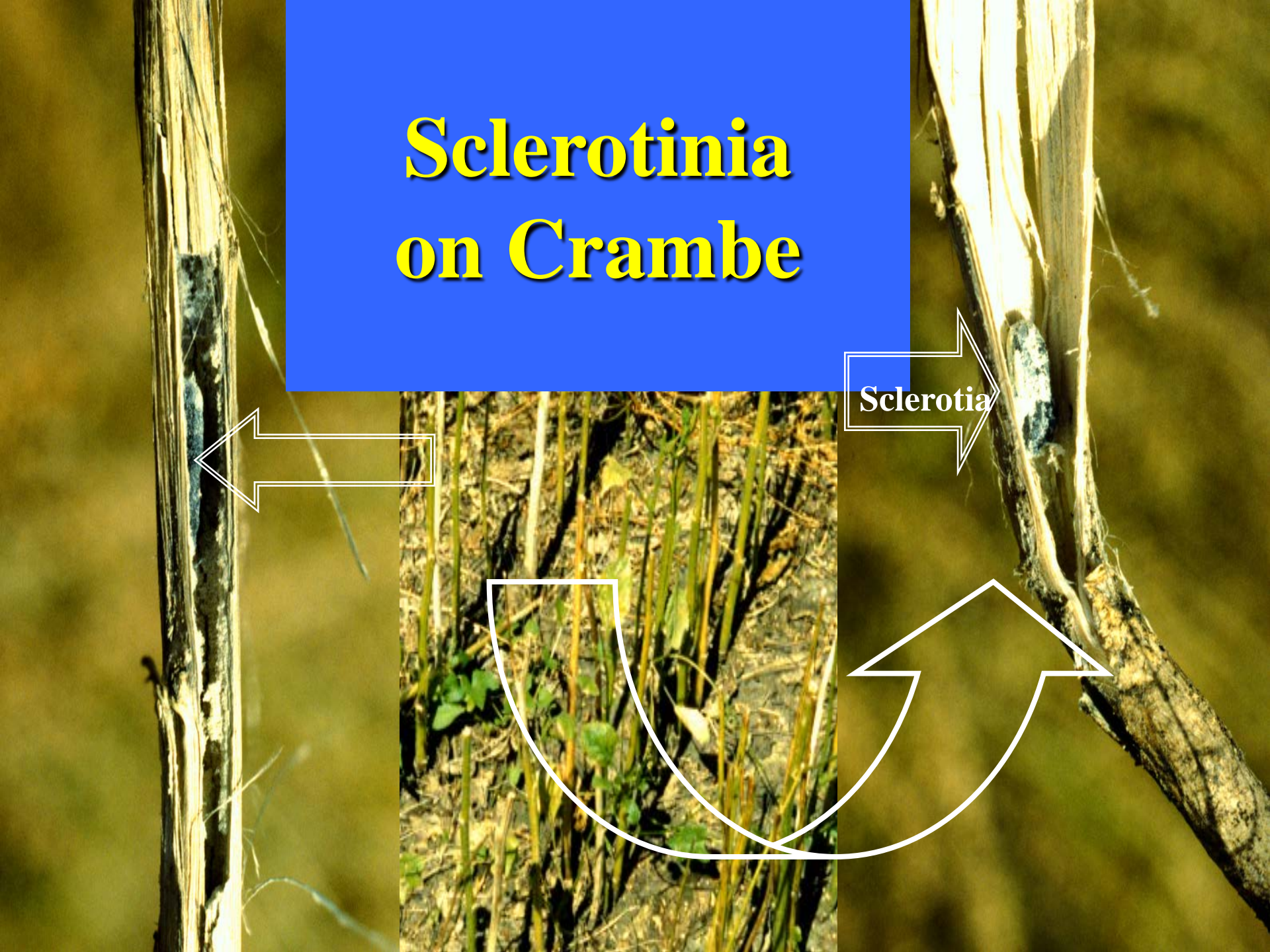


**White stems, infected with  
Sclerotinia after harvest**



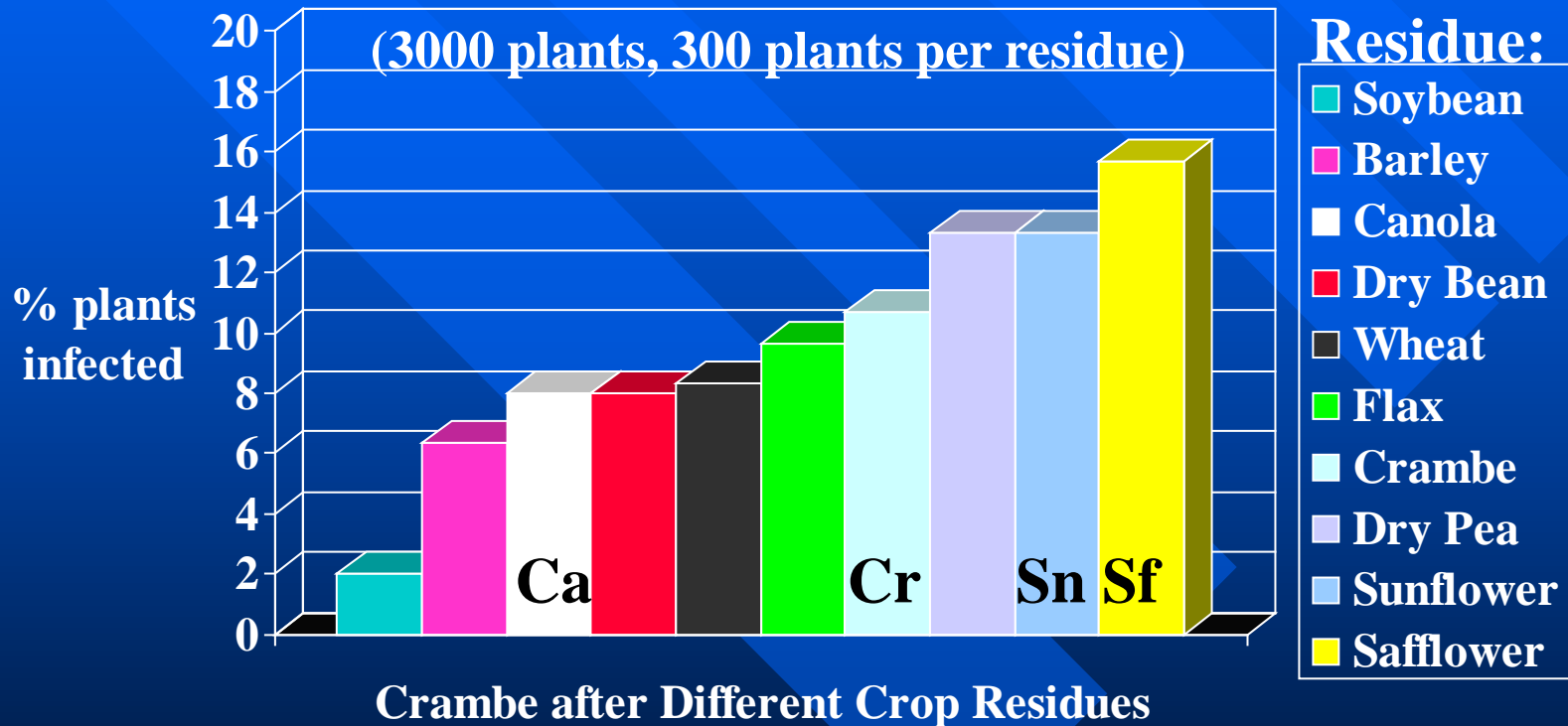
# Sclerotinia on Crambe

Sclerotia



