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Maternal control of seed weight in rapeseed (*Brassica napus* L.): the causal link between the size of pod (mother, source) and seed (offspring, sink)

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Seed size/weight is one of the key traits related to plant evolution/domestication and crop yield. The previous research on seed weight is concentrated on seed itself (such as embryo and endosperm), and the relative contribution and regulatory mechanism of mother plant in determining seed weight is basically unknown. For this purpose, we conducted an ingenious (hand emasculum and self- and cross-pollination on the same mother plant) genetic analysis using nine representative extremely large- and small-seed accessions chosen from the core germplasm. The results showed that maternal genotype accounted for an average 93% of the natural variation of seed weight in rapeseed (PLoS ONE 10(4): e0125360.), playing a predominant role, which overturns the previously potential cognition. On this basis, a systematic (including genetic, morphological, cytological, physiobiochemical and molecular) comparative study was conducted by his team members, using the extremely large and small-seed recombinant inbred lines derived from an elite sequenced cultivar Zhongshuang11 and No.73290 (Plant Biotechnol. J., <https://doi.org/10.1111/pbi.13011>). We found that these lines carry two major quantitative trait loci that regulate the expression of downstream genes related to pod development, which affect pod length and photosynthetic area, photosynthate accumulation in the pod wall and its transport and storage in the seed, and finally influence seed filling, size and weight. For the main crops such as wheat, rice and maize, leaf is the major source of photosynthate; whereas in the rapeseed, pod wall is the major source of photosynthate for seed filling and weight formation during its later developmental stage. Therefore, in some sense, this research has opened a new research field for seed weight in plants.

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