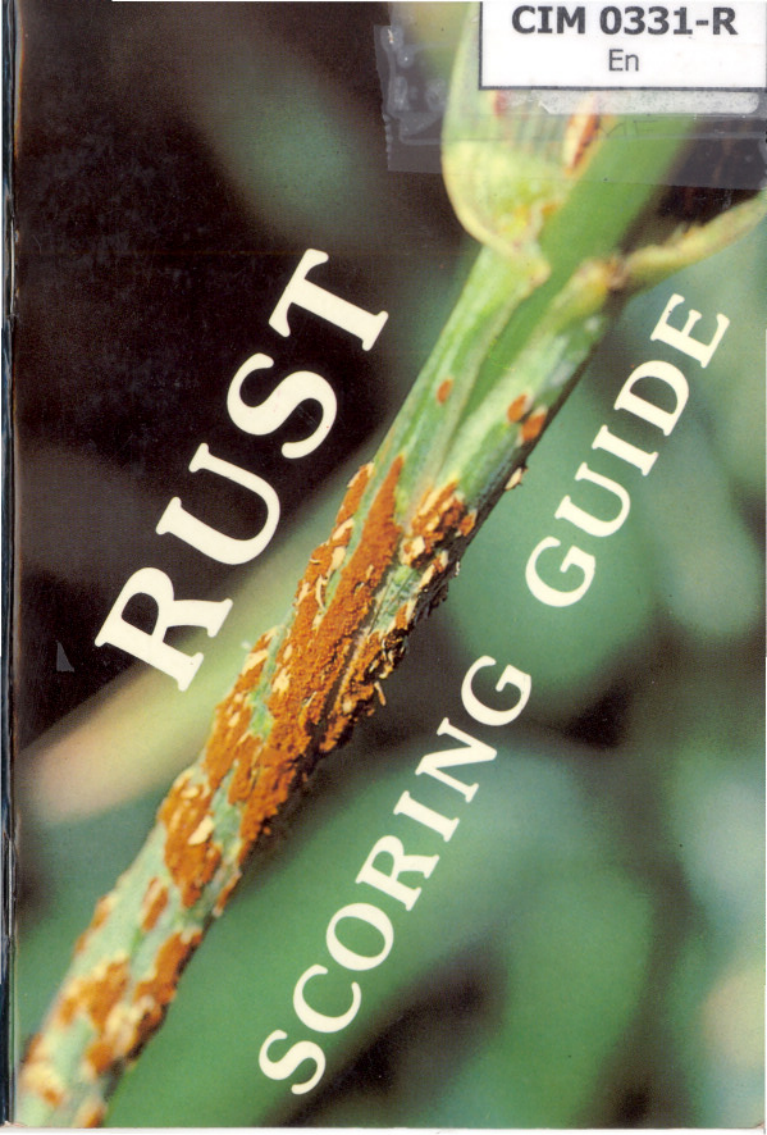


CIM 0331-R

En

The cover features a close-up photograph of a green plant stem heavily infested with a bright orange-brown rust fungus. The text 'RUST SCORING GUIDE' is printed in large, white, serif capital letters, following the diagonal path of the stem. In the top right corner, there is a white rectangular label with the text 'CIM 0331-R' and 'En' below it.

**RUST**  
**SCORING GUIDE**

# GROWTH STAGES OF SMALL GRAINS

code \_\_\_\_\_ (after Zadoks et al.)—

## **0** germination

- |    |                              |
|----|------------------------------|
| 00 | Dry seed                     |
| 01 | Start of imbibition          |
| 03 | Imbibition complete          |
| 05 | Radicle emerged from seed    |
| 07 | Coleoptile emerged from seed |
| 09 | Leaf just at coleoptile tip  |

## **1** seedling growth

- |    |                               |
|----|-------------------------------|
| 10 | First leaf through coleoptile |
| 11 | First leaf unfolded           |
| 12 | 2 leaves unfolded             |
| 13 | 3 leaves unfolded             |
| 14 | 4 leaves unfolded             |
| 15 | 5 leaves unfolded             |
| 16 | 6 leaves unfolded             |
| 17 | 7 leaves unfolded             |
| 18 | 8 leaves unfolded             |
| 19 | 9 or more leaves unfolded     |

## **2** tillering

- |    |                                  |
|----|----------------------------------|
| 20 | Main shoot only                  |
| 21 | Main shoot and 1 tiller          |
| 22 | Main shoot and 2 tillers         |
| 23 | Main shoot and 3 tillers         |
| 24 | Main shoot and 4 tillers         |
| 25 | Main shoot and 5 tillers         |
| 26 | Main shoot and 6 tillers         |
| 27 | Main shoot and 7 tillers         |
| 28 | Main shoot and 8 tillers         |
| 29 | Main shoot and 9 or more tillers |

code \_\_\_\_\_

**3 stem elongation** \_\_\_\_\_

- 30 Pseudostem erection (winter cereals only)
- 31 1st node detectable
- 32 2nd node detectable
- 33 3rd node detectable
- 34 4th node detectable
- 35 5th node detectable
- 36 6th node detectable
- 37 Flag leaf just visible
- 39 Flag leaf ligule just visible

**4 booting** \_\_\_\_\_

- 41 Flag leaf sheath extending
- 43 Boots just visibly swollen
- 45 Boots swollen
- 47 Flag leaf sheath opening
- 49 First awns visible

