**SUPPLEMENTAL MATERIAL for “Global response patterns of plant functional traits to combined nitrogen and phosphorus addition are governed by additive interactions”**

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**Table S1** Summary of studies and sites included in the meta-analysis\*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation** | **Site name** | **Latitude** | **Longitude** | **Elevation** | ***T*g** | ***AI*g** | ***PAR*g** | **Ecosystem type** | **Experiment type** | **N addition rate (g m-2)** | **P addition rate (g m-2)** |
| (Aerts et al., 2003) | bovenpolder | 51.85 | 5.62 | 6 | 9.6 | 1.56 | 478 | grassland | field | 10 | 5 |
| bethunepolder | 52.07 | 5.58 | 8 | 9.7 | 1.81 | 474 | grassland | field | 10 | 5 |
| (Arens et al., 2008) | pituffik | 76.55 | -68.57 | 229 | 4.2 | 0.25 | 855 | tundra | field | 5 | 2.5 |
| (Augustine et al., 2003) | mpala\_ranch | 0.28 | 37.88 | 1775 | 18.6 | 1.29 | 868 | grassland | field | 40 | 10 |
| (Aydin & Uzun, 2005) | ondokuz | 41.35 | 36.25 | 4 | 14.1 | 0.75 | 698 | grassland | field | 18 | 5.2 |
| (Bennett & Adams, 2001) | hamersley | -22.28 | 117.67 | 606 | 24.5 | 0.13 | 1078 | grassland | field | 5 | 2.5 |
| (Blanke et al., 2012) | alpflix | 46.53 | 9.65 | 2029 | 6.6 | 1.45 | 836 | grassland | field | 5 | 6 |
| (Boeye et al., 1997) | buitengoor | 51.20 | 5.17 | 36 | 10.3 | 1.46 | 481 | wetland | field | 20 | 5 |
| goorken | 51.32 | 5.12 | 27 | 10.1 | 1.51 | 480 | wetland | field | 20 | 5 |
| zwarte\_beek | 51.08 | 5.30 | 56 | 10.1 | 1.55 | 483 | wetland | field | 20 | 5 |
| (Borer et al., 2014) | sedgwick | 34.7 | -119.88 | 1122 | 12.8 | 0.49 | 883 | grassland | field | 10 | 10 |
| (Bowman et al., 1993) | niwot\_ridge | 40.06 | -105.58 | 3471 | 6.1 | 0.40 | 967 | tundra | field | 25 | 25 |
| (Bown et al., 2007) | purokohukohu | NA | NA | NA | NA | NA | NA | NA | pot | 7.14 (mM) | 0.42 (mM) |
| (Cárate-Tandalla et al., 2018) | bombuscaro | -4.12 | -78.97 | 1163 | 22.4 | 1.08 | 651 | forest | field | 5 | 1 |
| cajanuma | -4.12 | -79.18 | 2511 | 14.4 | 1.01 | 684 | forest | field | 5 | 1 |
| sanfrancisco | -3.97 | -79.18 | 2163 | 16.2 | 0.80 | 660 | forest | field | 5 | 1 |
| (Carswell et al., 2005) | okarito | -43.20 | 170.30 | NA | NA | NA | NA | NA | pot | 5 (mM) | 1.33 (mM) |
| (Chen et al., 2020) | zhifanggou | 36.74 | 109.25 | 1228 | 13.7 | 0.38 | 837 | grassland | field | 10 | 8 |

**Table S1 (cont.)**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation** | **Site name** | **Latitude** | **Longitude** | **Elevation** | ***T*g** | ***AI*g** | ***PAR*g** | **Ecosystem type** | **Experiment type** | **N addition rate (g m-2)** | **P addition rate (g m-2)** |
| (Cleland et al., 2019) | bldr.us | 39.97 | -105.23 | 1649 | 11.0 | 0.30 | 830 | grassland | field | 10 | 10 |
| bnch.us | 44.28 | -121.97 | 1298 | 7.8 | 1.71 | 770 | grassland | field | 10 | 10 |
| bogong.au | -36.87 | 147.24 | 1567 | 7.3 | 2.09 | 797 | grassland | field | 10 | 10 |
| burrawan.au | -27.73 | 151.14 | 411 | 18.2 | 0.34 | 897 | grassland | field | 10 | 10 |
| cbgb.us | 41.79 | -93.39 | 275 | 14.1 | 0.74 | 785 | grassland | field | 10 | 10 |
| cdcr.us | 45.40 | -93.2 | 282 | 15.1 | 0.67 | 826 | grassland | field | 10 | 10 |
| cdpt.us | 41.2 | -101.63 | 1018 | 13.8 | 0.28 | 874 | grassland | field | 10 | 10 |
| cowi.ca | 48.46 | -123.38 | 24 | 10.5 | 1.91 | 561 | grassland | field | 10 | 10 |
| elliot.us | 32.88 | -117.05 | 256 | 17.7 | 0.25 | 880 | grassland | field | 10 | 10 |
| frue.ch | 47.11 | 8.54 | 972 | 7.8 | 2.13 | 617 | grassland | field | 10 | 10 |
| gilb.za | -29.28 | 30.29 | 1666 | 13.9 | 0.59 | 855 | grassland | field | 10 | 10 |
| hall.us | 36.87 | -86.7 | 201 | 13.7 | 1.27 | 709 | grassland | field | 10 | 10 |
| hart.us | 42.72 | -119.5 | 1513 | 9.5 | 0.20 | 866 | grassland | field | 10 | 10 |
| konz.us | 39.07 | -96.58 | 421 | 15.0 | 0.58 | 817 | grassland | field | 10 | 10 |
| lancaster.uk | 53.99 | -2.63 | 219 | 8.0 | 3.37 | 443 | grassland | field | 10 | 10 |
| look.us | 44.21 | -122.13 | 1481 | 6.1 | 2.72 | 673 | grassland | field | 10 | 10 |
| mtca.au | -31.78 | 117.61 | 297 | 17.7 | 0.24 | 957 | grassland | field | 10 | 10 |
| sage.us | 39.43 | -120.24 | 1968 | 8.5 | 0.53 | 977 | grassland | field | 10 | 10 |
| saline.us | 39.05 | -99.1 | 566 | 14.9 | 0.35 | 858 | grassland | field | 10 | 10 |
| sgs.us | 40.82 | -104.77 | 1654 | 11.2 | 0.22 | 860 | grassland | field | 10 | 10 |
| shps.us | 44.24 | -112.2 | 1667 | 12.2 | 0.15 | 963 | grassland | field | 10 | 10 |
| sier.us | 39.24 | -121.28 | 258 | 16.3 | 1.06 | 820 | grassland | field | 10 | 10 |
| smith.us | 48.21 | -122.62 | 56 | 10.2 | 1.08 | 562 | grassland | field | 10 | 10 |
| spin.us | 38.14 | -84.5 | 284 | 13.6 | 1.07 | 718 | grassland | field | 10 | 10 |
| summ.za | -29.81 | 30.72 | 636 | 18.2 | 0.59 | 810 | grassland | field | 10 | 10 |
| trel.us | 40.08 | -88.83 | 215 | 15.4 | 0.82 | 784 | grassland | field | 10 | 10 |
| ukul.za | -29.67 | 30.4 | 810 | 17.6 | 0.50 | 831 | grassland | field | 10 | 10 |
| unc.us | 36.01 | -79.02 | 147 | 14.9 | 0.94 | 734 | grassland | field | 10 | 10 |
| valm.ch | 46.63 | 10.37 | 2233 | 5.5 | 0.80 | 827 | grassland | field | 10 | 10 |
| (Craft et al., 1995) | everglades | 26.38 | -80.46 | 5 | 23.4 | 0.79 | 860 | grassland | field | 22.4 | 4.8 |
| (Craine et al., 2008) | pretoriuskop | -25.13 | 31.23 | 569 | 20.9 | 0.39 | 861 | grassland | field | 10 | 5 |
| letaba | -23.76 | 31.43 | 270 | 22.7 | 0.24 | 870 | grassland | field | 10 | 5 |
| makhohlola | -25.30 | 31.91 | 198 | 22.3 | 0.33 | 820 | grassland | field | 10 | 5 |
| satara | -24.40 | 31.75 | 299 | 22.0 | 0.31 | 847 | grassland | field | 10 | 5 |
| nwashitsumbe | -22.78 | 31.25 | 386 | 23.1 | 0.25 | 890 | grassland | field | 10 | 5 |
| (Crous et al., 2017) | ANUglass | NA | NA | NA | NA | NA | NA | NA | pot | 3.3 (g yr-1) | 0.153 (g yr-1) |
| (Cunha et al., 2024) | londrina | -23.32 | -51.18 | NA | NA | NA | NA | NA | pot | 8.4 | 4.5 |
| (D’Antonio & Mack, 2006) | volcanoNP | 19.1 | -155.55 | 148 | 22.8 | 0.95 | 860 | forest | field | 10 | 10 |

