**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) |

**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 |
| (Li *et al.*, 2011) | daqinggou | 42.97 | 122.35 | 249 | 16.8 | 0.41 | 912 | grassland | field | 20 | 10 |
| (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 |
| (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 *et al.*, 1997a) | hasselt | 57 | 7 | 32 | 10.6 | 1.41 | 465 | grassland | field | 20 | 8 |
| (van Duren *et al.*, 1997b) | 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 |
| (Wang *et al.*, 2017) | huitong | 26.67 | 109.43 | 519 | 16.1 | 1.20 | 633 | forest | field | 20 | 5 |
| (Wang *et al.*, 2018) | haibeiAMERS | 37.617 | 101.2 | 3157 | 6.2 | 0.52 | 930 | tundra | field | 10 | 5 |
| (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 |
| (Yu *et al.*, 2009) | daqinguo | 42.97 | 122.35 | 249 | 16.8 | 0.41 | 912 | grassland | field | 20 | 10 |
| (Yu *et al.*, 2015) | ewenke | 48.5 | 119.7 | 709 | 11.0 | 0.34 | 877 | grassland | field | 10 | 5 |
| (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 | **-0.037±0.016** | **-2.318** | **0.020** | **[-0.068, -0.006]** |
| P | -0.015±0.015 | -1.019 | 0.308 | [-0.044, 0.014] |
| N+P | **-0.052±0.018** | **-2.880** | **0.004** | **[-0.088, -0.0167]** |
| *N*mass | N | 139 | **0.124±0.021** | **5.937** | **<0.001** | **[0.083, 0.165]** |
| P | -0.002±0.012 | -0.127 | 0.899 | [-0.025, 0.022] |
| N+P | **0.118±0.021** | **5.462** | **<0.001** | **[0.075, 0.160]** |
| *N*area | N | 84 | **0.125±0.042** | **2.987** | **0.003** | **[0.043, 0.208]** |
| P | 0.026±0.042 | 0.617 | 0.537 | [-0.056, 0.108] |
| N+P | **0.150±0.036** | **4.138** | **<0.001** | **[0.079, 0.221]** |
| *P*mass | N | 133 | **-0.075±0.032** | **-2.365** | **0.018** | **[-0.136, -0.013]** |
| P | **0.449±0.066** | **6.808** | **<0.001** | **[0.320, 0.578]** |
| N+P | **0.366±0.057** | **6.387** | **<0.001** | **[0.253, 0.478]** |
| *P*area | N | 79 | -0.054±0.075 | -0.720 | 0.472 | [-0.201, 0.093] |
| P | **0.530±0.113** | **4.693** | **<0.001** | **[0.309, 0.751]** |
| N+P | **0.383±0.110** | **3.489** | **<0.001** | **[0.168, 0.598]** |
| Leaf N:P | N | 115 | **0.137±0.048** | **2.881** | **0.004** | **[0.044, 0.230]** |
| P | **-0.337±0.064** | **-5.246** | **<0.001** | **[-0.463, -0.211]** |
| N+P | **-2.010±0.047** | **-4.242** | **<0.001** | **[-0.293, -0.108]** |

**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 | 0.095±0.073 | 1.313 | 0.189 | [-0.047, 0.238] |
| P | 0.083±0.083 | 1.006 | 0.315 | [-0.079, 0.245] |
| N+P | **0.214±0.096** | **2.227** | **0.026** | **[0.026, 0.402]** |
| *V*cmax | N | 42 | 0.007±0.093 | 0.078 | 0.938 | [-0.175, 0.190] |
| P | 0.115±0.072 | 1.607 | 0.108 | [-0.025, 0.256] |
| N+P | *0.164±0.085* | *1.937* | *0.053* | *[-0.002, 0.331]* |
| *J*max | N | 40 | 0.091±0.061 | 1.502 | 0.133 | [-0.028, 0.209] |
| P | **0.177±0.079** | **2.248** | **0.025** | **[0.023, 0.332]** |
| N+P | **0.261±0.027** | **9.601** | **<0.001** | **[0.208, 0.315]** |
| *J*max:*V*cmax | N | 32 | *0.003±0.002* | *1.695* | *0.090* | *[0.000, 0.007]* |
| P | 0.000±0.002 | -0.298 | 0.766 | [-0.004, 0.003] |
| N+P | **0.012±0.002** | **5.291** | **<0.001** | **[0.007, 0.016]** |
| *PNUE* | N | 58 | 0.057±0.118 | 0.483 | 0.629 | [-0.174, 0.287] |
| P | 0.151±0.132 | 1.142 | 0.253 | [-0.108, 0.409] |
| N+P | 0.124±0.189 | 0.656 | 0.512 | [-0.246, 0.494] |
| *PPUE* | N | 59 | 0.194±0.132 | 1.469 | 0.142 | [-0.065, 0.452] |
| P | -0.171±0.182 | 0.939 | 0.348 | [-0.528, 0.186] |
| N+P | -0.053±0.182 | -0.291 | 0.771 | [-0.411, 0.304] |

**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 | 0.034±0.053 | 0.643 | 0.520 | [-0.070, 0.139] |
| P | **0.155±0.077** | **2.007** | **0.045** | **[0.004, 0.307]** |
| N+P | **0.379±0.078** | **4.871** | **<0.001** | **[0.226, 0.531]** |
| *Aboveground biomass* | N | 125 | **0.326±0.037** | **8.753** | **<0.001** | **[0.253, 0.399]** |
| P | **0.191±0.033** | **5.741** | **<0.001** | **[0.126, 0.257]** |
| N+P | **0.627±0.480** | **13.106** | **<0.001** | **[0.533, 0.721]** |
| *Belowground biomass* | N | 63 | -0.015±0.070 | -0.218 | 0.828 | [-0.151, 0.121] |
| P | 0.032±0.043 | 0.745 | 0.456 | [0.053, 0.117] |
| N+P | 0.101±0.074 | 1.358 | 0.174 | [-0.045, 0.245] |
| *Root mass fraction* | N | 37 | **-0.158±0.047** | **-3.400** | **<0.001** | **[-0.250, -0.067]** |
| P | *-0.070±0.038* | *-1.828* | *0.068* | *[-0.145, 0.005]* |
| N+P | **-0.148±0.046** | **-3.252** | **0.001** | **[-0.237, -0.059]** |
| *Root:shoot ratio* | N | 40 | **-0.341±0.090** | **-3.802** | **<0.001** | **[-0.516, -0.165]** |
| P | **-0.227±0.102** | **-2.226** | **0.026** | **[-0.426, -0.027]** |
| N+P | **-0.401±0.114** | **-3.517** | **<0.001** | **[-0.625, -0.178]** |