**Supplementary materials**

Tab. S1Composition of the N-enriched 2-mm granular biochar used in this study.Notes: The table data comes from published articles that are uniformly processed in the same way. **Yin X. L., Peñuelas J., Sardans J., Xu X. P., Chen Y. Y., Fang Y. Y., Wu L. Q., Singh P. B., Tavakkoli E. and Wang W. Q.** (2021a). Effects of nitrogen-enriched biochar on rice growth and yield, iron dynamics, and soil carbon storage and emissions: A tool to improve sustainable rice cultivation. *Environmental Pollution* 287, 117565. **Yin X. L., Peñuelas J., Xu X. P., Sardans J., Fang Y. Y., Wiesmeier M., Chen Y. Y., Chen X. X. and Wang W. Q** (2021b). Effects of addition of nitrogen-enriched biochar on bacteria and fungi community structure and C, N, P, and Fe stoichiometry in subtropical paddy soils. *European Journal of Soil Biology* 106, 103351.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variables | Total carbon | Total nitrogen | Total phosphorous | Sodium | Magnesium | Aluminum | Sulfur | Potassium | Calcium | Manganese | Iron | Zinc |
| Composition (%) | 6.01 | 8.11 | 0.41 | 0.11 | 1.08 | 0.94 | 2.65 | 1.54 | 0.73 | 0.33 | 0.4 | 0.05 |

Tab. S2 Repeated-measures ANOVA of C, N, P contents, stoichiometric ratio and storages in rice. Notes: NEB: N-enriched biochar treatment; Time: different rice seasons (early and later rice); NEB × Time represents the interaction between them.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Index | Treatment | Root | Stem | Leaf | Grain |
| C | NEB | *P*=0.67 | *P*<0.01 | *P*<0.05 | *P*<0.05 |
| Time | *P*<0.05 | *P*<0.01 | *P*<0.01 | *P*<0.01 |
| NEB × Time | *P*=0.33 | *P*=0.67 | *P*<0.05 | *P*=0.27 |
| N | NEB | *P*<0.01 | *P*<0.01 | *P*=0.11 | *P*<0.01 |
| Time | *P*<0.01 | *P*<0.01 | *P*<0.01 | *P*<0.01 |
| NEB × Time | *P*<0.01 | *P*<0.01 | *P*<0.01 | *P*<0.01 |
| P | NEB | *P=*0.86 | *P*=0.61 | *P*=0.16 | *P*=0.63 |
| Time | *P*<0.01 | *P*=0.86 | *P*=0.21 | *P*<0.01 |
| NEB × Time | *P*<0.05 | *P*=0.29 | *P*=0.11 | *P*=0.23 |
| C/N | NEB | *P*<0.05 | *P*<0.05 | *P*=0.11 | *P*<0.01 |
| Time | *P*<0.01 | *P*<0.05 | *P*=0.69 | *P*<0.01 |
| NEB× Time | *P*=0.16 | *P*<0.05 | *P*<0.01 | *P*<0.05 |
| C/P | NEB | *P*=0.72 | *P*=0.33 | *P*=0.13 | *P*=0.67 |
| Time | *P*<0.01 | *P*=0.78 | *P*<0.05 | *P*=0.09 |
| NEB × Time | *P*<0.05 | *P*=0.34 | *P*=0.10 | *P*=0.32 |
| N/P | NEB | *P*<0.01 | *P*<0.01 | *P*=0.25 | *P*=0.09 |
| Time | *P*<0.01 | *P*<0.01 | *P*<0.01 | *P*<0.05 |
| NEB × Time | *P*<0.01 | *P*<0.01 | *P*=0.08 | *P*=0.11 |
| C storage | NEB | *P*<0.05 | *P*<0.01 | *P*<0.01 | *P*<0.01 |
| Time | *P*<0.05 | *P*=0.90 | *P*=0.62 | *P*=0.09 |
| NEB × Time | *P*=0.32 | *P*=0.71 | *P*=0.24 | *P*=0.98 |
| N storage | NEB | *P*<0.01 | *P*<0.01 | *P*<0.01 | *P*<0.01 |
| Time | *P*<0.01 | *P*<0.01 | *P*<0.01 | *P*<0.01 |
| NEB × Time | *P*<0.01 | *P*<0.01 | *P*<0.01 | *P*=0.11 |
| P storage | NEB | *P*=0.23 | *P*=0.19 | *P*<0.01 | *P*<0.01 |
| Time | *P*=0.20 | *P*=0.32 | *P*=0.06 | *P*=0.40 |
| NEB × Time | *P*=0.63 | *P*=0.56 | *P*=0.64 | *P*=0.34 |