**Table S1 (cont.)**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation** | **Site name** | **Latitude** | **Longitude** | **Elevation** | ***T*g** | ***AI*g** | ***PAR*g** | **Ecosystem type** | **Experiment type** | **N addition rate (g m-2)** | **P addition rate (g m-2)** |
| (Davidson et al., 2004) | fazendaVitoria | -2.98 | -47.52 | 136 | 25.9 | 1.62 | 771 | forest | field | 10 | 5 |
| (Dong et al., 2016) | baingoin | 31.43 | 90.03 | 4705 | 6.4 | 0.52 | 931 | grassland | field | 15 | 12.9 |
| (Eller et al., 2017) | flottbek | 53.56 | 9.86 | NA | NA | NA | NA | NA | pot | 1.3 (g pot-1) | 1.3 (g pot-1) |
| (Falk et al., 2010) | luneberg | 53.25 | 9.97 | 118 | 8.5 | 1.76 | 469 | grassland | field | 5 | 2 |
| (Fisher et al., 2013) | tambopata | -12.84 | -69.30 | 198 | 25.3 | 1.83 | 709 | forest | field | 2.5 | 0.5 |
| tono | -12.95 | -71.53 | 805 | 23.1 | 2.04 | 726 | forest | field | 2.5 | 0.5 |
| san\_pedro | -13.05 | -71.54 | 1511 | 20.2 | 1.68 | 674 | forest | field | 2.5 | 0.5 |
| wayqecha | -13.19 | -71.59 | 2989 | 12.9 | 0.29 | 683 | forest | field | 2.5 | 0.5 |
| (Firn et al., 2019) | bogong.au | -36.87 | 147.24 | 1567 | 7.3 | 2.09 | 797 | grassland | field | 10 | 10 |
| burrawan.au | -27.73 | 151.14 | 411 | 18.2 | 0.34 | 897 | grassland | field | 10 | 10 |
| cbgb.us | 41.79 | -93.39 | 275 | 14.1 | 0.74 | 785 | grassland | field | 10 | 10 |
| cowi.ca | 48.46 | -123.38 | 24 | 10.5 | 1.91 | 561 | grassland | field | 10 | 10 |
| elliot.us | 32.88 | -117.05 | 256 | 17.7 | 0.25 | 880 | grassland | field | 10 | 10 |
| frue.ch | 47.11 | 8.54 | 972 | 7.8 | 2.13 | 617 | grassland | field | 10 | 10 |
| gilb.za | -29.28 | 30.29 | 1666 | 13.9 | 0.59 | 855 | grassland | field | 10 | 10 |
| kiny.au | -36.20 | 143.75 | 99 | 15.5 | 0.33 | 809 | grassland | field | 10 | 10 |
| konz.us | 39.07 | -96.58 | 421 | 15.0 | 0.58 | 817 | grassland | field | 10 | 10 |
| lancaster.uk | 53.99 | -2.63 | 219 | 8.0 | 3.37 | 443 | grassland | field | 10 | 10 |
| look.us | 44.21 | -122.13 | 1481 | 6.1 | 2.72 | 673 | grassland | field | 10 | 10 |
| mcla.us | 38.86 | -122.41 | 647 | 14.0 | 1.15 | 803 | grassland | field | 10 | 10 |
| mtca.au | -31.78 | 117.61 | 297 | 17.7 | 0.24 | 957 | grassland | field | 10 | 10 |
| saline.us | 39.05 | -99.10 | 566 | 14.9 | 0.35 | 858 | grassland | field | 10 | 10 |
| sgs.us | 40.82 | -104.77 | 1654 | 11.2 | 0.22 | 860 | grassland | field | 10 | 10 |
| shps.us | 44.24 | -112.2 | 1667 | 12.2 | 0.15 | 963 | grassland | field | 10 | 10 |
| smith.us | 48.21 | -122.62 | 56 | 10.2 | 1.08 | 562 | grassland | field | 10 | 10 |
| summ.za | -29.81 | 30.72 | 636 | 18.2 | 0.59 | 810 | grassland | field | 10 | 10 |
| valm.ch | 46.63 | 10.37 | 2233 | 5.5 | 0.80 | 827 | grassland | field | 10 | 10 |
| (Fornara et al., 2013) | nash | 51.41 | -0.64 | 61 | 10.2 | 1.25 | 478 | grassland | field | 10 | 3.5 |
| (Friedrich et al., 2012) | luneberggh2 | 53.25 | 9.97 | NA | NA | NA | NA | NA | pot | 4.8 | 0.4 |
| (Frost et al., 2009) | hammersmith | 31.30 | -81.28 | 2 | 19.7 | 0.86 | 801 | wetland | field | 50 | 10 |
| (Gough & Hobbie, 2003) | toolik\_nonacidic | 68.63 | -149.72 | 726 | 6.8 | 0.52 | 592 | tundra | field | 10 | 5 |
| (Güsewell et al., 2002) | vechtplassen | 52.50 | 5.70 | -5 | 9.8 | 1.58 | 471 | wetland | field | 20 | 5 |
| (Güsewell et al., 2003) | gusewellS1 | 51.70 | 3.90 | -2 | 10.2 | 1.42 | 493 | wetland | field | 20 | 5 |
| gusewellS2 | 51.70 | 3.90 | -2 | 10.2 | 1.42 | 493 | wetland | field | 20 | 5 |
| gusewellV1 | 51.7 | 3.9 | -2 | 10.2 | 1.42 | 493 | wetland | field | 20 | 5 |
| gusewellV2 | 51.7 | 3.9 | -2 | 10.2 | 1.42 | 493 | wetland | field | 20 | 5 |
| gusewellV3 | 51.7 | 3.9 | -2 | 10.2 | 1.42 | 493 | wetland | field | 20 | 5 |
| gusewellT1 | 52.5 | 5.7 | -5 | 9.8 | 1.58 | 471 | wetland | field | 20 | 5 |
| gusewellT2 | 52.5 | 5.7 | -5 | 9.8 | 1.58 | 471 | wetland | field | 20 | 5 |

**Table S1 (cont.)**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation** | **Site name** | **Latitude** | **Longitude** | **Elevation** | ***T*g** | ***AI*g** | ***PAR*g** | **Ecosystem type** | **Experiment type** | **N addition rate (g m-2)** | **P addition rate (g m-2)** |
| (Güsewell et al., 2003) | gusewellW1 | 52.5 | 5.7 | -5 | 9.8 | 1.58 | 471 | wetland | field | 20 | 5 |
| gusewellW2 | 52.5 | 5.7 | -5 | 9.8 | 1.58 | 471 | wetland | field | 20 | 5 |
| gusewellW3 | 52.5 | 5.7 | -5 | 9.8 | 1.58 | 471 | wetland | field | 20 | 5 |
| gusewellW4 | 52.5 | 5.7 | -5 | 9.8 | 1.58 | 471 | wetland | field | 20 | 5 |
| (Haag, 1974) | tuktoyaktuk | 69.43 | -133.02 | 1 | 7.5 | 0.36 | 712 | tundra | field | 10 | 10 |
| (Han et al., 2011) | seefs\_sunny | 38.79 | 110.35 | 1230 | 14.2 | 0.30 | 948 | grassland | field | 10 | 10 |
| (Harrington et al., 2001) | volcanoNP | 19.10 | -155.55 | 148 | 22.8 | 0.95 | 860 | forest | field | 10 | 10 |
| naPaliKona | 22.13 | -159.63 | 1056 | 15.7 | 1.27 | 879 | forest | field | 10 | 10 |
| (Haubensak & D’Antonio, 2011) | ggnra | 37.87 | -122.52 | 87 | 14.1 | 1.18 | 793 | grassland | field | 10 | 10 |
| (He et al., 2016) | haibei | 37.62 | 101.2 | 3157 | 6.2 | 0.52 | 930 | grassland | field | 10 | 5 |
| (Herbert & Fownes, 1995) | naPaliKona | 22.13 | -159.63 | 1056 | 15.7 | 1.27 | 879 | forest | field | 10 | 10 |
| (Hersch-Green et al., 2024) | kbs.us | 42.41 | -85.39 | 289 | 13.0 | 0.86 | 739 | grassland | field | 10 | 10 |
| konz.us | 39.07 | -96.58 | 421 | 15.0 | 0.58 | 817 | grassland | field | 10 | 10 |
| spin.us | 38.14 | -84.50 | 284 | 13.6 | 1.07 | 718 | grassland | field | 10 | 10 |
| (Huff et al., 2015) | tifft | 42.87 | -78.87 | 178 | 12.5 | 0.97 | 729 | grassland | field | 10 | 8.6 |
| (Iversen et al., 2010) | undercBog | 46 | -89 | 523 | 12.1 | 0.85 | 799 | wetland | field | 6 | 2 |
| undercRichFen | 46 | -89 | 523 | 12.1 | 0.85 | 799 | wetland | field | 6 | 2 |
| (Jing et al., 2016) | haibeiAGERS | 37.6 | 101.32 | 3311 | 5.6 | 0.54 | 927 | grassland | field | 10 | 5 |
| (Ket et al., 2011) | altamaha | 31.33 | -81.47 | 6 | 19.6 | 0.85 | 795 | wetland | field | 50 | 10 |
| (Lawrence, 2001) | kembera | 0.12 | 110.5 | 133 | 26.4 | 2.15 | 773 | forest | field | 54 | 60 |
| (L. J. Li et al., 2011) | daqinggou | 42.97 | 122.35 | 249 | 16.8 | 0.41 | 912 | grassland | field | 20 | 10 |
| (J. H. Li et al., 2014) | amwelu | 34.92 | 102.88 | 3213 | 7.5 | 0.76 | 822 | grassland | field | 10 | 10 |
| (Ludwig et al., 2001) | tarangire | -3.5 | 36 | 1045 | 22.0 | 0.40 | 792 | grassland | field | 20 | 8 |
| (Lund et al., 2009) | fajemyr | 56.25 | 13.55 | 141 | 8.3 | 2.22 | 544 | wetland | field | 4 | 0.4 |
| (Mayor et al., 2014) | gigante | 9.11 | -79.84 | 83 | 26.4 | 1.38 | 939 | forest | field | 12.5 | 5 |
| (McMaster et al., 1982) | echoValley | 32.9 | 70 | 1472 | 17.2 | 0.31 | 874 | shrubland | field | 4 | 2 |
| (Mo et al., 2019) | xiaolongRS | 21.45 | 110.9 | 27 | 23.3 | 1.11 | 794 | forest | field | 10 | 10 |
| (Mo et al., 2021) | xiaoliangRS | 21.45 | 110.9 | 27 | 23.3 | 1.11 | 794 | forest | field | 10 | 10 |
| (Ngai & Jefferies, 2004) | laPerouse | 58.744 | -93.601 | 6 | 9.8 | 0.69 | 799 | wetland | field | 17 | 12 |
| (Ngatia et al., 2015) | mpala | 0 | 37 | 1852 | 16.5 | 0.52 | 852 | grassland | field | 10 | 5 |
| (Nielsen et al., 2009) | brandbjerg | 55.88 | 11.97 | 9 | 9.7 | 1.67 | 551 | grassland | field | 7.5 | 1 |
| (O’Halloran et al., 2010) | tshane | -24.17 | 21.89 | 1117 | 21.3 | 0.12 | 1067 | grassland | field | 6.7 | 3.3 |
| (Øien, 2004) | solendet | 62.67 | 11.83 | 696 | 7.1 | 1.42 | 631 | wetland | field | 12 | 3 |
| (Prystupa et al., 2004) | uniBueAi | -34.58 | -58.48 | 23 | 17.4 | 0.73 | 777 | cropland | field | 10 | 5.7 |
| (Rejmánková et al., 2008) | belize | 18.83 | -89.12 | 103 | 25.1 | 0.54 | 880 | wetland | field | 20 | 10 |
| (Ren et al., 2010) | lanzhou | 33.97 | 101.88 | 3646 | 5.7 | 0.91 | 805 | grassland | field | 10 | 20 |
| (Ries & Shugart, 2008) | pandamatenga | -18.66 | 25.5 | 1082 | 23.5 | 0.26 | 974 | grassland | field | 20 | 10 |
| (Scott et al., 2015) | ruakura | -37.78 | 175.32 | 46 | 14.2 | 1.35 | 723 | grassland | field | 10 | 3.15 |

