

Yield determining weather conditions for winter oilseed rape

Wiebke Weymann, Ulf Böttcher, Klaus Sieling, Henning Kage

Introduction

In comparison with other main agricultural crops, winter oilseed rape (WOSR) yield is highly variable. The aim of this study was to investigate correlations between weather conditions and yield data during certain growth stages.

Hypothesis: Weather conditions determine WOSR yield by influencing the source-sink ratio. Sink-capacity is mainly affected during flowering, while weather conditions during fruit development limit the source strength.

Methods

Field trials with different N levels in spring (0 – 320 kg N/ha):
 - 5 experiments at Hohenschulden (Kiel, Germany), 1992 – 2011
 - 6 experiments, distributed over Germany, 2006 – 2009

Maximum yield was estimated from quadratic N response curves. Growth stages (GS, Fig. 1) according to Schuette et al. (1982) were simulated with a phenological model (Böttcher et al. 2012). Correlations and interactions between yield, weather variables and sites were tested with analysis of covariance ($\alpha = 0.05$).

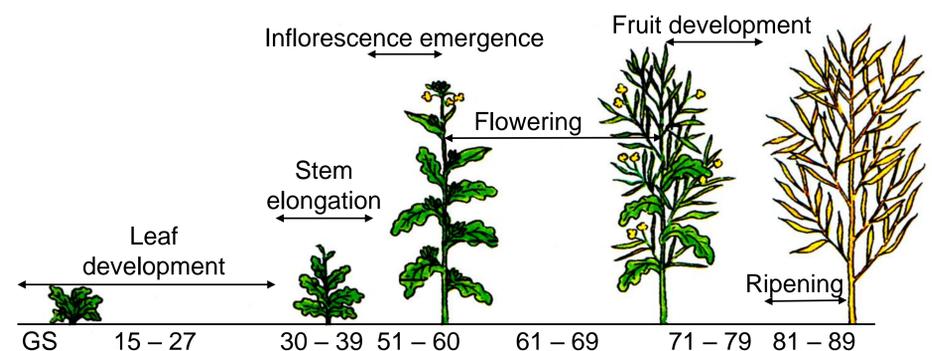


Fig. 1: Growth stages (GS) of winter oilseed rape (adapted from Diepenbrock and Geisler 1985)

Results

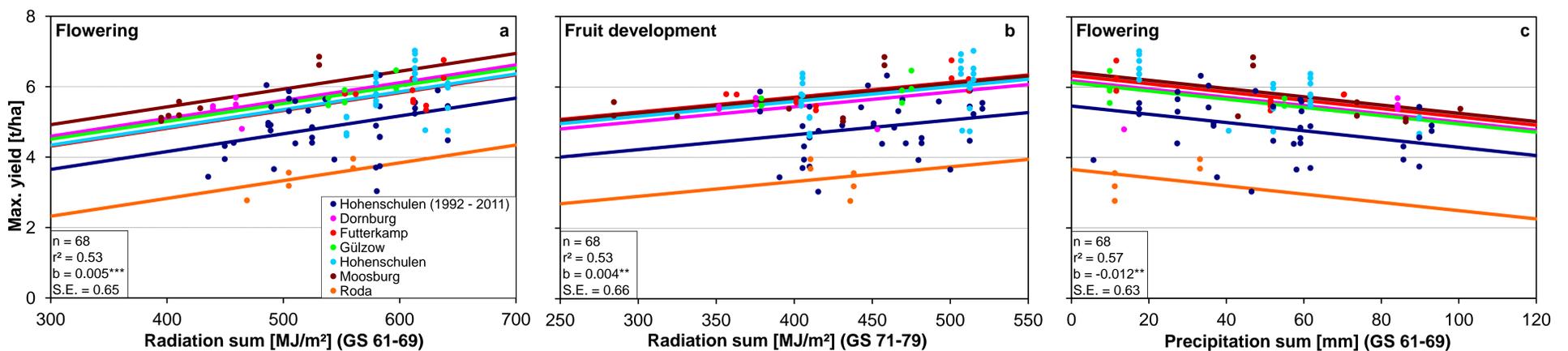


Fig. 2: Correlations between maximum yield of WOSR and a) radiation sum during flowering, b) radiation sum during fruit development and c) precipitation sum during flowering

Correlations to maximum yield:

Positive	- Radiation during flowering (Fig. 2a) - Radiation during fruit development (Fig. 2b) - Duration of fruit development (temp. dependent)
Negative	- Precipitation during flowering (Fig. 2c) - Mean temperature during fruit development

Weather variables and sites showed no significant interactions.

WOSR yield variability was best explained by combining the precipitation during flowering and the possibly autocorrelated radiation sums during flowering and fruit development ($r^2 = 0.60$).

Discussion and outlook

During flowering, sink-capacity of WOSR may be most sensitive to precipitation. In contrast, during fruit development, radiation mainly affects yield production by determining the photosynthetic activity of pod walls and therefore the source strength of WOSR.

The presented work will be continued with systematic analyses of weather conditions and yield data in order to verify the first results and explain more clearly the variability of WOSR yield.

References:

- Böttcher, U., Rampin, E., Hartmann, K., Zanetti, F., Flenet, F., Morison, M. (2012): A phenological model of winter oilseed rape according to BBCH scale (submitted to Field Crops Research).
 Diepenbrock, W., Geisler, G. (1985): Die Ertragsstruktur von Raps. Kali-Briefe 17. 585 – 618.
 Schuette, F., Steinberger, J., Meier, U. (1982): Entwicklungsstadien des Raps: Einschl. Ruebsen, Senfarten und Oelrettich. BBA Merkblatt 27 (7).

funded by



(Union zur Förderung von
 Oel- und Proteinpflanzen e.V.)

