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## Plant Traits and Production Rates from CO2 Starvation to Saturation

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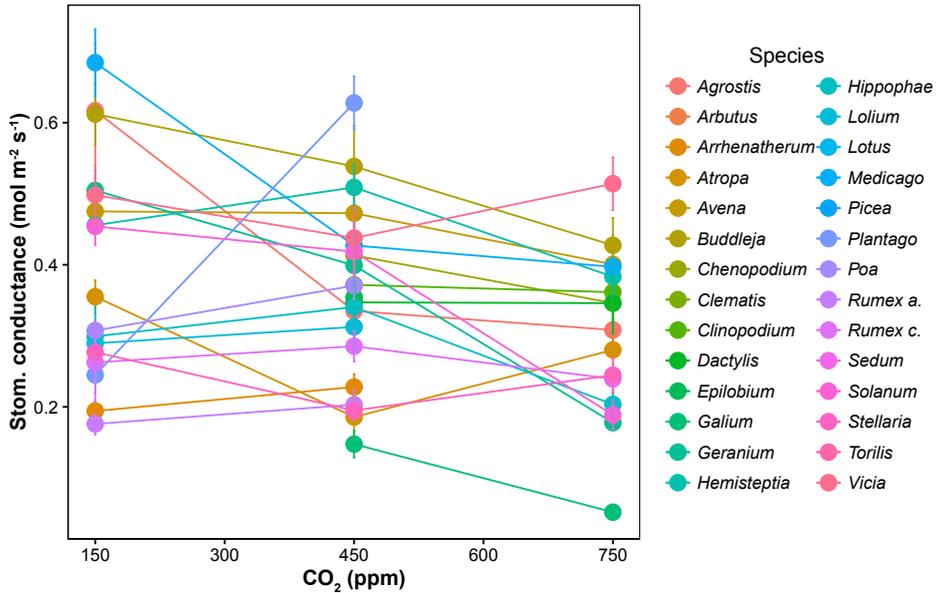
# Appendix 3

**Appendix table 3.1** Species grown for the experiment with their species name, family name and functional type. Underneath the traits is listed the number of replicates per species and below that the number of species tested per trait-treatment combination. SLA (specific leaf area), RGR (Relative Growth rate, C% (Carbon content by weight), N% (Nitrogen content by weight), A<sub>s</sub>, g<sub>s</sub>, iWUE (gas exchange parameters), R (respiration), Stomata (stomatal morphology traits).