**Table S1 (cont.)**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation** | **Site name** | **Latitude** | **Longitude** | **Elevation** | ***T*g** | ***AI*g** | ***PAR*g** | **Ecosystem type** | **Experiment type** | **N addition rate (g m-2)** | **P addition rate (g m-2)** |
| (Shaver et al., 1998) | toolik\_inlet | 68.63 | -149.57 | 768 | 6.6 | 0.53 | 590 | tundra | field | 10 |  |
| toolik\_sag | 68.77 | -148.87 | 452 | 7.7 | 0.49 | 592 | tundra | field | 10 |  |
| (Soudzilovskaia et al., 2005) | teberda | 48.45 | 41.7 | 86 | 14.0 | 0.47 | 705 | tundra | field | 9 | 2.5 |
| (Sun et al., 2022) | shihezi | 44.33 | 86.5 | 456 | 17.1 | 0.08 | 932 | crop | field | 12 | 5 |
| (Tischer et al., 2015) | cordillera | -3.97 | -70.07 | 127 | 26.5 | 2.53 | 644 | grassland | field | 5 | 1 |
| (van Cleve & Oliver, 1982) | fairbanks | 64.83 | -147.72 | 132 | 12.3 | 0.39 | 688 | forest | field | 11.1 | 5.5 |
| (van der Hoek et al., 2004) | bennekomse | 52.02 | 5.6 | 6 | 9.8 | 1.61 | 473 | grassland | field | 20 | 4 |
| (van der Waal et al., 2011) | klaserie | -24.22 | 31.27 | 402 | 22.3 | 0.31 | 870 | grassland | field | 30 | 25 |
| (van Duren, Boeye, et al., 1997) | hasselt | 57 | 7 | 32 | 10.6 | 1.41 | 465 | grassland | field | 20 | 8 |
| (van Duren, Pegtel, et al., 1997) | drentsche | 53.08 | 6.67 | 10 | 9.0 | 1.86 | 475 | grassland | field | 20 | 8 |
| (van Wijnen & Bakker, 1999) | schiermonikoog | 53.5 | 6.17 | 6 | 9.0 | 2.08 | 475 | wetland | field | 25 | 10 |
| (Verlinden et al., 2018) | katelijne | 51.08 | 4.53 | NA | NA | NA | NA | NA | mesocosm | 9.5 | 2 |
| (Verryckt et al., 2022) | nouragues | 4.00 | -52.60 | 57 | 25.8 | 2.06 | 887 | forest | field | 12.5 | 5 |
| (Q. Wang et al., 2017) | huitong | 26.67 | 109.43 | 519 | 16.1 | 1.20 | 633 | forest | field | 20 | 5 |
| (D. Wang et al., 2018) | haibeiAMERS | 37.617 | 101.2 | 3157 | 6.2 | 0.52 | 930 | tundra | field | 10 | 5 |
| (F. C. Wang et al., 2019) | qianyanzhou | 26.70 | 105.10 | 1913 | 12.2 | 0.93 | 617 | forest | field | 10 | 5 |
| (Warren & Adams, 2002) | bullsbrook | -31.67 | 116.02 | 40 | 18.8 | 0.51 | 977 | forest | field | 2 (mM) | 0.34 (mM) |
| (Wigand et al., 2004) | nags\_creek | 41.63 | -71.32 | -16 | 12.3 | 1.17 | 710 | wetland | field | 32 | 3.2 |
| (Wright et al., 2011) | barro | 9.12 | -79.85 | 56 | 26.5 | 1.41 | 938 | forest | field | 12.5 | 5 |
| (Yang et al., 2014) | haibei | 38.297 | 101.337 | NA | NA | NA | NA | grassland | field | 10 | 5 |
| (Ye et al., 2022) | jiulianshan\_RS | 24.49 | 114.38 | 624 | 18.1 | 1.49 | 680 | forest | field | 10 | 5 |
| (Ye et al., 2023) | jiulianshan | 24.49 | 114.38 | 624 | 18.1 | 1.49 | 680 | forest | field | 10 | 5 |
| (Z. Y. Yu et al., 2009) | daqinguo | 42.97 | 122.35 | 249 | 16.8 | 0.41 | 912 | grassland | field | 20 | 10 |
| (L. Yu et al., 2015) | ewenke | 48.5 | 119.7 | 709 | 11.0 | 0.34 | 877 | grassland | field | 10 | 5 |
| (Q. Yu et al., 2022) | primary | 18.73 | 108.90 | 901 | 20.6 | 1.02 | 832 | forest | field | 10 | 10 |
| secondary | 18.74 | 108.86 | 845 | 20.9 | 1.03 | 833 | forest | field | 10 | 10 |
| (Zeng & Wang, 2015) | saihanba | 42.42 | 117.35 | 1684 | 9.7 | 0.46 | 924 | forest | field | 5 | 5 |

**\***Key: *T*g=1970-2000 growing season temperature (°C), *AI*g=growing season aridity index (unitless), *PAR*g=growing season photosynthetically active radiation (μmol m-2 s-1)

**Table S2** Meta-analytic results summarizing the effects of N, P, and N+P on traits related to leaf chemistry\*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient addition** | **k** | **Coefficient (±SE)** | **Z-value** | ***p*-value** | **95% CI range** |
| *M*area | N | 113 | **-3.536±1.613** | **-2.318** | **0.020** | **[-6.574, -0.598]** |
| P | -1.489±1.511 | -1.019 | 0.308 | [-4.305, 1.410] |
| N+P | **-5.067±1.816** | **-2.880** | **0.004** | **[-8.424, -1.686]** |
| *N*mass | N | 139 | **13.202±2.122** | **5.937** | **<0.001** | **[8.654, 17.939]** |
| P | -0.200±1.207 | -0.127 | 0.899 | [-2.469, 2.224] |
| N+P | **12.524±2.224** | **5.462** | **<0.001** | **[7.788, 17.351]** |
| *N*area | N | 87 | 13.428±4.081 | **3.164** | **0.002** | **[4.917, 22.630]** |
| P | 3.045±3.977 | 0.771 | 0.441 | [-4.591, 11.405] |
| N+P | 16.649±3.458 | **4.523** | **<0.001** | **[9.090, 24.732]** |
| *P*mass | N | 133 | -7.226±3.252 | **-2.365** | **0.018** | **[-12.716, -1.292]** |
| P | 56.674±6.823 | **6.808** | **<0.001** | **[37.713, 78.247]** |
| N+P | 44.196±5.866 | **6.387** | **<0.001** | **[28.788, 61.285]** |
| *P*area | N | 82 | -5.446±7.358 | -0.781 | 0.435 | [-17.717, 8.763] |
| P | 71.258±11.293 | **5.031** | **<0.001** | **[38.819, 111.277]** |
| N+P | 47.55±10.960 | **3.730** | **<0.001** | **[20.322, 80.941]** |
| *Leaf N:P* | N | 118 | **15.142±4.707** | **3.049** | **0.002** | **[5.127, 26.112]** |
| P | **-29.107±6.503** | **-5.476** | **<0.001** | **[-37.312, -19.828]** |
| N+P | **-18.291±4.707** | **-4.429** | **<0.001** | **[-25.323, -10.685]** |

\*Significant effects noted in bold font. Model coefficients have been transformed to percent change to mimic figures. Key: *M*area=leaf biomass per unit leaf area (g m-2); *N*mass=leaf nitrogen content per unit leaf biomass (gN g-1); *N*area=leaf nitrogen content per unit leaf area (gN m-2); *P*mass=leaf phosphorus content per unit leaf biomass (gP g-1); *P*area=leaf phosphorus content per unit leaf area (gP m-2).