**5 ear emergence** \_\_\_\_\_

- 51 First spikelet of ear just visible
- 53 One-fourth of ear emerged
- 55 One-half of ear emerged
- 57 Three-fourths of ear emerged
- 59 Emergence of ear completed

**6 flowering** \_\_\_\_\_

- 61 Beginning of flowering
- 65 Flowering half-way complete
- 69 Flowering complete

## **7** *milk development*

71	Seed water ripe	
73	Early milk	
75	Medium milk	} An increase in the solids of the liquid endosperm is notable when crushing the seed between fingers
77	Late milk	

## **8** *dough development*

83	Early dough	
85	Soft dough	(Fingernail impression not held)
87	Hard dough	(Fingernail impression held; head losing chlorophyll)

## **9** *ripening*

91	Seed hard (difficult to divide by thumbnail)
92	Seed hard (can no longer be dented by thumbnail)
93	Seed loosening in daytime
94	Over-ripe; straw dead and collapsing
95	Seed dormant
96	Viable seed giving 50 percent germination
97	Seed not dormant
98	Secondary dormancy induced
99	Secondary dormancy lost

## RECORDING IN THE FIELD

---

Detailed outlines for recording stripe, stem and leaf rust intensities in cereals, based upon **severity** (percentage of rust infection on the plants) and **field response** (type of disease reaction), have been developed by Loegering.

**Severity** is recorded as a percentage, according to the modified Cobb scale. This recording process relies upon visual observations, and it is common to use the following intervals: Trace, 5, 10, 20, 40, 60, 100 percent infection.

**Field response** is recorded using the following letters:

- O No visible infection on plants.
- R **Resistant**; visible chlorosis or necrosis, *no uredia* are present.
- MR **Moderately Resistant**; *small uredia* are present and surrounded by either chlorotic or necrotic areas.
- M **Intermediate**; *variable sized uredia* are present, some with chlorosis, necrosis, or both.
- MS **Moderately Susceptible**; *medium sized uredia* are present and possibly surrounded by chlorotic areas.
- S **Susceptible**; *large uredia* are present, generally with little or no chlorosis and no necrosis.

Severity and field response readings are usually combined.

For example:

- tR = Trace severity with a resistant field response.
- 5MR = 5% severity with a moderately resistant field response.
- 60S = 60% severity with a susceptible field response.

# STRIPE RUST (Yellow Rust)

*Puccinia striiformis*

severity \_\_\_\_\_



5%



10%



20%



40%



60%



100%

*field response*



R



MR



MS

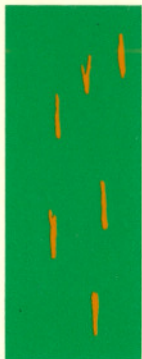


S

# STEM RUST (Black Rust)

*Puccinia graminis*

severity \_\_\_\_\_



5%



10%



20%



40%



60%



100%



*field response*



R



MR



MS



S

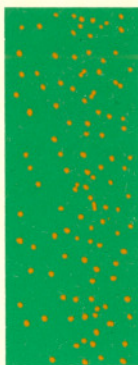
# LEAF RUST (Brown Rust)

*Puccinia recondita*

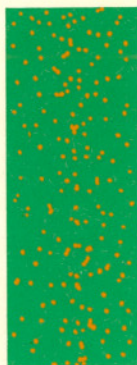
severity \_\_\_\_\_



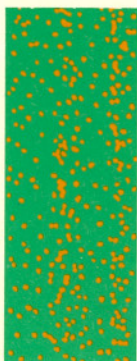
5%



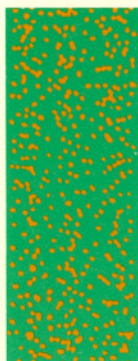
10%



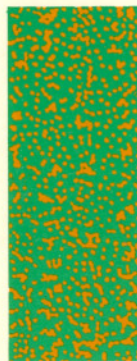
20%



40%

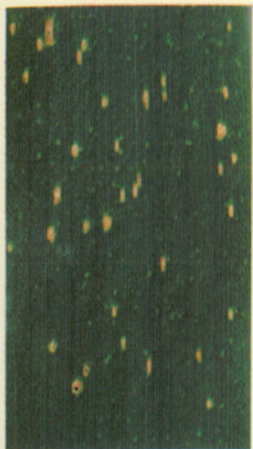


60%

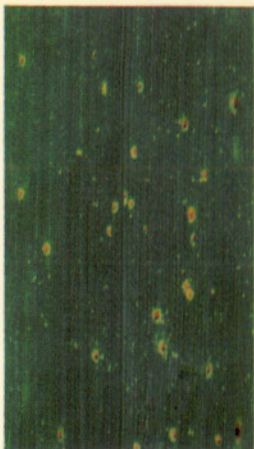


100%

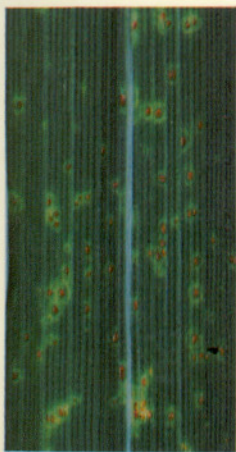
*field response*



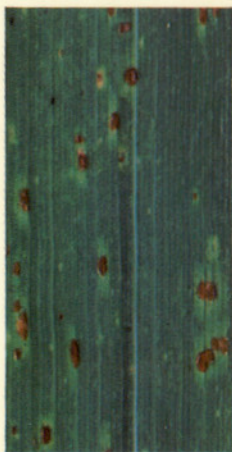
R



MR



MS



S



\*610295\*

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