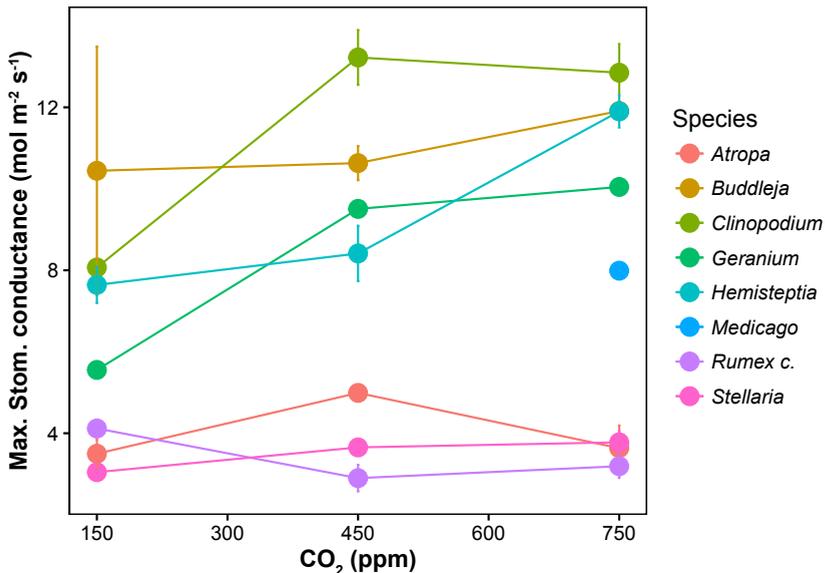
| Species name                 | Family           | Type         | SLA |    |    | RGR |    |    | C% & N% |    |    | A & g <sub>s</sub> & iWUE |    |    | R |    |    | Stomata |   |   |
|------------------------------|------------------|--------------|-----|----|----|-----|----|----|---------|----|----|---------------------------|----|----|---|----|----|---------|---|---|
|                              |                  |              | L   | A  | H  | L   | A  | H  | L       | A  | H  | L                         | A  | H  | L | A  | H  | L       | A | H |
| <i>Agrostis capillaris</i>   | Poaceae          | grass        | 5   | 6  | 7  | 5   | 6  | 7  | 5       | 6  | 7  | 2                         | 5  | 5  | 2 | 3  | 5  | x       | x | x |
| <i>Arbutus unedo</i>         | Ericaceae        | woody, tree  | 5   | 7  | 6  | 5   | 7  | 6  | 5       | 7  | 6  | x                         | x  | x  | x | x  | x  | x       | x | x |
| <i>Arrhenatherum elatius</i> | Poaceae          | grass        | 8   | 9  | x  | 8   | 8  | x  | 8       | 9  | x  | 8                         | 9  | x  | x | x  | x  | x       | x | x |
| <i>Atropa belladonna</i>     | Solanaceae       | forb         | 7   | 6  | 6  | 7   | 6  | 6  | 7       | 6  | 6  | 4                         | 4  | 4  | 4 | 4  | 4  | 4       | 4 | 4 |
| <i>Avena sativa</i>          | Poaceae          | grass        | 10  | 10 | 9  | 10  | 10 | 9  | 10      | 10 | 9  | 8                         | 8  | 7  | 8 | 8  | 7  | x       | x | x |
| <i>Buddleja davidii</i>      | Scrophulariaceae | woody, shrub | 6   | 6  | 7  | x   | x  | x  | 6       | 6  | 7  | 4                         | 5  | 4  | 4 | 5  | 4  | 4       | 4 | 3 |
| <i>Chenopodium album</i>     | Amaranthaceae    | forb         | x   | 10 | 10 | x   | 10 | 10 | x       | 10 | 10 | x                         | 10 | 10 | x | 10 | 10 | x       | x | x |
| <i>Clematis vitalba</i>      | Ranunculaceae    | woody, shrub | 4   | 5  | 5  | 4   | 5  | 5  | 4       | 5  | 5  | x                         | x  | x  | x | x  | x  | x       | x | x |
| <i>Clinopodium chinense</i>  | Lamiaceae        | forb         | 8   | 8  | 7  | x   | x  | x  | 7       | 8  | 7  | x                         | 5  | 4  | x | 5  | 4  | 3       | 5 | 5 |
| <i>Dactylis glomerata</i>    | Poaceae          | grass        | x   | 10 | 9  | x   | 10 | 9  | x       | x  | x  | x                         | 10 | 9  | x | 10 | 9  | x       | x | x |
| <i>Epilobium hirsutum</i>    | Onagraceae       | forb         | 4   | 8  | x  | 4   | 8  | x  | 4       | 8  | x  | x                         | 8  | x  | x | 8  | x  | x       | x | x |
| <i>Gallium aparine</i>       | Rubiaceae        | forb         | x   | 5  | 5  | x   | 5  | 5  | x       | 5  | 5  | x                         | 5  | 5  | x | 5  | 5  | x       | x | x |
| <i>Geranium pratense</i>     | Geraniaceae      | forb         | 6   | 6  | 6  | 6   | 6  | 6  | 6       | 5  | 6  | 4                         | 4  | 4  | 4 | 3  | 4  | 4       | 3 | 4 |
| <i>Hemisteptia lyrata</i>    | Asteraceae       | forb         | 7   | 7  | 8  | 7   | 7  | 8  | 7       | 7  | 8  | 3                         | 5  | 5  | 3 | 5  | 5  | 4       | 5 | 5 |

**Appendix table 3.1 (continued)** Species grown for the experiment with their species name, family name and functional type. Underneath the traits is listed the number of replicates per species and below that the number of species tested per trait-treatment combination. SLA (specific leaf area), RGR (Relative Growth rate, C% (Carbon content by weight), N% (Nitrogen content by weight), A, g<sub>s</sub>, iWUE (gas exchange parameters), R (respiration), Stomata (stomatal morphology traits).