**Table S3** Meta-analytic results summarizing the effects of N, P, and N+P on traits related to leaf photosynthesis

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient addition** | **k** | **Coefficient (±SE)** | **Z-value** | ***p*-value** | **95% CI range** |
| *A*sat | N | 85 | *11.405±6.716* | *1.659* | *0.097* | *[-1.882, 26.491]* |
| P | 9.527±7.358 | 1.284 | 0.199 | [-4.687, 25.734] |
| N+P | **27.89±9.527** | **2.702** | **0.007** | **[7.037, 52.806]** |
| *V*cmax | N | 42 | 0.702±9.746 | 0.078 | 0.938 | [-16.054, 20.925] |
| P | 12.187±7.466 | 1.607 | 0.108 | [-2.469, 29.175] |
| N+P | *17.821±8.872* | *1.937* | *0.053* | *[-0.200, 39.236]* |
| *J*max | N | 40 | 9.527±6.290 | 1.502 | 0.133 | [-2.761, 23.368] |
| P | **19.363±8.220** | **2.248** | **0.025** | **[2.327, 39.375]** |
| N+P | **29.823±2.737** | **9.601** | **<0.001** | **[23.121, 37.026]** |
| *J*max:*V*cmax | N | 32 | *0.300±0.200* | *1.695* | *0.090* | *[0.000, 0.702]* |
| P | 0.000±0.200 | -0.298 | 0.766 | [-0.399, 0.300] |
| N+P | **1.207±0.200** | **5.291** | **<0.001** | **[0.702, 1.613]** |
| *PNUE* | N | 61 | 7.358±10.738 | 0.698 | 0.486 | [-12.015, 30.996] |
| P | 18.057±12.075 | 1.463 | 0.144 | [-5.446, 47.403] |
| N+P | 20.322±18.887 | 1.704 | 0.283 | [-14.187, 68.877] |
| *PPUE* | N | 62 | *24.857±12.187* | *1.933* | *0.053* | *[-0.300, 56.361]* |
| P | -17.963±17.000 | -1.255 | 0.210 | [-39.710, 11.739] |
| N+P | -2.955±17.234 | -0.191 | 0.849 | [-28.894, 32.445] |

\*Significant effects noted in bold font, marginal effects noted in italic font. Model coefficients have been transformed to percent change to mimic figures. Key: *A*sat=light-saturated net photosynthesis rate (μmol m-2 s-1); *V*cmax=maximum rate of Rubisco carboxylation (μmol m-2 s-1); *J*max=maximum rate of electron transport for RuBP regeneration (μmol m-2 s-1); *J*max:*V*cmax=ratio of the maximum rate of electron transport for RuBP regeneration to the maximum rate of Rubisco carboxylation (unitless); *PNUE*=photosynthetic nitrogen use efficiency (μmol gN-1 s-1); *PPUE*=photosynthetic phosphorus use efficiency (μmol gP-1 s-1)

**Table S4** Meta-analytic results summarizing the effects of N, P, and N+P on whole-plant traits

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient addition** | **k** | **Coefficient (±SE)** | **Z-value** | ***p*-value** | **95% CI range** |
| *Total biomass* | N | 42 | 3.458±5.443 | 0.643 | 0.520 | [-6.761, 14.912] |
| P | **16.766±8.004** | **2.007** | **0.045** | **[0.401, 35.934]** |
| N+P | **46.082±8.112** | **4.871** | **<0.001** | **[25.358, 70.063]** |
| *Aboveground biomass* | N | 125 | **38.542±3.769** | **8.753** | **<0.001** | **[28.788, 49.033]** |
| P | **21.046±3.355** | **5.741** | **<0.001** | **[13.428, 29.305]** |
| N+P | **87.199±4.917** | **13.106** | **<0.001** | **[70.404, 105.649]** |
| *Belowground biomass* | N | 63 | -1.489±7.251 | -0.218 | 0.828 | [-14.015, 12.862] |
| P | 3.252±4.394 | 0.745 | 0.456 | [-5.162, 12.412] |
| N+P | 10.628±7.681 | 1.358 | 0.174 | [-4.400, 27.762] |
| *Root mass fraction* | N | 37 | **-14.615±4.812** | **3.400** | **<0.001** | **[-22.120, -6.480]** |
| P | *-6.761±3.873* | *-1.828* | *0.068* | *[-13.498, 0.501]* |
| N+P | **-13.757±4.707** | **-3.252** | **0.001** | **[-21.101, -5.729]** |
| *Root:shoot ratio* | N | 40 | **-28.894±9.417** | **-3.802** | **<0.001** | **[-40.310, -15.211]** |
| P | **-20.308±10.738** | **-2.226** | **0.026** | **[-34.688, -2.664]** |
| N+P | **-33.035±12.075** | **-3.517** | **<0.001** | **[-46.474, -16.306]** |

\*Significant effects noted in bold font, marginal effects noted in italic font. Model coefficients have been transformed to percent change to mimic figures.

**Table S5** Meta-analytic results summarizing the interaction effect on leaf nutrient, leaf photosynthetic, and whole-plant traits

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trait** | **k** | **Coefficient (±SE)** | **Z-value** | ***p*-value** | **95% CI range** |
| *M*area | 88 | -3.729±8.654 | -0.459 | 0.646 | [-18.209, 13.315] |
| *N*mass | 139 | 2.634±6.396 | 0.423 | 0.672 | [-9.154, 16.067] |
| *N*area | 87 | -4.972±18.530 | -0.297 | 0.766 | [-31.887, 32.711] |
| *Pmass* | *133* | *-11.219±6.930* | *-1.781* | *0.075* | [-22.042, 1.207] |
| *P*area | 82 | -9.335±19.722 | -0.545 | 0.586 | [-36.237, 28.917] |
| ***Leaf N:P*** | **118** | **-39.950±20.322** | **-2.763** | **0.006** | **[-58.189, -13.757]** |
| *A*sat | 85 | 19.722±28.146 | 0.727 | 0.467 | [-26.288, 94.449] |
| *V*cmax | 42 | 16.766±30.474 | 0.584 | 0.560 | [-30.650, 96.600] |
| *J*max | 40 | 15.373±34.178 | 0.486 | 0.627 | [-35.144, 105.238] |
| *J*max:*V*cmax | 32 | 9.199±12.187 | 0.761 | 0.447 | [-12.890, 36.752] |
| *PNUE* | 61 | 15.373±49.332 | 0.356 | 0.722 | [-47.429, 153.198] |
| *PPUE* | 62 | -10.952±29.434 | -0.448 | 0.654 | [-46.313, 47.846] |
| *Total biomass* | 42 | 14.339±10.96 | 1.289 | 0.197 | [-6.761, 40.074] |
| ***Aboveground biomass*** | **125** | **19.961±7.788** | **2.418** | **0.016** | **[3.562, 39.097]** |
| *Belowground biomass* | 63 | 3.977±9.417 | 0.429 | 0.668 | [-12.890, 24.110] |
| *Root mass fraction* | 40 | 13.655±14.912 | 0.920 | 0.358 | [-13.498, 49.332] |
| *Root:shoot* | 37 | 12.975±13.769 | 0.940 | 0.347 | [-12.366, 45.499] |

\*Significant effects noted in bold font, marginal effects noted in italic font. Model coefficients and 95% confidence interval ranges have been transformed to percent change to mimic figures. Key: *M*area=leaf biomass per unit leaf area (g m-2); *N*mass=leaf nitrogen content per unit leaf biomass (gN g-1); *N*area=leaf nitrogen content per unit leaf area (gN m-2); *P*mass=leaf phosphorus content per unit leaf biomass (gP g-1); *P*area=leaf phosphorus content per unit leaf area (gP m-2); leaf N:P=ratio of leaf nitrogen content per unit leaf biomass to leaf phosphorus content per unit leaf biomass (unitless); *A*sat=light-saturated net photosynthesis rate (μmol m-2 s-1); *V*cmax=maximum rate of Rubisco carboxylation (μmol m-2 s-1); *J*max=maximum rate of electron transport for RuBP regeneration (μmol m-2 s-1); *J*max:*V*cmax=ratio of the maximum rate of electron transport for RuBP regeneration to the maximum rate of Rubisco carboxylation (unitless); *PNUE*=photosynthetic nitrogen use efficiency (μmol gN-1 s-1); *PPUE*=photosynthetic phosphorus use efficiency (μmol gP-1 s-1)

