Effect of timing and duration of combined heat and drought stress on oilseed rape (*Brassica napus* L.)

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Oilseed rape (*Brassica napus L.)* is a major global oil crop grown mainly under temperate climatic conditions. With increasing global edible oil demand and improving genetic yield, its production further expands to warmer climatic zones. Moreover, global climate change leads to an increasing incidence of heat and drought stress, which are critical limiting factors to plant growth and yield formation in oilseed rape, impeding its agronomic and economic performance.

A pot experiment was conducted in the experimental facilities at Julius Kühn-Institut in Kleinmachnow. The study aims at investigating the single and combined effects of heat and drought stress on crop morphology, physiology, and yield formation under consideration of timing and intensity of stress. Hence, four factors are tested in combination: heat stress at five levels as well as drought stress, treatment timing, and treatment duration with two levels each. We find that all experiment factors exerpted significant effects on grain yield, with increasing heat and drought stress as well as longer duration leading to lower yields. We further find that stress during flowering showed lower yield effects than during seed filling stage. Finally we find that early stress, which mainly acts on the main branch, is compensated by increased formation of siliques, seeds and grain yield on the lower side branches. Analysis of seed size distribution and fatty acid composition provide deeper insights in the effects and mechanisms of combined heat and drought stress.