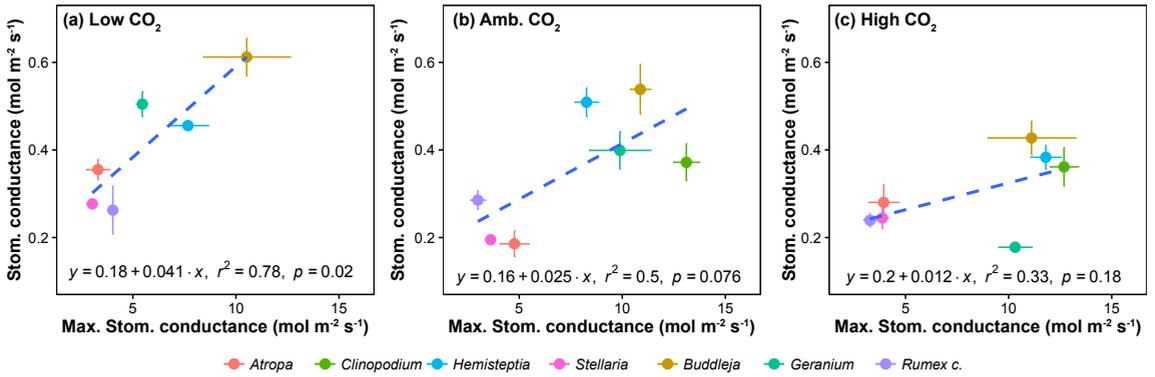
| Species name                | Family          | Type         | SLA |    |    | RGR |    |    | C% & N% |    |    | A & g <sub>s</sub> & iWUE |    |    | R  |    |    | Stomata |    |    |   |   |   |
|-----------------------------|-----------------|--------------|-----|----|----|-----|----|----|---------|----|----|---------------------------|----|----|----|----|----|---------|----|----|---|---|---|
|                             |                 |              | L   | A  | H  | L   | A  | H  | L       | A  | H  | L                         | A  | H  | L  | A  | H  | L       | A  | H  |   |   |   |
| <i>Hippophae rhamnoides</i> | Elaeagnaceae    | woody, shrub | 6   | 7  | 6  | 6   | 7  | 6  | 6       | 7  | 6  | 4                         | 6  | 3  | 6  | 3  | 3  | 6       | 3  | 3  | x | x | x |
| <i>Lolium perenne</i>       | Poaceae         | grass        | 10  | 10 | x  | 10  | 10 | x  | 10      | 10 | x  | 10                        | 10 | x  | 10 | 10 | x  | 10      | 10 | x  | x | x | x |
| <i>Lotus corniculatus</i>   | Fabaceae        | forb         | 5   | 9  | 8  | 5   | 9  | 8  | 5       | 9  | 7  | x                         | x  | x  | x  | x  | x  | x       | x  | x  | x | x | x |
| <i>Medicago lupulina</i>    | Fabaceae        | forb         | 6   | 6  | 6  | 6   | 6  | 7  | 6       | 6  | 7  | 5                         | 5  | 5  | 5  | 5  | 5  | 5       | 5  | 5  | 3 | 3 | 4 |
| <i>Picea sitchensis</i>     | Pinaceae        | woody, tree  | 8   | 8  | 6  | 8   | 8  | 8  | 8       | 8  | 8  | x                         | x  | x  | x  | x  | x  | x       | x  | x  | x | x | x |
| <i>Plantago lanceolata</i>  | Plantaginaceae  | forb         | 7   | 10 | x  | 7   | 10 | x  | 7       | 10 | x  | 7                         | 10 | x  | 7  | 10 | x  | 7       | 10 | x  | x | x | x |
| <i>Poa annua</i>            | Poaceae         | grass        | 10  | 10 | x  | 10  | 10 | x  | 9       | 10 | x  | 10                        | 10 | x  | 10 | 8  | x  | 10      | 8  | x  | x | x | x |
| <i>Rumex acetosella</i>     | Polygonaceae    | forb         | 4   | 10 | x  | 4   | 10 | x  | 4       | 9  | x  | 4                         | 9  | x  | 4  | 9  | x  | 4       | 9  | x  | x | x | x |
| <i>Rumex chalepensis</i>    | Polygonaceae    | forb         | 7   | 7  | 7  | 7   | 8  | 7  | 7       | 7  | 6  | 4                         | 5  | 5  | 4  | 5  | 5  | 4       | 5  | 5  | 5 | 6 | 5 |
| <i>Sedum album</i>          | Crassulaceae    | forb         | 5   | 8  | 7  | 5   | 8  | 8  | 5       | 8  | 8  | x                         | x  | x  | x  | x  | x  | x       | x  | x  | x | x | x |
| <i>Solanum dulcamara</i>    | Solanaceae      | woody, shrub | 7   | 7  | 6  | 7   | 7  | 7  | 7       | 7  | 7  | 6                         | 6  | 6  | 6  | 6  | 6  | 6       | 6  | 6  | 6 | 6 | 6 |
| <i>Stellaria media</i>      | Caryophyllaceae | forb         | 7   | 7  | 7  | x   | x  | x  | 7       | 7  | 7  | 5                         | 5  | 5  | 5  | 5  | 5  | 5       | 5  | 5  | 4 | 4 | 4 |
| <i>Torilis scabra</i>       | Apiaceae        | forb         | 5   | 6  | 6  | 5   | 6  | 6  | 5       | 6  | 6  | x                         | x  | x  | x  | x  | x  | x       | x  | x  | x | x | x |
| <i>Vicia sepium</i>         | Fabaceae        | forb         | 8   | 8  | 7  | 8   | 8  | 8  | 7       | 8  | 8  | 6                         | 6  | 6  | 7  | 8  | 8  | 7       | 8  | 8  | x | x | x |
|                             |                 | No species   | 25  | 28 | 22 | 22  | 25 | 19 | 25      | 27 | 20 | 17                        | 22 | 16 | 25 | 20 | 15 | 20      | 15 | 15 | 8 | 8 | 8 |