**Table S6** Climate moderator effects on leaf nutrient responses to nutrient addition\*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef. (±SE)** | **Z-value** | ***p*-value** | **95% CI** |
| *M*area | n | *T*g | 0.140±0.301 | 0.464 | 0.643 | [-0.439, 0.723] |
| *AI*g | 3.811±2.470 | 1.530 | 0.126 | [-1.045, 8.904] |
| *PAR*g | 0.000±0.020 | -0.258 | 0.796 | [-0.040, 0.030] |
| p | *T*g | 0.371±0.250 | 1.450 | 0.147 | [-0.130, 0.874] |
| ***AI*g** | **5.001±2.112** | **2.329** | **0.020** | **[0.773, 9.396]** |
| *PAR*g | 0.020±0.010 | 1.476 | 0.140 | [-0.010, 0.040] |
| np | *Tg* | *0.592±0.311* | *1.873* | *0.061* | *[-0.030, 1.207]* |
| ***AI*g** | **7.918±2.716** | **2.841** | **0.005** | **[2.388, 13.746]** |
| *PAR*g | 0.020±0.020 | 1.211 | 0.226 | [-0.010, 0.060] |
| *N*mass | n | ***T*g** | **-0.668±0.260** | **-2.536** | **0.011** | **[-1.173, -0.150]** |
| ***AIg*** | **-5.465±2.922** | **-1.951** | **0.050** | **[-10.649, 0.030]** |
| *PAR*g | -0.010±0.020 | -0.577 | 0.564 | [-0.040, 0.020] |
| p | *T*g | 0.160±0.220 | 0.721 | 0.471 | [-0.270, 0.592] |
| *AI*g | -2.039±2.562 | -0.814 | 0.416 | [-6.770, 2.932] |
| *PAR*g | -0.010±0.010 | -0.449 | 0.653 | [-0.040, 0.020] |
| np | ***Tg*** | **-0.688±0.301** | **-2.287** | **0.022** | **[-1.272, -0.100]** |
| *AI*g | -3.911±3.365 | -1.204 | 0.229 | [-9.950, 2.542] |
| *PAR*g | -0.010±0.020 | -0.740 | 0.459 | [-0.050, 0.020] |
| *N*area | n | *Tg* | *-1.232±0.642* | *-1.943* | *0.052* | *[-2.459, 0.010]* |
| *AIg* | *-11.006±6.545* | *-1.838* | *0.066* | *[-21.408, 0.773]* |
| *PAR*g | 0.000±0.030 | -0.015 | 0.988 | [-0.070, 0.070] |
| p | *T*g | 0.040±0.521 | 0.071 | 0.944 | [-0.985, 1.066] |
| *AI*g | 1.877±4.571 | 0.417 | 0.677 | [-6.658, 11.204] |
| *PAR*g | 0.010±0.030 | 0.456 | 0.649 | [-0.050, 0.070] |
| np | *Tg* | -0.419±0.431 | -0.962 | 0.336 | [-1.252, 0.431] |
| *AI*g | -2.362±3.676 | -0.662 | 0.508 | [-9.026, 4.791] |
| *PAR*g | 0.020±0.030 | 0.741 | 0.459 | [-0.030, 0.070] |
| *P*mass | n | *T*g | 0.461±0.501 | 0.916 | 0.360 | [-0.519, 1.450] |
| *AI*g | 3.811±5.411 | 0.710 | 0.478 | [-6.378, 15.108] |
| *PAR*g | -0.050±0.030 | -1.616 | 0.106 | [-0.110, 0.010] |
| p | ***T*g** | **-2.127±1.056** | **-2.053** | **0.040** | **[-4.113, -0.100]** |
| *AIg* | *-16.423±11.004* | *-1.717* | *0.086* | *[-31.894, 2.562]* |
| *PAR*g | 0.100±0.060 | 1.629 | 0.103 | [-0.020, 0.220] |
| np | ***Tg*** | **-2.284±0.944** | **-2.454** | **0.014** | **[-4.077, -0.469]** |
| *AI*g | -8.415±9.757 | -0.944 | 0.345 | [-23.700, 9.922] |
| ***PAR*g** | **0.110±0.050** | **2.018** | **0.044** | **[0.000, 0.220]** |

**Table S6 (cont.)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef. (±SE)** | **Z-value** | ***p*-value** | **95% CI** |
| *P*area | n | *T*g | 0.763±0.844 | 0.896 | 0.370 | [-0.896, 2.439] |
| *AI*g | -6.16±7.455 | -0.884 | 0.377 | [-18.486, 8.037] |
| *PAR*g | -0.080±0.050 | -1.653 | 0.098 | [-0.180, 0.010] |
| p | *Tg* | *-2.829±1.562* | *-1.856* | *0.064* | *[-5.739, 0.160]* |
| *AI*g | -15.659±12.930 | -1.400 | 0.162 | [-33.549, 7.047] |
| *PAR*g | 0.130±0.080 | 1.524 | 0.127 | [-0.040, 0.290] |
| np | *Tg* | -1.646±1.806 | -0.930 | 0.352 | [-5.039, 1.857] |
| *AI*g | -14.290±15.246 | -1.087 | 0.277 | [-35.092, 13.179] |
| *PAR*g | 0.190±0.090 | 2.034 | 0.042 | [0.010, 0.381] |
| *Leaf N:P* | n | ***T*g** | **-1.479±0.451** | **-3.307** | **0.001** | **[-2.352, -0.608]** |
| *AI*g | *-7.230±4.112* | *-1.881* | *0.060* | *[-14.333, 0.321]* |
| *PAR*g | 0.030±0.030 | 1.054 | 0.292 | [-0.020, 0.080] |
| p | ***T*g** | **2.153±0.834** | **2.560** | **0.011** | **[0.501, 3.832]** |
| ***AI*g** | **16.428±7.616** | **2.072** | **0.038** | **[0.823, 34.461]** |
| *PAR*g | -0.050±0.050 | -0.964 | 0.335 | [-0.140, 0.050] |
| np | *Tg* | 0.934±0.793 | 1.180 | 0.238 | [-0.608, 2.501] |
| *AI*g | 8.981±7.122 | 1.250 | 0.211 | [-4.772, 24.732] |
| *PAR*g | -0.100±0.0500 | -2.068 | 0.039 | [-0.190, 0.000] |

\*Trait acronyms are as defined in Fig. 2. Model coefficients and 95% confidence interval ranges have been transformed to percent change to mimic figures. Rows where *p*-values are less than 0.05 are noted in bold font and *p*-values where 0.5<*p*<0.1 are noted in italic font. Key: *T*g=mean growing season temperature (°C), *AI*g=mean growing season aridity index (unitless), *PAR*g=mean growing season photosynthetically active radiation (μmol m-2 s-1)

**Table S7** Climate moderator effects on whole-plant responses to nutrient addition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef. (±SE)** | **Z-value** | ***p*-value** | **95% CI** |
| *Total biomass* | n | *Tg* | *-2.635±1.390* | *-1.927* | *0.054* | *[-5.238, 0.050]* |
| *AI*g | 1.187±9.68 | 0.128 | 0.899 | [-15.574, 21.276] |
| *PAR*g | 0.050±0.050 | 0.989 | 0.323 | [-0.050, 0.140] |
| p | *Tg* | *-2.156±1.268* | *-1.731* | *0.084* | *[-4.544, 0.290]* |
| *AI*g | -4.849±8.535 | -0.607 | 0.544 | [-18.958, 11.706] |
| *PAR*g | 0.040±0.050 | 0.744 | 0.457 | [-0.060, 0.130] |
| np | *Tg* | *-2.790±1.572* | *-1.813* | *0.070* | *[-5.710, 0.230]* |
| *AI*g | -14.922±12.975 | -1.325 | 0.185 | [-33.008, 8.058] |
| *PAR*g | 0.000±0.060 | -0.072 | 0.943 | [-0.130, 0.120] |
| *Aboveground biomass* | n | *T*g | -0.359±0.652 | -0.560 | 0.576 | [-1.627, 0.914] |
| *AI*g | 8.535±7.262 | 1.168 | 0.243 | [-5.399, 24.533] |
| *PAR*g | 0.020±0.030 | 0.569 | 0.569 | [-0.040, 0.070] |
| p | *T*g | -0.130±0.713 | -0.189 | 0.850 | [-1.518, 1.268] |
| *AIg* | *14.935±7.767* | *1.860* | *0.063* | *[-0.747, 33.096]* |
| *PAR*g | 0.040±0.030 | 1.330 | 0.184 | [-0.020, 0.100] |
| np | *Tg* | -1.252±0.975 | -1.299 | 0.194 | [-3.101, 0.642] |
| *AI*g | -7.642±11.160 | -0.751 | 0.453 | [-24.949, 13.644] |
| *PAR*g | -0.030±0.040 | -0.697 | 0.486 | [-0.110, 0.050] |
| *Belowground biomass* | n | *T*g | -0.300±0.904 | -0.328 | 0.743 | [-2.049, 1.481] |
| *AI*g | 17.621±10.749 | 1.590 | 0.112 | [-3.709, 43.692] |
| *PAR*g | 0.070±0.050 | 1.443 | 0.149 | [-0.030, 0.170] |
| p | *T*g | 0.050±0.773 | 0.069 | 0.945 | [-1.449, 1.572] |
| *AI*g | -2.887±8.828 | -0.346 | 0.729 | [-17.717, 14.625] |
| *PAR*g | 0.030±0.040 | 0.610 | 0.542 | [-0.060, 0.110] |
| np | *Tg* | -0.916±1.015 | -0.912 | 0.362 | [-2.849, 1.066] |
| *AI*g | 15.373±12.187 | 1.244 | 0.214 | [-7.900, 44.528] |
| ***PAR*g** | **0.120±0.060** | **2.202** | **0.028** | **[0.010, 0.230]** |
| *Root mass fraction* | n | *T*g | -0.638±1.369 | -0.469 | 0.639 | [-3.246, 2.051] |
| *AI*g | 12.131±11.204 | 1.078 | 0.281 | [-8.935, 38.085] |
| *PARg* | *0.120±0.060* | *1.889* | *0.059* | *[0.000, 0.240]* |
| p | *T*g | -0.965±1.045 | -0.930 | 0.353 | [-2.955, 1.076] |
| *AI*g | -8.011±8.709 | -1.000 | 0.317 | [-21.902, 8.350] |
| *PAR*g | 0.030±0.050 | 0.540 | 0.589 | [-0.070, 0.130] |
| np | *Tg* | 0.120±1.390 | 0.089 | 0.929 | [-2.537, 2.860] |
| *AI*g | 13.224±11.438 | 1.147 | 0.252 | [-8.433, 39.990] |
| *PAR*g | 0.080±0.060 | 1.328 | 0.184 | [-0.040, 0.200] |

**Table S7 (cont.)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef. (±SE)** | **Z-value** | ***p*-value** | **95% CI** |
| *Root:shoot* | n | *T*g | -1.025±2.819 | -0.371 | 0.711 | [-6.265, 4.509] |
| *AI*g | 3.655±28.044 | 0.145 | 0.885 | [-36.148, 68.270] |
| *PAR*g | 0.110±0.130 | 0.841 | 0.401 | [-0.140, 0.361] |
| p | *T*g | -3.969±2.891 | -1.422 | 0.155 | [-9.190, 1.542] |
| ***AI*g** | **-41.128±27.852** | **-2.156** | **0.031** | **[-63.625, -4.706]** |
| *PAR*g | -0.080±0.140 | -0.602 | 0.547 | [-0.349, 0.190] |
| np | *Tg* | -0.419±3.686 | -0.116 | 0.908 | [-7.226, 6.897] |
| *AI*g | -0.618±37.713 | -0.019 | 0.985 | [-46.916, 86.060] |
| *PAR*g | 0.040±0.170 | 0.227 | 0.821 | [-0.300, 0.381] |