# Crambe with Sclerotinia, 1999

Crop Sequence Project, NGPRL, Mandan, ND



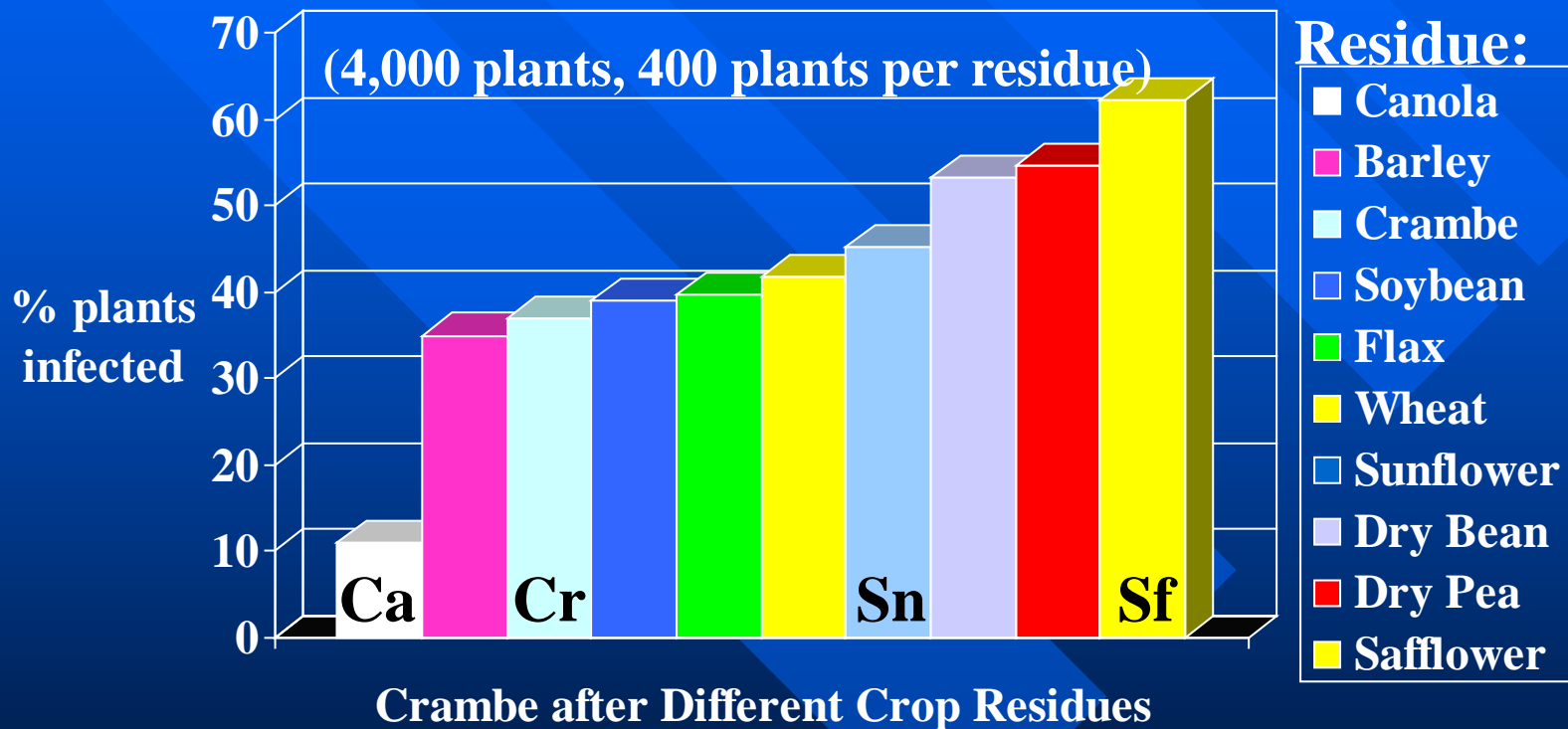
**NS**

NS = No significant difference at  $P \leq 0.05$



# Crambe with Sclerotinia, 2000

Crop Sequence Project, NGPRL, Mandan, ND