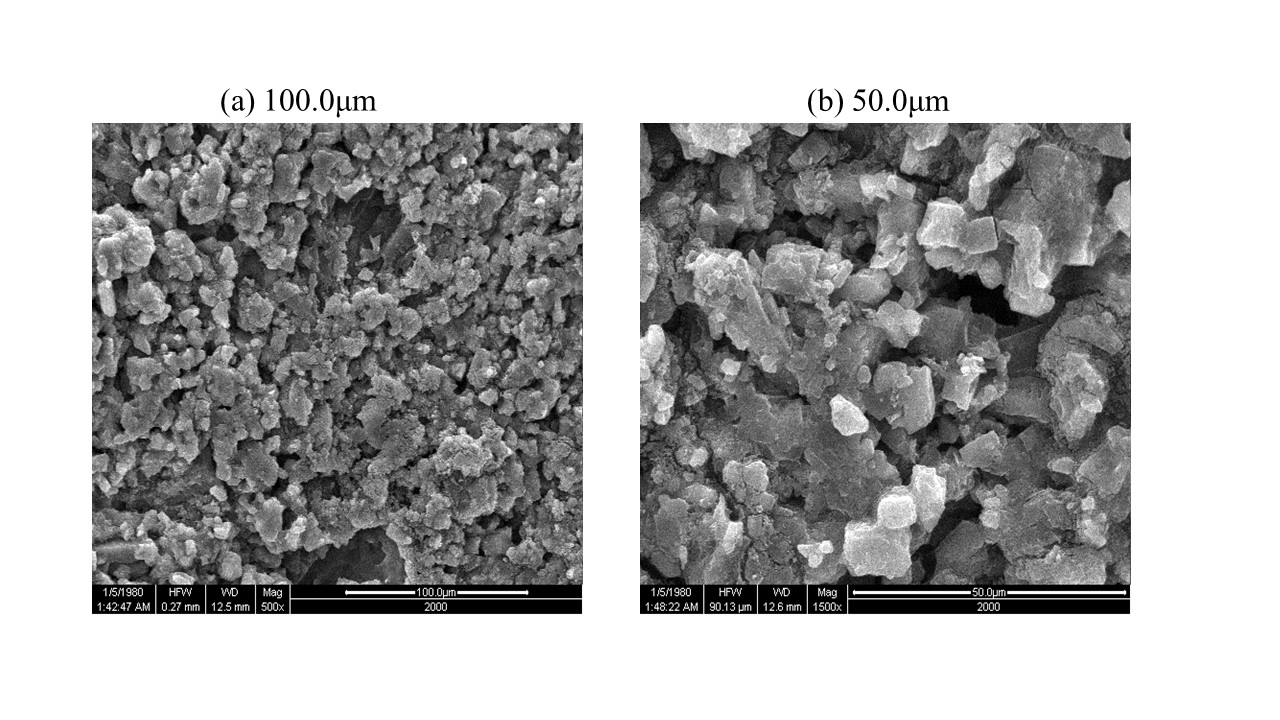


Fig. S1 Electron microscopy image of N-enriched biochar (4 and 8 t ha-1) at 100.0μm (a) and 50.0μm (b)



Fig. S2 Content (a-c), ecological stoichiometric ratio (d-f) and storage (g-l) of C, N and P in roots, stems, leaves and grains of rice plants. Notes: The data (including early and later rice) given in the figure are the mean values and standard errors. Uppercase letters indicate within-growth stage treatment differences, respectively (*p*< 0.05). T stands for tillering stage and M stands for maturity stage in the legend.

