

[10.1071/CP21673](https://doi.org/10.1071/CP21673)

*Crop & Pasture Science*

### Supplementary Material

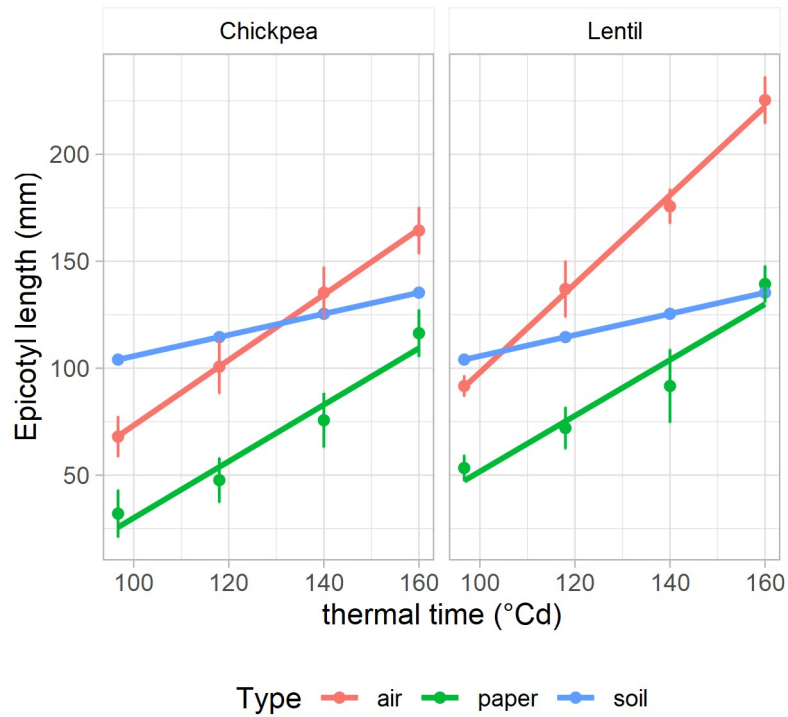
**Chickpea and lentil show little genetic variation in emergence ability and rate from deep sowing, but small-sized seed produces less vigorous seedlings**