**NS**

NS = No significant difference at  $P \leq 0.05$

# Sclerotinia Head Blight on Safflower (*Carthamus tinctorius*)



**A sclerotium pulled from under infected head**



# Sclerotinia on Safflower



Sclerotia in stem

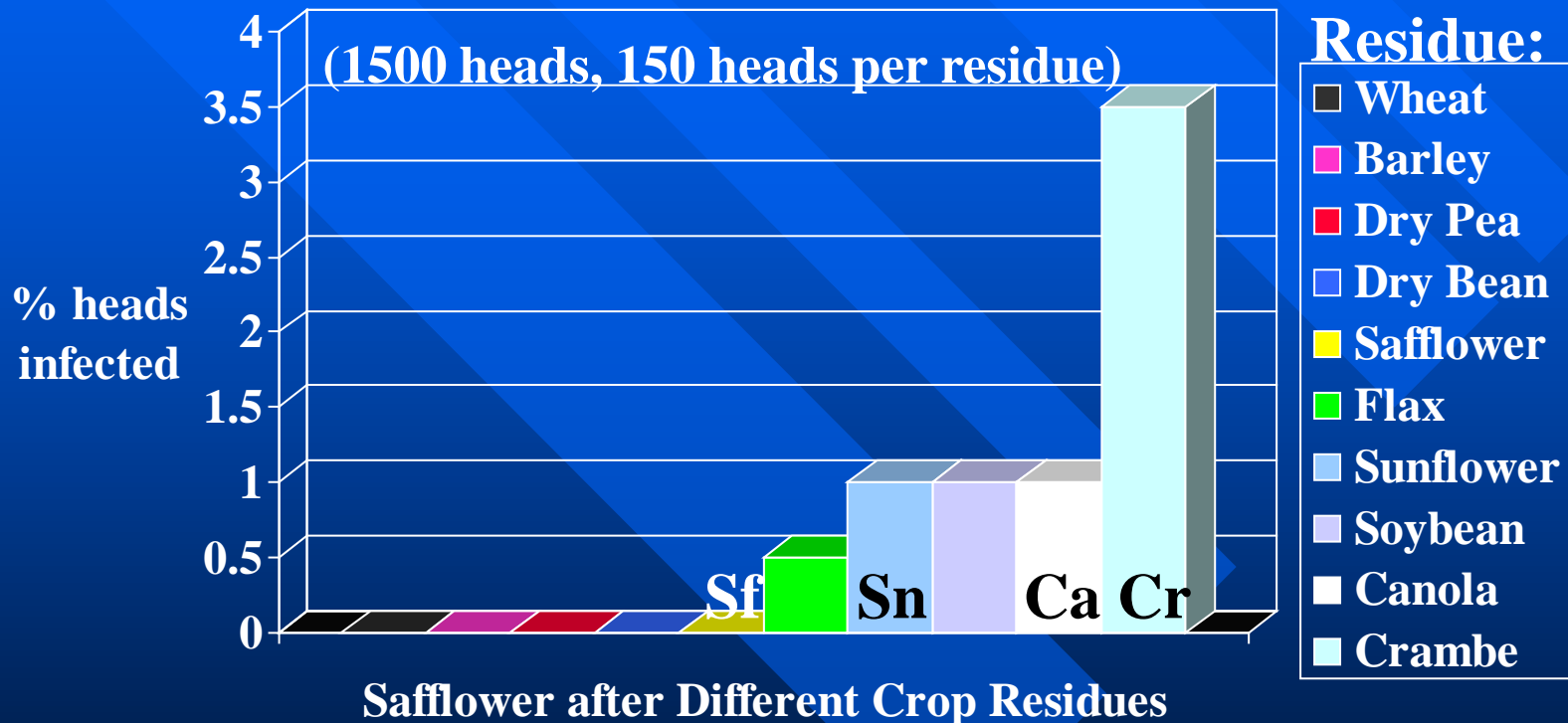


Sclerotia from heads



# Safflower with Sclerotinia, 1999

Crop Sequence Project, NGPRL, Mandan, ND

