

AN INHIBITORY EFFECT OF LIGHT ON THE INFECTION BY BROWN LEAF RUST OF WHEAT¹

*Een remmende invloed van licht op de infectie door
bruine roest van tarwe*

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In routine work with brown leaf rust of wheat (*Puccinia recondita* Rob. ex Desm. f. sp. *trititica* Henders.) the results of seedling inoculations were variable. Mr. VAN DEN BOGAERT has put forward the hypothesis that fluctuations in light intensity and duration of exposure during the first 24 hours after inoculation were responsible for this variation.

Seedlings of cv. 'Rubis' were inoculated when the second leaf became just visible. Temperature varied from ca. 15 to 20°C, according to the experiment. Relative humidity was ca. 70%, except for the first 24 hours when the plants were incubated in closed cages of colourless polyethylene at approximately 100% R.H. Supplementary light of ca. 15,000 lux at plant level was given during 16 hours per day using Philips TL-MF fluorescent tubes, 40 Watts, colour 33. Darkness during the period immediately following inoculation was procured by wrapping aluminium foil over plants and pots or by enveloping the polyethylene cages in black plastic film.

In the experiments 1, 2 and 3 (Table 1) care was taken to use equal numbers of uniform plants per pot. In the experiments 4, 5 and 6 respectively 30, 60 and 13 plants per treatment were used. For details of experiment 7 see below. The experiments were executed at different seasons of the year using various isolates of the rust. The results are consistent in showing a great number of pustules after the dark treatment when compared with the light treatment. Apparently, light has an inhibiting effect on the infection process during the first 6 to 24 hours. The practice of covering the polyethylene incubation cages with black plastic film during the first 16 to 24 hours after inoculation has been adopted in routine work with good results.

Experiment 7 was designed to find out whether the favourable influence of darkness was a pre- or a post-penetration effect; 60 seedlings were inoculated, 30 were incubated in darkness, the other 30 in light. After 16 hours incubation 9 primary leaves per treatment were cut away to determine the numbers of germinated and ungerminated spores on the upper leaf surface. When pustules were fully developed, these were counted on 15 leaves per treatment. The entries in Table 2 for the total number of spores per view and the number of germinated spores per view are averaged from over a thousand 0.541 mm² microscope views. The entries for the number of pustules per view are averaged

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TABLE 1. Relation between the period of darkness in hours after inoculation and the resulting number of pustules.

Verband tussen de donker-periode na inoculatie in uren en het infectieresultaat in aantallen sporenhoopjes.

Observer	Number of experiment	Hours darkness after inoculation				Entries represent number of:
		24	16	6-7	0	
A	1	143	—	251	10	Pustules per pot
	2	192	—	116	1	<i>Sporenhoopjes per pot</i>
	3	258	—	304	83	
B	4	—	—	3.5	0.7	Pustules per leaf
	5	—	—	31.8	2.4	<i>Sporenhoopjes per blad</i>
	6	200	—	—	1.7	
C	7	—	7.84	—	1.80	Pustules per cm ² <i>Sporenhoopjes per cm²</i>
		24	16	6-7	0	
<i>Waarnemer</i>	<i>Proefnummer</i>	<i>Uren duisternis na inoculatie</i>				<i>Getallen geven aantal:</i>

from nearly a thousand 8.757 mm² views and multiplied by a factor 0.541/8.757 for the purpose of comparison.

The ratio of germinated spores to pustules was almost independent of the light treatment, being 7.13 in the dark and 8.86 in the light. The ratio of total spores to germinated spores, however, was greatly influenced by the light treatment, being 1.58 in the dark and 5.18 in the light. Thus, in the dark 63 % of the spores germinated against 19 % in the light. Consequently, the inhibition of the infection process by light occurs mainly or exclusively in the pre-penetration phase. This result is corroborated by other reports (see ZADOKS & GROENEWEGEN, 1967).

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TABLE 2. Numbers of spores, germinated spores and pustules with and without 16 hours darkness after inoculation.

Aantallen sporen, gekiemde sporen en sporenhoopjes met en zonder 16 uur duisternis na inoculatie.

Light (L) of darkness (D)	Total number of spores per view	Number of germinated spores per view	Number of sori per view
D	0.77	0.49	0.0687
L	0.72	0.14	0.0158
<i>Licht (L) of donker (D)</i>	<i>Totaal aantal sporen per beeldveld</i>	<i>Aantal gekiemde sporen per beeldveld</i>	<i>Aantal sporenhoopjes per beeldveld</i>

SAMENVATTING

Licht gedurende 6 tot 24 uur na inoculatie heeft een remmende invloed op het infectieproces met als resultaat dat weinig sporenhoopjes gevormd worden. De lichtremming vindt hoofdzakelijk plaats in een fase voorafgaand aan de penetratie. Bij routinewerk in de kas werden de resultaten belangrijk verbeterd door na inoculatie de planten gedurende 16 tot 24 uur te incuberen in volledige duisternis, uiteraard bij 100 % relatieve luchtvochtigheid.

REFERENCES

- ZADOKS, J. C. & L. J. M. GROENEWEGEN, - 1967. On light sensitivity in germinating uredospores of wheat brown rust. *Neth. J. Pl. Path.* 73: In press.