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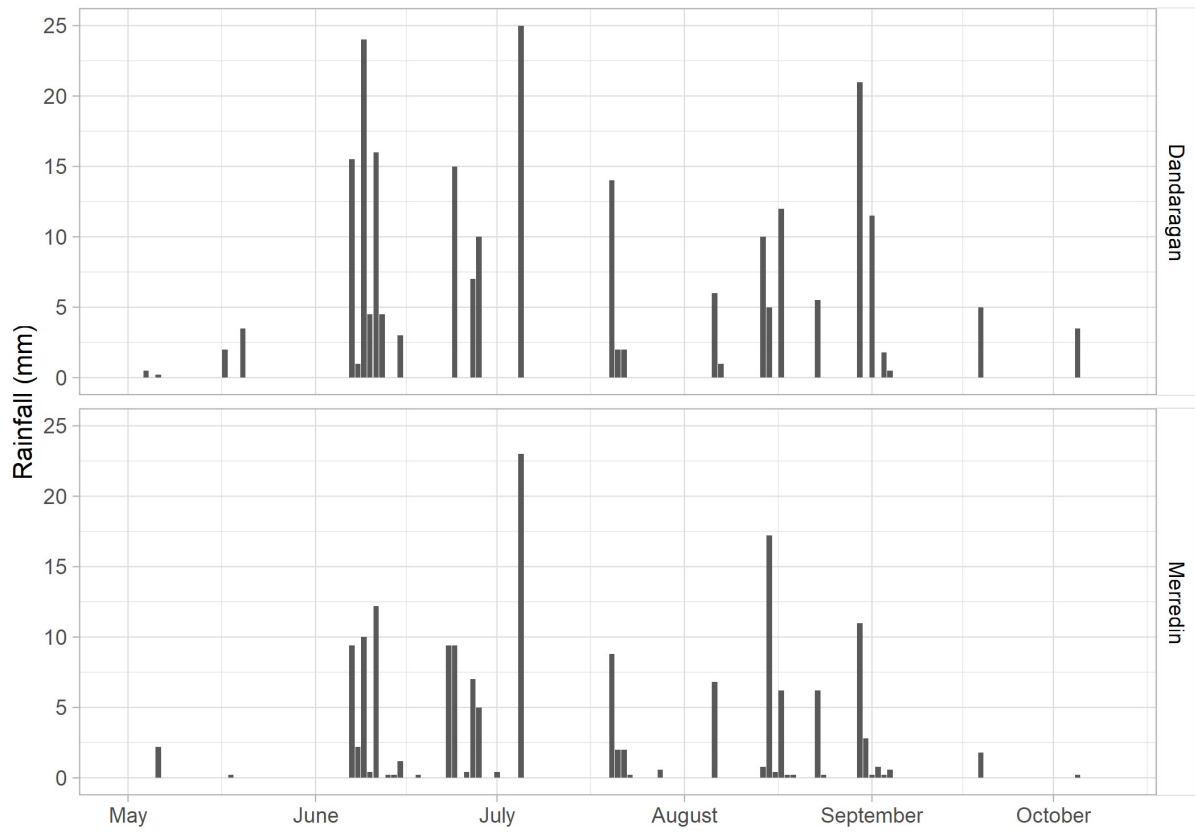
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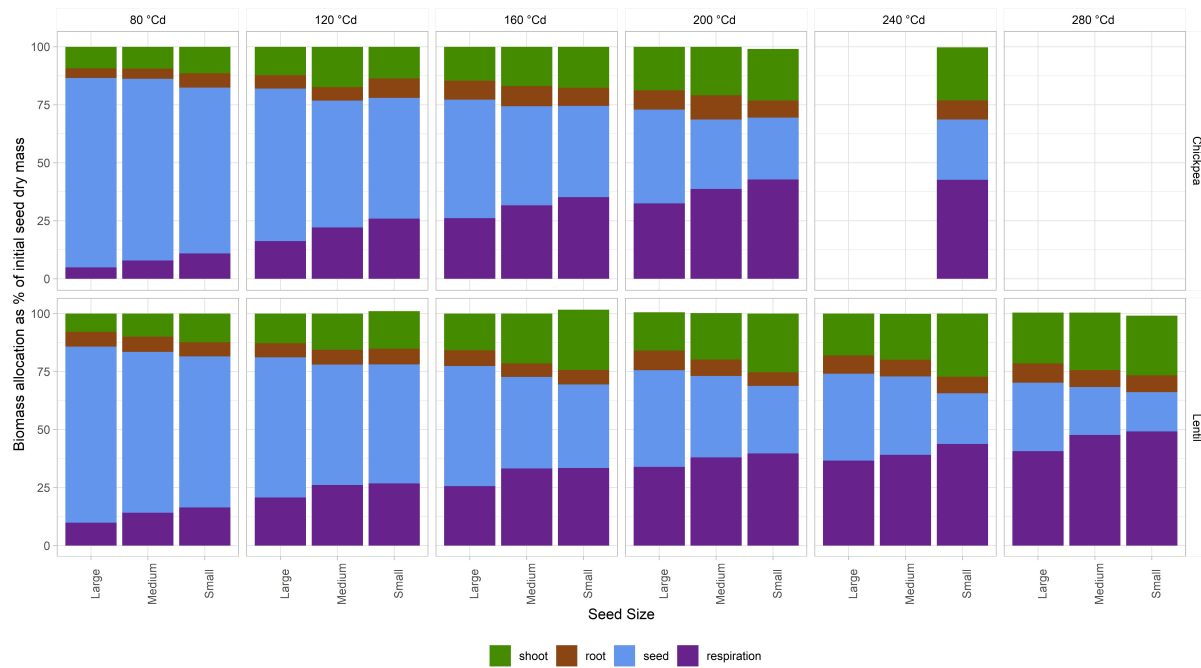
## Supplementary Figures