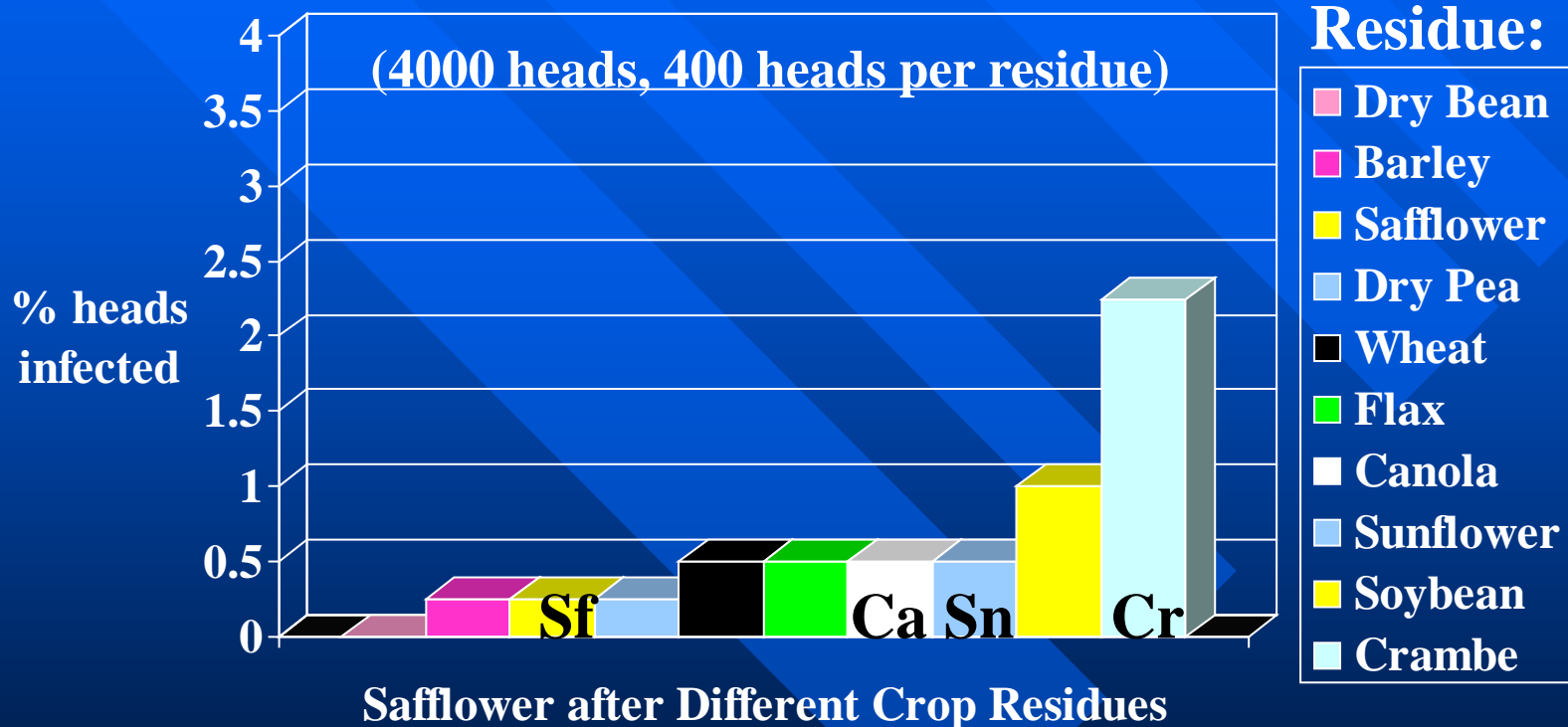


**NS**

NS = No significant difference at  $P \leq 0.05$

# Safflower with Sclerotinia, 2000

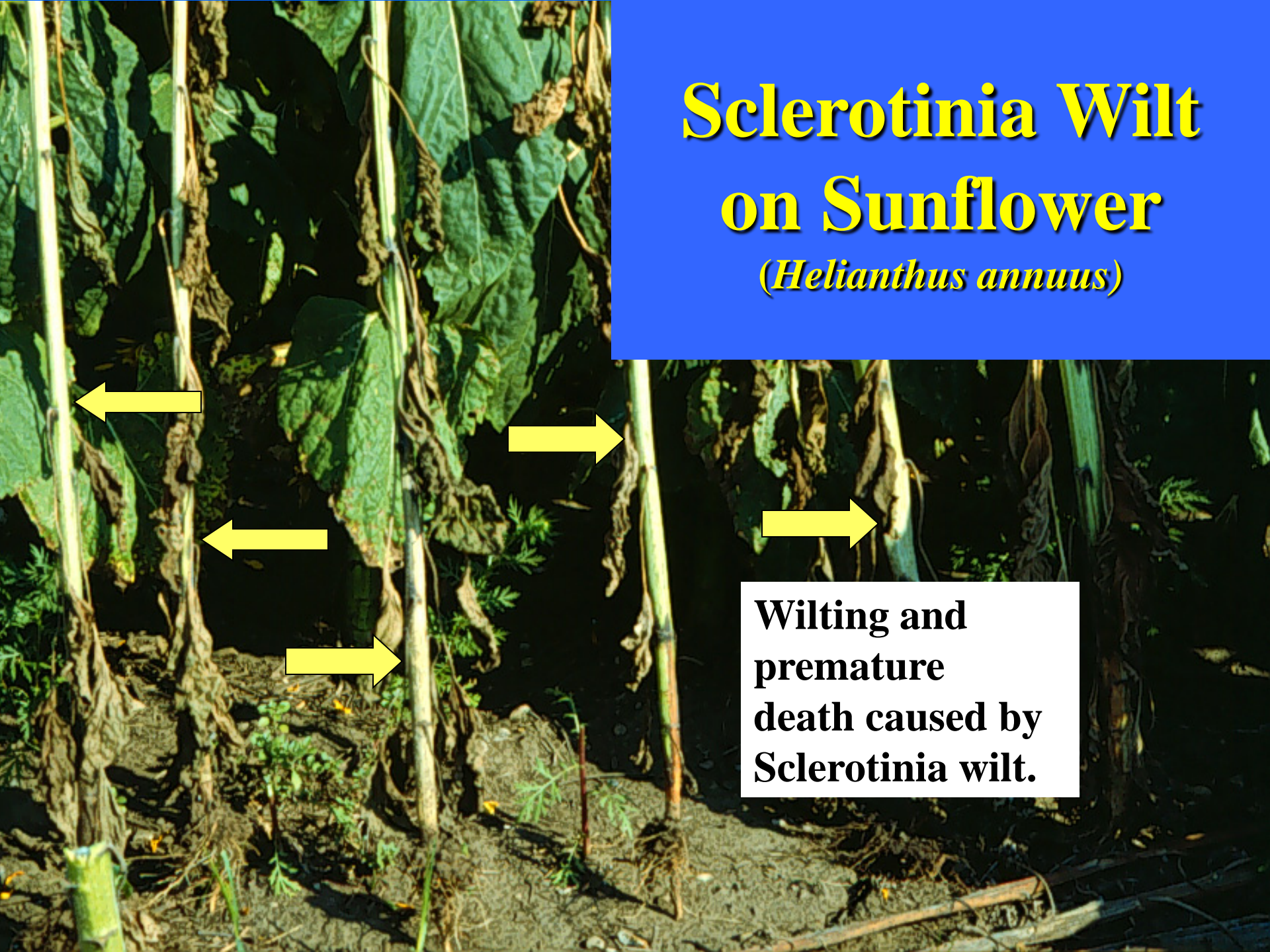
Crop Sequence Project, NGPRL, Mandan, ND