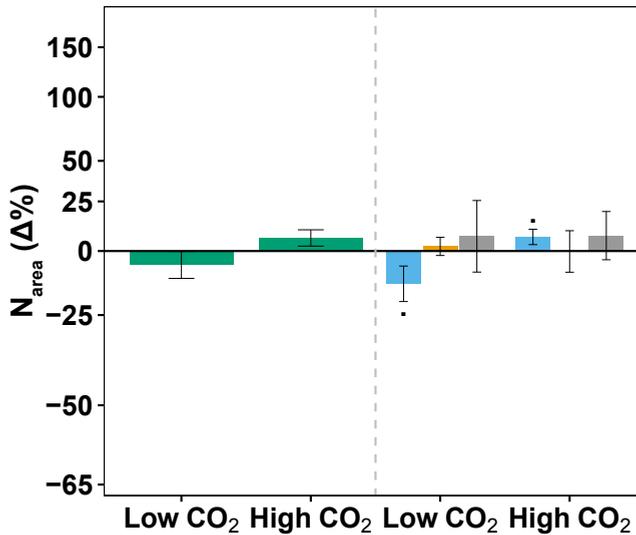
**Appendix 3.1** Stomatal conductance changes to CO<sub>2</sub>. For 16-22 species at low (160ppm) ambient (450ppm) and high (750ppm) CO<sub>2</sub> the level of stomatal conductance (mol m<sup>-2</sup> s<sup>-1</sup>) at growth conditions. Overall there is no significant change at low CO<sub>2</sub> but there is a significant decrease at high CO<sub>2</sub> (20%±8; 16 species, p<0.05)



**Appendix 3.2** Maximum stomatal conductance (mol m<sup>-2</sup> s<sup>-1</sup>) calculated based on abaxial and adaxial stomatal densities and morphological parameters (pore size and guardcell width). Due to decreases in stomatal density at low CO<sub>2</sub> Maximum stomatal conductance is lower for certain species.



**Appendix 3.3** Relationship between stomatal conductance ( $g_s$ ) at growth conditions and maximum stomatal conductance ( $g_{smax}$ ) as calculated from stomatal morphology and density. At low CO<sub>2</sub> (a) there appears to be a robust ( $r^2=0.78$ ) significant ( $p<0.05$ ) relationship between operational  $g_s$  and developmental  $g_s$ . With increasing CO<sub>2</sub> (b,c) the strength of this relationship diminishes.



**Appendix 3.4** Shifts in Nitrogen content per area ( $N_{area}$ ) with CO<sub>2</sub>. Contrasting to nitrogen content per weight ( $N_w$ ) there is no significant shift in nitrogen content per area.