\*Trait acronyms are as defined in Fig. 2. Model coefficients and 95% confidence interval ranges have been transformed to percent change to mimic figures. Rows where *p*-values are less than 0.05 are noted in bold font and *p*-values where 0.5<*p*<0.1 are noted in italic font. Key: *T*g=mean growing season temperature (°C), *AI*g=mean growing season aridity index (unitless), *PAR*g=mean growing season photosynthetically active radiation (μmol m-2 s-1)

**Table S8** N2-fixer moderator effects on leaf nutrient responses to nutrient addition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef.** | **Z-value** | ***p*-value** | **95% CI** |
| *M*area | n | *non-fixer* | **-4.305** | **3.508** | **<0.001** | **[-7.873, -0.698]** |
| *N2-fixer* | **13.428** | **[2.737, 25.107]** |
| p | *non-fixer* | **-0.698** | **-4.584** | **<0.001** | **[-4.209, 2.840]** |
| *N2-fixer* | **-15.718** | **[-21.886, -9.063]** |
| np | *non-fixer* | **-4.972** | **3.015** | **0.003** | **[-8.057, -1.882]** |
| *N2-fixer* | **7.681** | **[-0.995, 17.117]** |
| *N*mass | n | *non-fixer* | **16.532** | **-4.498** | **<0.001** | **[11.182, 22.018]** |
| *N2-fixer* | **-3.052** | **[-11.219, 5.760]** |
| p | *non-fixer* | **-0.598** | **3.454** | **0.001** | **[-3.149, 2.020]** |
| *N2-fixer* | **12.187** | **[4.917, 19.842]** |
| np | *non-fixer* | **14.683** | **-2.258** | **0.024** | **[9.308, 20.322]** |
| *N2-fixer* | **2.532** | **[-7.318, 13.542]** |
| *N*area | n | *non-fixer* | 13.088 | 1.423 | 0.155 | [4.394, 22.385] |
| *N2-fixer* | 20.563 | [7.466, 35.256] |
| p | *non-fixer* | *2.429* | *1.836* | *0.066* | *[-5.351, 10.738]* |
| *N2-fixer* | *11.516* | *[-0.598, 25.107]* |
| np | *non-fixer* | 16.532 | 0.615 | 0.539 | [8.981, 24.608] |
| *N2-fixer* | 20.202 | [7.037, 34.851] |
| *P*mass | n | *non-fixer* | **-8.972** | **2.595** | **0.009** | **[-14.956, -2.566]** |
| *N2-fixer* | **4.185** | **[-7.133, 17.000]** |
| p | *non-fixer* | **55.893** | **5.376** | **<0.001** | **[34.716, 80.219]** |
| *N2-fixer* | **100.973** | **[70.063, 137.501]** |
| np | *non-fixer* | **43.190** | **2.021** | **0.043** | **[25.986, 62.580]** |
| *N2-fixer* | **67.197** | **[38.265, 102.182]** |
| *P*area | n | *non-fixer* | **-8.057** | **7.716** | **<0.001** | **[-20.547, 6.396]** |
| *N2-fixer* | **37.163** | **[15.258, 63.068]** |
| p | *non-fixer* | **68.371** | **3.46** | **0.001** | **[36.479, 107.716]** |
| *N2-fixer* | **101.778** | **[60.480, 153.958]** |
| np | *non-fixer* | **45.936** | **3.819** | **<0.001** | **[19.006, 78.961]** |
| *N2-fixer* | **85.151** | **[46.375, 134.199]** |
| *Leaf N:P* | n | *non-fixer* | **19.363** | **-5.375** | **<0.001** | **[7.788, 32.313]** |
| *N2-fixer* | **-8.881** | **[-20.626, 4.603]** |
| p | *non-fixer* | -31.065 | -1.638 | 0.101 | [-40.190, -20.547] |
| *N2-fixer* | -36.365 | [-46.206, -24.723] |
| np | *non-fixer* | **-18.045** | **-8.141** | **<0.001** | **[-26.948, -8.057]** |
| *N2-fixer* | **-46.900** | **[-54.388, -38.245]** |

\*Significant effects noted in bold font. Model coefficients and 95% confidence interval ranges have been transformed to percent change to mimic figures. Key: *M*area=leaf biomass per unit leaf area (g m-2); *N*mass=leaf nitrogen content per unit leaf biomass (gN g-1); *N*area=leaf nitrogen content per unit leaf area (gN m-2); *P*mass=leaf phosphorus content per unit leaf biomass (gP g-1); *P*area=leaf phosphorus content per unit leaf area (gP m-2)

**Table S9** Mycorrhizal acquisition strategy moderator effects on leaf nutrient responses to nutrient addition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef.** | **Z-value** | ***p*-value** | **95% CI** |
| *M*area | n | *mining* | **1.106** | **-2.472** | **0.013** | **[-3.921, 6.290]** |
| *scavenging* | **-4.496** | **[-7.688, -1.094]** |
| p | *mining* | 0.300 | -1.026 | 0.305 | [-4.113, 5.022] |
| *scavenging* | -1.784 | [-4.877, 1.41] |
| np | *mining* | **-14.871** | **4.265** | **<0.001** | **[-20.308, -8.972]** |
| *scavenging* | **-2.955** | **[-6.947, 1.207]** |
| *N*mass | n | *mining* | 16.067 | -0.561 | 0.575 | [9.199, 23.491] |
| *scavenging* | 14.683 | [9.527, 20.081] |
| p | *mining* | -1.686 | 1.077 | 0.281 | [-6.293, 3.252] |
| *scavenging* | 0.803 | [-1.686, 3.355] |
| np | *mining* | 17.117 | -1.041 | 0.298 | [8.981, 25.86] |
| *scavenging* | 13.428 | [8.329, 18.887] |
| *N*area | n | *mining* | **4.289** | **2.231** | **0.026** | **[-6.387, 16.300]** |
| *scavenging* | **14.339** | **[5.548, 23.738]** |
| p | *mining* | 4.707 | -0.429 | 0.668 | [-5.541, 15.951] |
| *scavenging* | 2.942 | [-4.687, 11.071] |
| np | *mining* | 17.351 | -0.162 | 0.872 | [6.396, 29.434] |
| *scavenging* | 16.532 | [8.981, 24.732] |
| *P*mass | n | *mining* | **-20.308** | **6.069** | **<0.001** | **[-26.288, -13.843]** |
| *scavenging* | **-6.387** | **[-12.103, -0.300]** |
| p | *mining* | **123.67** | **-6.408** | **<0.001** | **[89.080, 164.323]** |
| *scavenging* | **54.496** | **[35.391, 76.297]** |
| np | *mining* | **29.823** | **3.544** | **<0.001** | **[12.637, 49.631]** |
| *scavenging* | **46.375** | **[28.660, 66.529]** |
| *P*area | n | *mining* | -4.591 | -0.129 | 0.897 | [-20.943, 15.027] |
| *scavenging* | -5.446 | [-17.799, 8.654] |
| p | *mining* | **194.763** | **-8.585** | **<0.001** | **[126.144, 284.203]** |
| *scavenging* | **60.159** | **[26.617, 102.587]** |
| np | *mining* | 50.381 | -0.294 | 0.769 | [18.412, 90.980] |
| *scavenging* | 47.108 | [19.961, 80.579] |
| *Leaf N:P* | n | *mining* | *5.654* | *1.930* | *0.054* | *[-8.698, 22.262]* |
| *scavenging* | *19.125* | *[8.004, 31.390]* |
| p | *mining* | **-49.338** | **4.918** | **<0.001** | **[-58.355, -38.430]** |
| *scavenging* | **-29.813** | **[-39.890, -18.045]** |
| np | *mining* | **-31.340** | **2.851** | **0.004** | **[-41.257, -19.748]** |
| *scavenging* | **-18.454** | **[-27.312, -8.515]** |

\*Significant effects noted in bold font. Model coefficients and 95% confidence interval ranges have been transformed to percent change to mimic figures. Key: *M*area=leaf biomass per unit leaf area (g m-2); *N*mass=leaf nitrogen content per unit leaf biomass (gN g-1); *N*area=leaf nitrogen content per unit leaf area (gN m-2); *P*mass=leaf phosphorus content per unit leaf biomass (gP g-1); *P*area=leaf phosphorus content per unit leaf area (gP m-2)