**NS**

NS = No significant difference at  $P \leq 0.05$

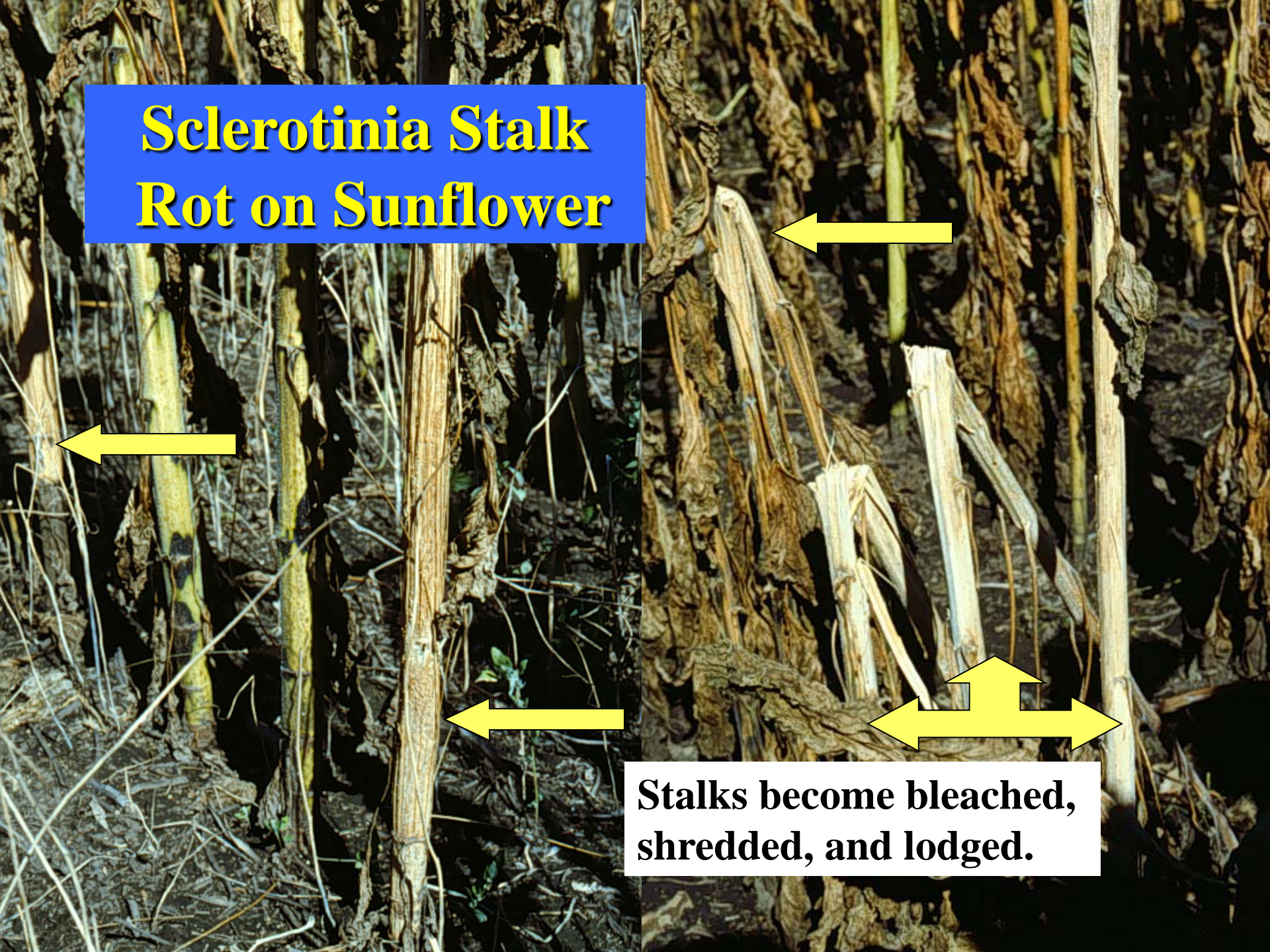
# Sclerotinia Wilt on Sunflower (*Helianthus annuus*)



**Wilting and  
premature  
death caused by  
Sclerotinia wilt.**



# Sclerotinia Stalk Rot on Sunflower



**Stalks become bleached, shredded, and lodged.**



# Signs of Sclerotinia in Sunflower Stalk

Sclerotia  
inside

Fungal structures  
(sclerotia) produced  
in the stalk.