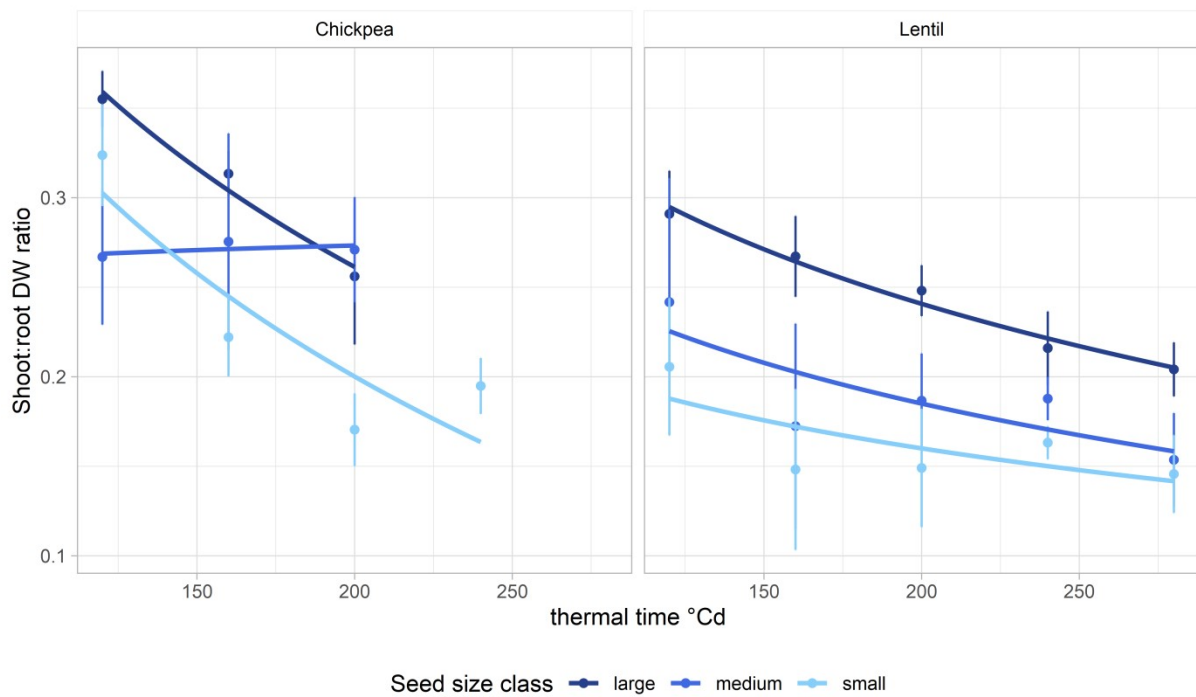
**Supplementary Figure S1:** Chickpea and lentil epicotyl growth with time, measured using three protocols. Epicotyl elongation over time is presented as a mean ( $n=3$ ) with a linear regression by protocol type. Epicotyl elongation was measured in seedlings grown in the dark in either air (red), inside a germination paper roll (green) or through soil (blue) at 20°C. Air grown epicotyls were measured from seeds sown at 20 mm into 50 mm damp soil within clear plastic containers (170 mm x 80 mm x 300 mm). Paper grown epicotyls were measured from seeds placed 50 mm from the base of damp germination paper (SDB1924, Anchor Paper Company, USA). Papers were loosely rolled and placed within a measuring cylinder with water at the base (below the seed). For epicotyls measured in soil seed was sown 250 mm deep in capped plastic tubes 85 x 350 mm. Tubes were filled volumetrically to in 50 mm layers to ensure consistent bulk density ( $1.26 \pm 0.02 \text{ g cm}^{-3}$ ). Measurements are from staggered destructive harvests. All seedlings were grown in the dark and measurements taken under green light. Seed size was determined as the mean 10-seed weight from four measures (300 mg chickpeas, 50 mg lentils).



**Supplementary Figure S2:** Daily rainfall May-October 2019 at field trial sites in Merredin (-31.451, 118.216) and Dandaragan (-30.657, 115.768) in Western Australia.



**Supplementary Figure S3:** Biomass allocation as a percent of initial seed dry weight, in Striker chickpea and Hallmark lentil. Means of percent total biomass are presented for each seed size, by seedling component, at each harvest time. Lentil groups were 20, 40 and 60 ± 3.0 mg; chickpea groups were 100, 200 and 300 mg ± 10.0 mg. Biomass was measured from seedlings of 3 seed sizes (n = 4) sown at 350 mm in a 11 % moisture content soil at 20 °C. An estimated initial seed dry mass was calculated from the initial fresh seed mass and its seed moisture content; difference in this value and the total seedling dry mass at harvest was assumed to be from loss via respiration. Data is not presented for time points past where the shoot had emerged.



**Supplementary Figure S4:** Root to shoot dry weight ratios in Striker chickpea and Hallmark lentil. Means of each size grouping are presented with a regression by seed size. Roots and pre-emergent shoots were collected from seedlings of 3 seed sizes ( $n = 4$ ) sown at 350 mm in a 11 % moisture content soil at 20 °C. Plant material was dried for 48 h at 60 °C. Lentil groups were 20, 40 and 60  $\pm$  3.0 mg; chickpea group were 100, 200 and 300 mg  $\pm$  10.0 mg.