**Table S10** Photosynthetic pathway moderator effects on leaf nutrient responses to nutrient addition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef.** | **Z-value** | ***p*-value** | **95% CI** |
| *M*area | n | *C3* | **-0.896** | **-3.662** | **<0.001** | **[-4.209, 2.532]** |
| *C4* | **-11.839** | **[-16.723, -6.667]** |
| p | *C3* | -2.274 | 1.628 | 0.104 | [-5.351, 1.005] |
| *C4* | 1.918 | [-3.052, 7.144] |
| np | *C3* | **-1.882** | **-4.699** | **<0.001** | **[-5.918, 2.224]** |
| *C4* | **-15.802** | **[-21.101, -10.058]** |
| *N*mass | n | *C3* | **12.524** | **2.643** | **0.008** | **[7.358, 18.057]** |
| *C4* | **27.507** | **[16.532, 39.654]** |
| p | *C3* | *0.000* | *1.645* | *0.100* | *[-2.371, 2.429]* |
| *C4* | *5.548* | *[-0.797, 12.187]* |
| np | *C3* | **11.405** | **3.123** | **0.002** | **[6.078, 17.000]** |
| *C4* | **28.018** | **[17.234, 39.794]** |
| *N*area | n | *C3* | **15.835** | **-2.084** | **0.037** | **[6.609, 25.860]** |
| *C4* | **5.971** | **[-4.400, 17.468]** |
| p | *C3* | 2.942 | 0.119 | 0.905 | [-4.972, 11.516] |
| *C4* | 3.458 | [-6.293, 14.339] |
| np | *C3* | **21.774** | **-6.916** | **<0.001** | **[11.628, 32.843]** |
| *C4* | **-5.162** | **[-14.444, 5.127]** |
| *P*mass | n | *C3* | -9.063 | 1.260 | 0.208 | [-15.634, -2.078] |
| *C4* | 1.613 | [-14.358, 20.563] |
| p | *C3* | **66.696** | **-2.884** | **0.004** | **[42.618, 94.838]** |
| *C4* | **19.483** | **[-7.226, 53.726]** |
| np | *C3* | 44.340 | 0.124 | 0.901 | [26.998, 64.050] |
| *C4* | 46.375 | [15.835, 84.966] |
| *P*area | n | *C3* | -5.918 | 0.435 | 0.664 | [-18.372, 8.437] |
| *C4* | -2.274 | [-20.228, 19.722] |
| p | *C3* | 72.979 | -0.683 | 0.494 | [39.515, 114.470] |
| *C4* | 61.931 | [23.986, 111.488] |
| np | *C3* | **52.653** | **-2.518** | **0.012** | **[22.507, 90.218]** |
| *C4* | **22.262** | **[-5.918, 59.042]** |
| *Leaf N:P* | n | *C3* | 17.468 | 0.152 | 0.879 | [6.078, 29.953] |
| *C4* | 18.649 | [1.005, 39.515] |
| p | *C3* | -31.202 | -0.417 | 0.676 | [-40.310, -20.705] |
| *C4* | -33.369 | [-45.228, -18.942] |
| np | *C3* | -20.626 | 1.132 | 0.258 | [-29.461, -10.774] |
| *C4* | -12.716 | [-27.819, 5.548] |

\*Significant effects noted in bold font. Model coefficients and 95% confidence interval ranges have been transformed to percent change to mimic figures. Key: *M*area=leaf biomass per unit leaf area (g m-2); *N*mass=leaf nitrogen content per unit leaf biomass (gN g-1); *N*area=leaf nitrogen content per unit leaf area (gN m-2); *P*mass=leaf phosphorus content per unit leaf biomass (gP g-1); *P*area=leaf phosphorus content per unit leaf area (gP m-2)

**Table S11** N2-fixer moderator effects on leaf photosynthetic responses to nutrient addition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef.** | **Z-value** | ***p*-value** | **95% CI** |
| *A*sat | n | *non-fixer* | **8.329** | **2.441** | **0.015** | **[-4.877, 23.368]** |
| *N2-fixer* | **19.602** | **[3.252, 38.542]** |
| p | *non-fixer* | **4.603** | **8.152** | **<0.001** | **[-10.952, 22.875]** |
| *N2-fixer* | **51.589** | **[26.617, 81.303]** |
| np | *non-fixer* | **30.474** | **-3.930** | **<0.001** | **[7.788, 57.775]** |
| *N2-fixer* | **11.405** | **[-8.972, 36.479]** |
| *V*cmax | n | *non-fixer* | **7.144** | **-3.879** | **<0.001** | **[-4.591, 20.202]** |
| *N2-fixer* | **-25.248** | **[-37.998, -9.968]** |
| p | *non-fixer* | **15.373** | **-2.309** | **0.021** | **[1.308, 31.521]** |
| *N2-fixer* | **-5.541** | **[-22.120, 14.454]** |
| np | *non-fixer* | **28.531** | **-4.918** | **<0.001** | **[14.683, 44.196]** |
| *N2-fixer* | **-17.634** | **[-31.477, -0.995]** |
| *J*max | n | *non-fixer* | **13.088** | **-2.001** | **0.045** | **[2.840, 24.483]** |
| *N2-fixer* | **-3.825** | **[-17.387, 12.075]** |
| p | *non-fixer* | 19.125 | 0.218 | 0.828 | [1.715, 39.515] |
| *N2-fixer* | 21.531 | [-2.664, 51.740] |
| np | *non-fixer* | **34.178** | **-4.209** | **<0.001** | **[27.634, 41.058]** |
| *N2-fixer* | **-9.063** | **[-23.662, 8.220]** |
| *PNUE* | n | *non-fixer* | 7.466 | -0.209 | 0.834 | [-12.015, 31.128] |
| *N2-fixer* | 6.609 | [-13.411, 31.390] |
| p | *non-fixer* | **11.963** | **8.293** | **<0.001** | **[-11.041, 40.917]** |
| *N2-fixer* | **66.363** | **[30.474, 112.336]** |
| np | *non-fixer* | **22.753** | **-5.056** | **<0.001** | **[-13.498, 74.368]** |
| *N2-fixer* | **-6.200** | **[-34.754, 34.851]** |
| *PPUE* | n | *non-fixer* | **33.643** | **-7.223** | **<0.001** | **[0.300, 78.069]** |
| *N2-fixer* | **-24.346** | **[-44.899, 3.873]** |
| p | *non-fixer* | *-19.587* | *1.825* | *0.068* | *[-41.667, 10.738]* |
| *N2-fixer* | *-3.052* | *[-32.699, 39.794]* |
| np | *non-fixer* | **4.498** | **-6.616** | **<0.001** | **[-26.288, 48.290]** |
| *N2-fixer* | **-39.770** | **[-58.687, -12.190]** |

\*Significant effects noted in bold font. Model coefficients and 95% confidence interval ranges have been transformed to percent change to mimic figures. Key:

**Table S12** Mycorrhizal acquisition strategy moderator effects on leaf nutrient responses to nutrient addition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef.** | **Z-value** | ***p*-value** | **95% CI** |
| *A*sat | n | *mining* | **-12.366** | **4.872** | **<0.001** | **[-26.582, 4.603]** |
| *scavenging* | **15.604** | **[-0.797, 34.851]** |
| p | *mining* | 10.960 | -0.35 | 0.726 | [-6.293, 31.390] |
| *scavenging* | 8.763 | [-6.012, 25.986] |
| np | *mining* | **8.654** | **3.613** | **<0.001** | **[-12.278, 34.582]** |
| *scavenging* | **32.843** | **[9.199, 61.446]** |
| *V*cmax | n | *mining* | **-18.045** | **5.064** | **<0.001** | **[-35.144, 3.666]** |
| *scavenging* | **9.417** | **[-12.366, 36.752]** |
| p | *mining* | 12.750 | -0.108 | 0.914 | [-4.209, 32.711] |
| *scavenging* | 12.075 | [-3.052, 29.563] |
| np | *mining* | **2.634** | **3.199** | **0.001** | **[-17.963, 28.531]** |
| *scavenging* | **22.998** | **[-0.300, 51.740]** |
| *J*max | n | *mining* | **-5.446** | **4.278** | **<0.001** | **[-19.908, 11.628]** |
| *scavenging* | **19.602** | **[2.429, 39.654]** |
| p | *mining* | 20.322 | -0.171 | 0.864 | [0.803, 43.476] |
| *scavenging* | 19.125 | [1.511, 39.934] |
| np | *mining* | **10.076** | **3.302** | **0.001** | **[-6.947, 30.213]** |
| *scavenging* | **32.711** | **[13.769, 54.651]** |
| *PNUE* | n | *mining* | **-10.774** | **3.705** | **<0.001** | **[-28.965, 12.075]** |
| *scavenging* | **10.849** | **[-9.787, 36.343]** |
| p | *mining* | 17.704 | 0.063 | 0.950 | [-7.411, 49.631] |
| *scavenging* | 18.175 | [-5.541, 47.698] |
| np | *mining* | 24.483 | -0.665 | 0.506 | [-12.628, 77.181] |
| *scavenging* | 19.722 | [-14.700, 68.203] |
| *PPUE* | n | *mining* | **0.602** | **2.991** | **0.003** | **[-24.195, 33.643]** |
| *scavenging* | **28.018** | **[0.100, 63.722]** |
| p | *mining* | **-45.990** | **5.130** | **<0.001** | **[-63.175, -20.785]** |
| *scavenging* | **-12.190** | **[-37.998, 24.359]** |
| np | *mining* | **-18.860** | **2.182** | **0.029** | **[-43.221, 15.835]** |
| *scavenging* | **-0.797** | **[-27.819, 36.479]** |

\*Significant effects noted in bold font. Model coefficients and 95% confidence interval ranges have been transformed to percent change to mimic figures. Key:

**Table S13** Photosynthetic pathway moderator effects on leaf photosynthetic responses to nutrient addition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef.** | **Z-value** | ***p*-value** | **95% CI** |
| *A*sat | n | *C3* | **-13.064** | **-5.745** | **<0.001** | **[-2.469, 27.634]** |
| *C4* | **11.963** | **[-25.696, 1.613]** |
| p | *C3* | **-15.549** | **-6.632** | **<0.001** | **[-3.536, 30.083]** |
| *C4* | **27.890** | **[-28.538, -0.100]** |
| np | *C3* | 31.39 | 0.764 | 0.445 | [6.078, 54.188] |
| *C4* | 0.702 | [7.896, 60.159] |
| *V*cmax | n | *C3* | 8.546 | 0.464 | 0.643 | [-16.138, 20.804] |
| *C4* | 12.412 | [-24.648, 56.361] |
| p | *C3* | -2.274 | -1.365 | 0.172 | [-2.078, 29.175] |
| *C4* | 17.939 | [-23.203, 24.359] |
| np | *C3* | 17.351 | -0.058 | 0.954 | [-0.200, 39.236] |
| *C4* | 9.527 | [-5.824, 46.228] |
| *J*max | n | *C3* | 12.412 | 0.145 | 0.885 | [-2.761, 23.244] |
| *C4* | 19.602 | [-22.508, 62.905] |
| p | *C3* | 1.410 | -1.509 | 0.131 | [2.737, 39.236] |
| *C4* | 29.175 | [-21.730, 31.521] |
| np | *C3* | 26.744 | -0.220 | 0.826 | [20.925, 37.988] |
| *C4* | 6.930 | [6.716, 50.531] |
| *PNUE* | n | *C3* | **27.762** | **3.900** | **<0.001** | **[-12.453, 30.474]** |
| *C4* | **18.887** | **[2.737, 58.883]** |
| p | *C3* | **-20.388** | **-8.214** | **<0.001** | **[-4.782, 48.587]** |
| *C4* | **18.649** | **[-37.500, 1.410]** |
| np | *C3* | **45.645** | **4.406** | **<0.001** | **[-15.126, 65.699]** |
| *C4* | **24.483** | **[3.149, 105.649]** |
| *PPUE* | n | *C3* | 34.986 | 0.986 | 0.324 | [-0.399, 55.582] |
| *C4* | -17.634 | [2.840, 77.358] |
| p | *C3* | -28.609 | -1.231 | 0.218 | [-39.286, 11.851] |
| *C4* | -3.825 | [-51.032, 4.081] |
| np | *C3* | **51.589** | **4.535** | **<0.001** | **[-29.602, 31.390]** |
| *C4* | **-13.064** | **[5.022, 118.803]** |

\*Significant effects noted in bold font. Model coefficients and 95% confidence interval ranges have been transformed to percent change to mimic figures. Key:

**Table S14** Photosynthetic pathway moderator effects on leaf photosynthetic responses to nutrient addition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Nutrient** | **Moderator** | **Coef.** | **Z-value** | ***p*-value** | **95% CI** |
| *Total biomass* | n | *C3* | 23.244 | -0.970 | 0.332 | [-41.257, 158.830] |
| *C4* | -33.102 | [-75.068, 79.679] |
| p | *C3* | **1.207** | **8.491** | **<0.001** | **[-25.844, 38.127]** |
| *C4* | **440.325** | **[329.306, 580.053]** |
| np | *C3* | 77.891 | 1.639 | 0.101 | [-18.617, 288.841] |
| *C4* | 405.815 | [90.980, 1239.659] |
| *Aboveground biomass* | n | *C3* | 60.320 | -0.328 | 0.743 | [16.766, 119.899] |
| *C4* | 40.214 | [-32.834, 192.706] |
| p | *C3* | 19.363 | -0.051 | 0.960 | [-8.972, 56.518] |
| *C4* | 17.351 | [-37.500, 120.119] |
| np | *C3* | 93.093 | -0.079 | 0.937 | [26.744, 194.174] |
| *C4* | 85.151 | [-28.68, 381.146] |
| *Belowground biomass* | n | *C3* | 18.175 | 0.267 | 0.790 | [-29.953, 99.571] |
| *C4* | 34.447 | [-38.676, 194.763] |
| p | *C3* | -10.863 | 2.096 | 0.960 | [-26.948, 8.763] |
| *C4* | 28.660 | [-2.664, 70.063] |
| np | *C3* | 3.666 | 0.661 | 0.509 | [-44.512, 93.673] |
| *C4* | 52.348 | [-41.316, 295.508] |

\*Significant effects noted in bold font. Model coefficients and 95% confidence interval ranges have been transformed to percent change to mimic figures.

**Table S15** Climate moderator effects on interaction effect sizes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trait** | **Moderator** | **Coef. (±SE)** | **Z-value** | ***p*-value** | **95% CI** |
| *M*area | *T*g | [1.460±1.991] | 0.735 | 0.462 | [-2.386, 5.456] |
| *AI*g | [-6.571±24.277] | -0.313 | 0.754 | [-38.979, 43.05] |
| *PAR*g | [0.010±0.156] | 0.062 | 0.951 | [-0.295, 0.316] |
| *N*mass | *T*g | [0.024±1.089] | 0.022 | 0.982 | [-2.078, 2.171] |
| *AI*g | [12.011±17.192] | 0.715 | 0.475 | [-17.923, 52.862] |
| *PAR*g | [0.026±0.085] | 0.301 | 0.763 | [-0.141, 0.192] |
| *N*area | *T*g | [3.829±2.370] | 1.604 | 0.109 | [-0.829, 8.706] |
| *AIg* | *[48.155±24.355]* | *1.803* | *0.071* | *[-3.355, 127.119]* |
| *PAR*g | [0.236±0.146] | 1.611 | 0.107 | [-0.051, 0.523] |
| *P*mass | *T*g | [0.398±1.238] | 0.323 | 0.747 | [-1.993, 2.848] |
| *AI*g | [22.294±17.721] | 1.234 | 0.217 | [-11.174, 68.374] |
| *PAR*g | [0.065±0.090] | 0.721 | 0.471 | [-0.112, 0.242] |
| *P*area | *T*g | [3.427±2.434] | 1.401 | 0.161 | [-1.335, 8.418] |
| ***AI*g** | **[74.847±22.811]** | **2.719** | **0.007** | **[16.884, 161.555]** |
| ***PAR*g** | **[0.351±0.146]** | **2.398** | **0.017** | **[0.064, 0.638]** |
| *Leaf N:P* | ***T*g** | **[4.008±1.846]** | **2.148** | **0.032** | **[0.344, 7.805]** |
| *AI*g | [21.666±18.488] | 1.156 | 0.248 | [-12.749, 69.654] |
| *PAR*g | **[-0.291±0.113]** | **-2.574** | **0.010** | **[-0.511, -0.069]** |
| *Total biomass* | *T*g | [3.995±3.738] | 1.067 | 0.286 | [-3.223, 11.752] |
| *AI*g | [-2.789±21.811] | -0.143 | 0.886 | [-33.966, 43.106] |
| *PAR*g | [-0.042±0.112] | -0.371 | 0.710 | [-0.261, 0.178] |
| *Aboveground biomass* | ***T*g** | **[-3.051±1.499]** | **-2.082** | **0.037** | **[-5.837, -0.181]** |
| ***AI*g** | **[-32.131±18.069]** | **-2.334** | **0.020** | **[-50.989, -6.016]** |
| *PAR*g | [-0.098±0.068] | -1.428 | 0.153 | [-0.232, 0.036] |
| *Belowground biomass* | *T*g | [-1.448±1.676] | -0.878 | 0.380 | [-4.607, 1.815] |
| *AI*g | [-6.037±20.485] | -0.334 | 0.738 | [-34.787, 35.388] |
| *PAR*g | [0.032±0.091] | 0.347 | 0.728 | [-0.147, 0.210] |
| *Root mass fraction* | *T*g | [1.315±4.651] | 0.287 | 0.774 | [-7.322, 10.756] |
| *AI*g | [29.968±50.352] | 0.643 | 0.520 | [-41.56, 189.045] |
| *PAR*g | [-0.089±0.218] | -0.410 | 0.682 | [-0.514, 0.338] |
| *Root:shoot* | *T*g | [-0.762±4.277] | -0.183 | 0.855 | [-8.583, 7.728] |
| *AI*g | [7.988±49.877] | 0.190 | 0.849 | [-51.141, 138.675] |
| *PAR*g | [-0.102±0.208] | -0.490 | 0.624 | [-0.508, 0.306] |

**Table S16** N2-fixer moderator effects on interaction effect sizes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trait** | **Moderator** | **Coef. (±SE)** | **Z-value** | ***p*-value** | **95% CI** |
| *M*area | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |
| *N*mass | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |
| *N*area | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |
| *P*mass | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |
| *P*area | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |
| *Leaf N:P* | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |
| *Total biomass* | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |
| *Aboveground biomass* | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |
| *Belowground biomass* | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |
| *Root mass fraction* | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |
| *Root:shoot* | *non-fixer* |  |  |  |  |
| *N2-fixer* |  |  |  |  |

**Table S17** Mycorrhizal acquisition strategy moderator effects on interaction effect sizes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trait** | **Moderator** | **Coef. (±SE)** | **Z-value** | ***p*-value** | **95% CI** |
| *M*area | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |
| *N*mass | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |
| *N*area | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |
| *P*mass | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |
| *P*area | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |
| *Leaf N:P* | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |
| *Total biomass* | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |
| *Aboveground biomass* | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |
| *Belowground biomass* | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |
| *Root mass fraction* | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |
| *Root:shoot* | *mining* |  |  |  |  |
| *scavenging* |  |  |  |  |

**Table S18** Photosynthetic pathway moderator effects on interaction effect sizes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trait** | **Moderator** | **Coef. (±SE)** | **Z-value** | ***p*-value** | **95% CI** |
| *M*area | *C3* |  |  |  |  |
| *C4* |  |  |  |  |
| *N*mass | *C3* |  |  |  |  |
| *C4* |  |  |  |  |
| *N*area | *C3* |  |  |  |  |
| *C4* |  |  |  |  |
| *P*mass | *C3* |  |  |  |  |
| *C4* |  |  |  |  |
| *P*area | *C3* |  |  |  |  |
| *C4* |  |  |  |  |
| *Leaf N:P* | *C3* |  |  |  |  |
| *C4* |  |  |  |  |
| *Total biomass* | *C3* |  |  |  |  |
| *C4* |  |  |  |  |
| *Aboveground biomass* | *C3* |  |  |  |  |
| *C4* |  |  |  |  |
| *Belowground biomass* | *C3* |  |  |  |  |
| *C4* |  |  |  |  |
| *Root mass fraction* | *C3* |  |  |  |  |
| *C4* |  |  |  |  |
| *Root:shoot* | *C3* |  |  |  |  |
| *C4* |  |  |  |  |

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