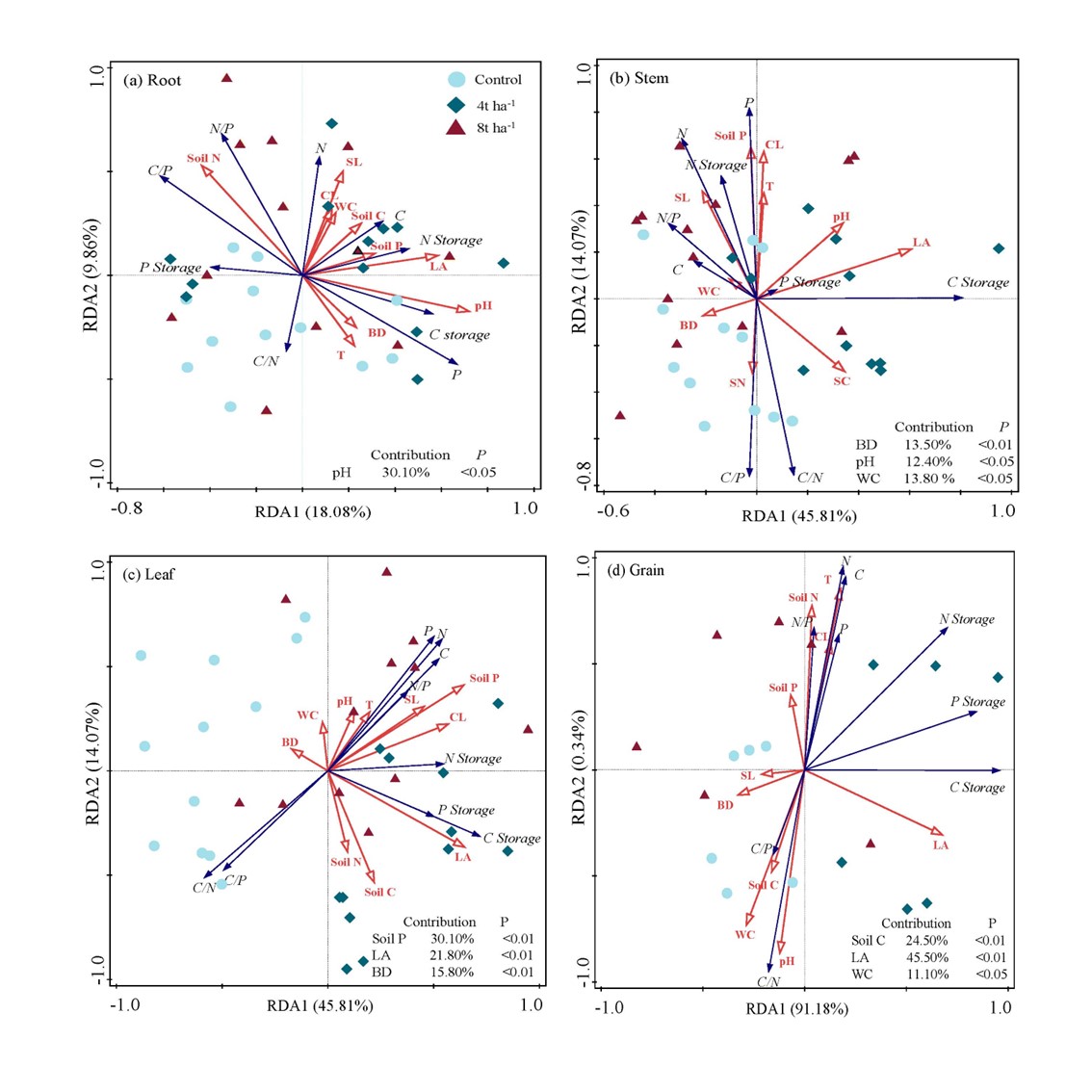


Fig. S3 RDA analysis of C, N and P contents, storage and ecological stoichiometric ratio in rice roots (a), stems (b), leaves (c) and grains (d) of rice plants. Notes: WC: Soil water content; CL: Chlorophyll; BD: Soil bulk density T: Soil temperature; SL: Soil salinity; LA: Leaf surface area.



Fig. S4 Effects of N-enriched biochar on the contents of C (a-d), N (e-h) and P (i-l) in roots (a,e,i), stems (b,f,j), leaves (c,g,k) and grains (d,h,l) of rice plants. Notes: The data given in the figure are the mean values and standard errors. Uppercase letters indicate within-growth stage treatment differences, respectively (*p*< 0.05). T stands for tillering stage and M stands for maturity stage in the legend.