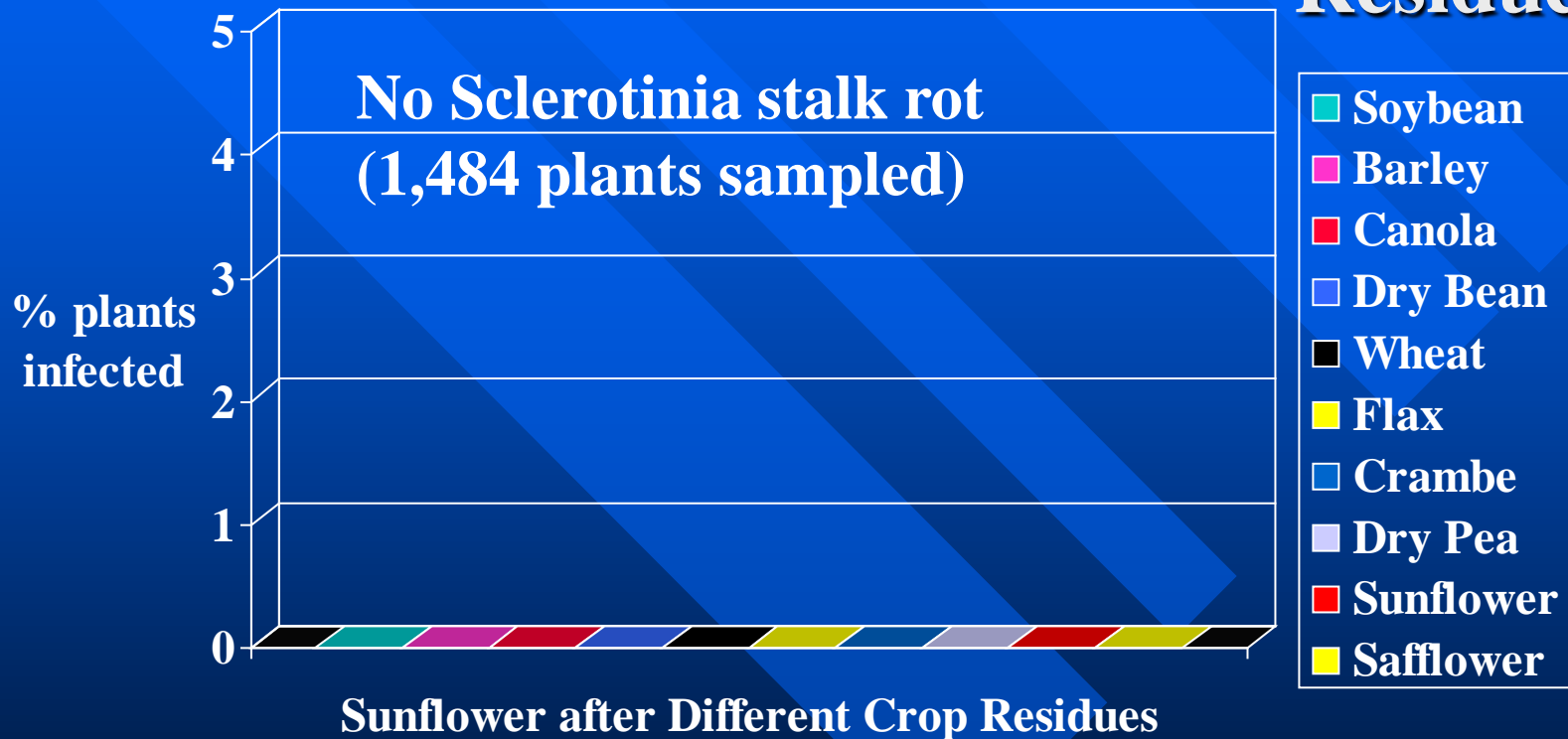




# Sunflower with Sclerotinia, 1999

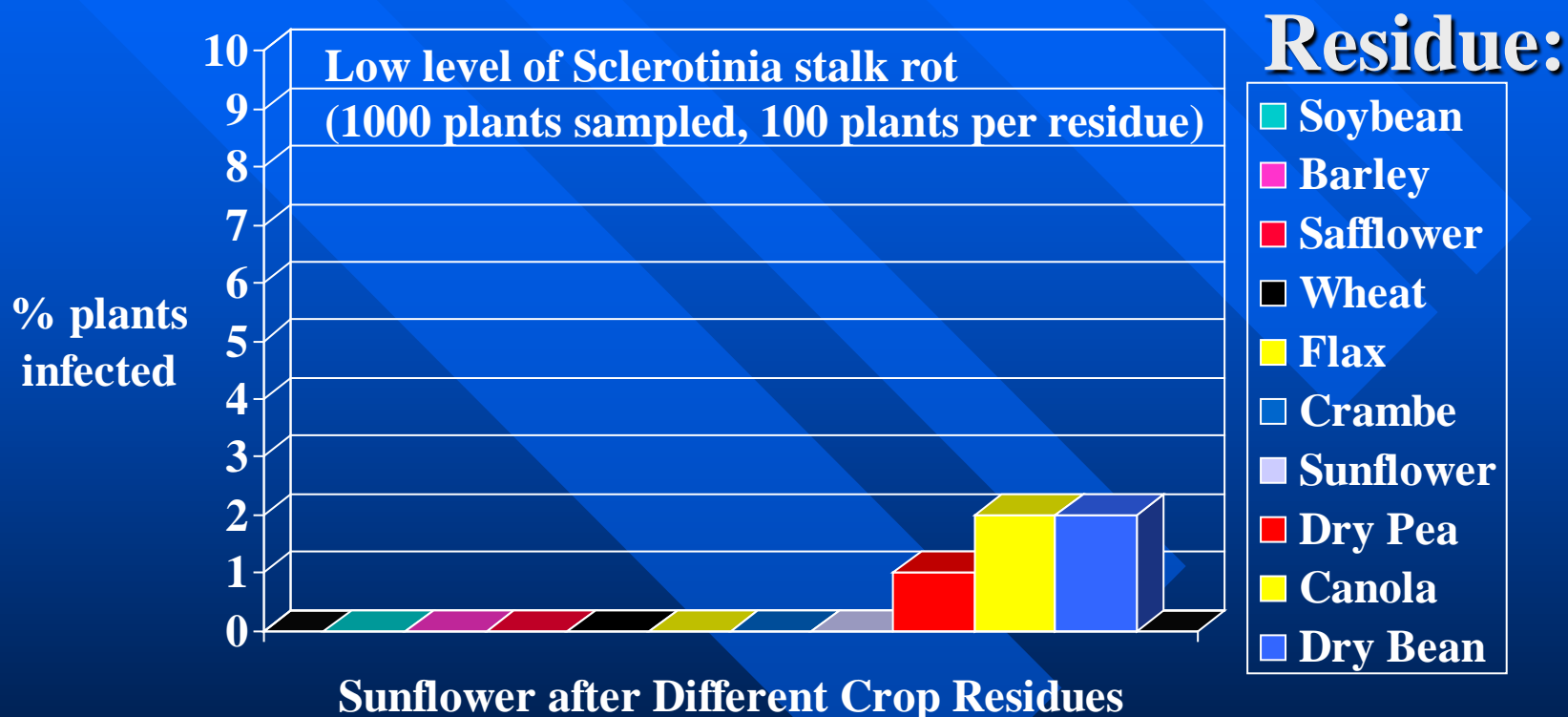
Crop Sequence Project, NGPRL, Mandan, ND

Residue:



# Sunflower with Sclerotinia, 2000

Crop Sequence Project, NGPRL, Mandan, ND



(1 infected plant on Pea and 2 on Canola and Bean)

NS = No significant difference at  $P \leq 0.05$



**Using management practices to reduce disease risks in diversified cropping systems is discussed in an upcoming publication:**

**Krupinsky, J.M., Bailey, K.L., McMullen, M.P., Gossen, B.D., and Turkington, T.K. 2002. Managing plant disease risk with diversified cropping systems. Agronomy Journal. (Accepted for publication, March/April 2002)**

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**[www.mandan.ars.usda.gov](http://www.mandan.ars.usda.gov)**

# **Sclerotinia Disease on Canola, Crambe, Safflower, and Sunflower as Influenced by Previous Crops.**

Krupinsky, J.M., D.L. Tanaka, S.D. Merrill, and R.E. Ries. 2001. Sclerotinia disease on canola, crambe, safflower and sunflower as influenced by previous crops. Pages 47-48 In: Proc. of the 11<sup>th</sup> International Sclerotinia Workshop, July 8-12, Central Science Laboratory, York, England, 194 pp.

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**Management Principles  
to Minimize Disease Risks  
are included in the**

**“Introduction to Plant Disease”**

**Additional information is available on  
internet links, check out**

**“Internet Resources for Information  
on Plant Diseases”**



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