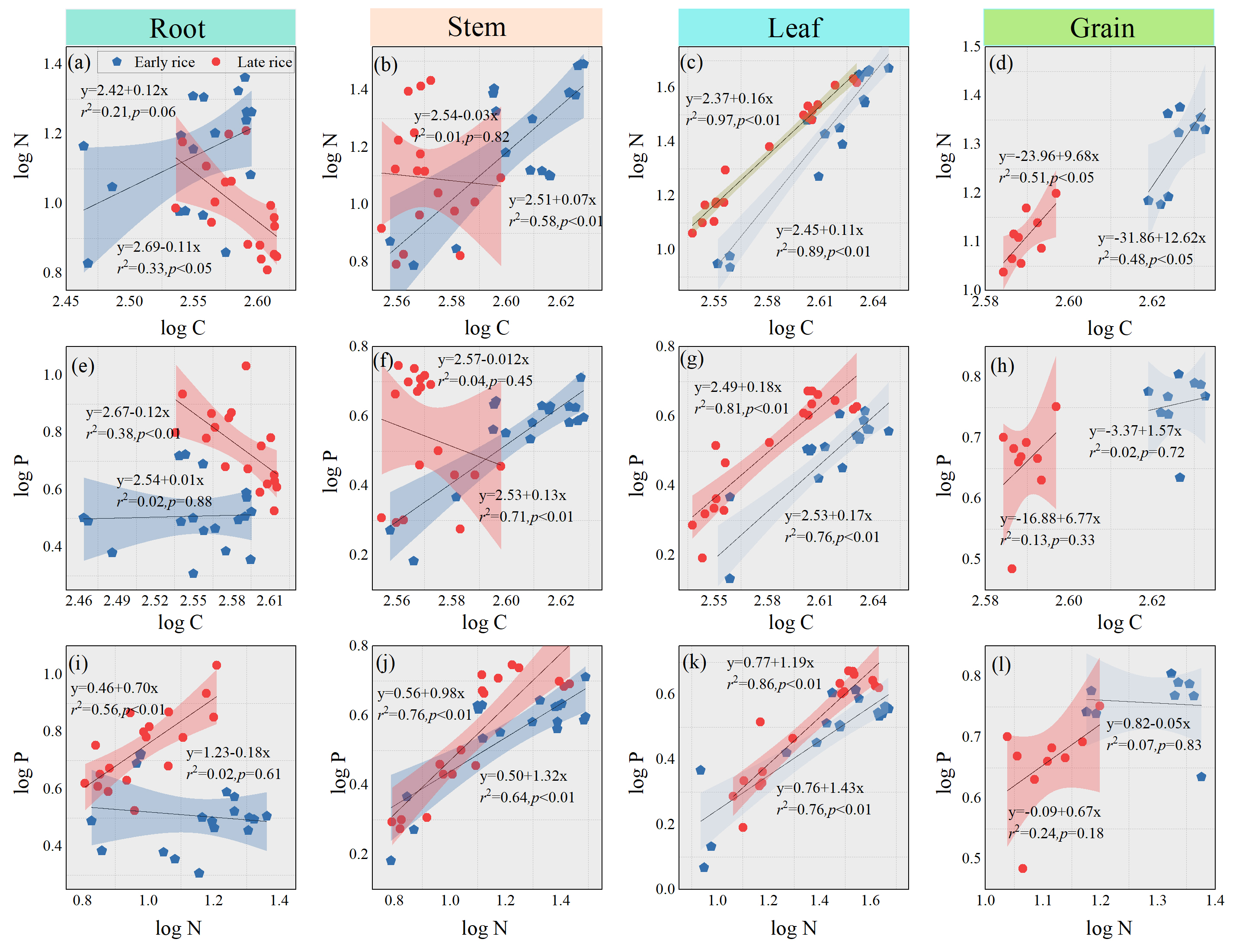


Fig. S5 Theoretical model of allometric growth of C, N and P contents in roots (a,e,i), stems (b,f,j), leaves (c,g,k) and grains (d,h,l) of rice plants. Note: *r*2 is the fitting coefficient.