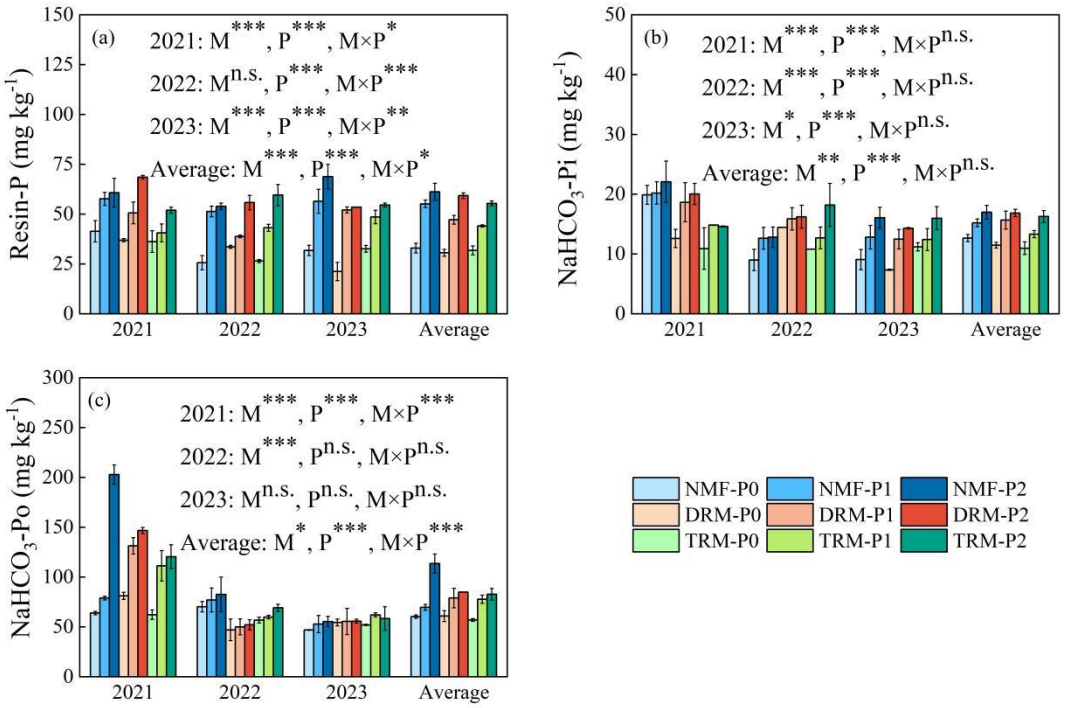

Figure S1. Resin-P (a), NaHCO3-Pi (b) and NaHCO3-Po (c) in the 2021-2023 growing seasons and the corresponding 3-year averages for three mulching treatments [no film mulching with flat planting (NMF), double ridges and furrows mulched with one plastic film (DRM), and three ridges and furrows mulched with one plastic film (TRM)] and three P levels [0 kg P ha−1 (P0), 9.10 kg P ha−1 (P1), and 18.2 kg P ha−1 (P2)]. M: mulching treatments; P: phosphorus levels; M×P: interaction between mulching and phosphorus levels. * $p \le 0.05$, ** $p \le 0.01$, *** $p \le 0.001$, and n.s. indicates no significant difference between treatments. Error bars are standard deviations.

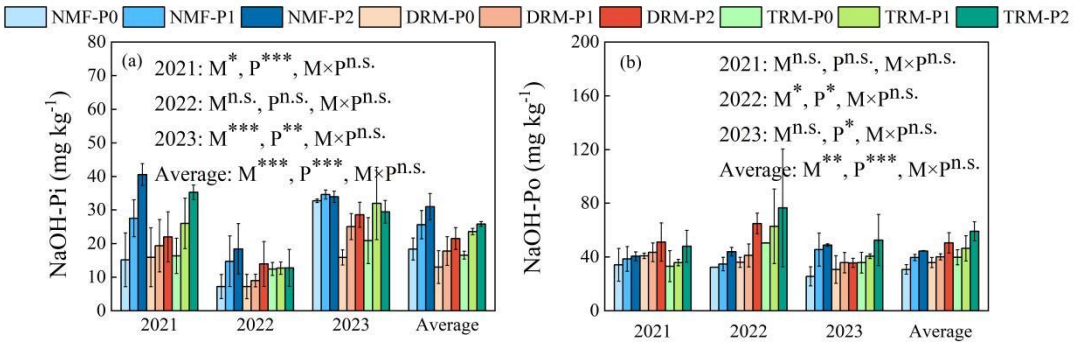

Figure S2. NaOH-Pi (a) and NaOH-Po (b) in the 2021-2023 growing seasons and the corresponding 3-year averages for three mulching treatments [no film mulching with flat planting (NMF), double ridges and furrows mulched with one plastic film (DRM), and three ridges and furrows mulched with one plastic film (TRM)] and three P levels [0 kg P ha^{-1} (P0), 9.10 kg P ha^{-1} (P1), and 18.2 kg P ha^{-1} (P2)]. M: mulching treatments; P: phosphorus levels; M×P: interaction between mulching and phosphorus levels. * $p \le 0.05$, ** $p \le 0.01$, *** $p \le 0.001$, and n.s. indicates no significant difference between treatments. Error bars are standard deviations.

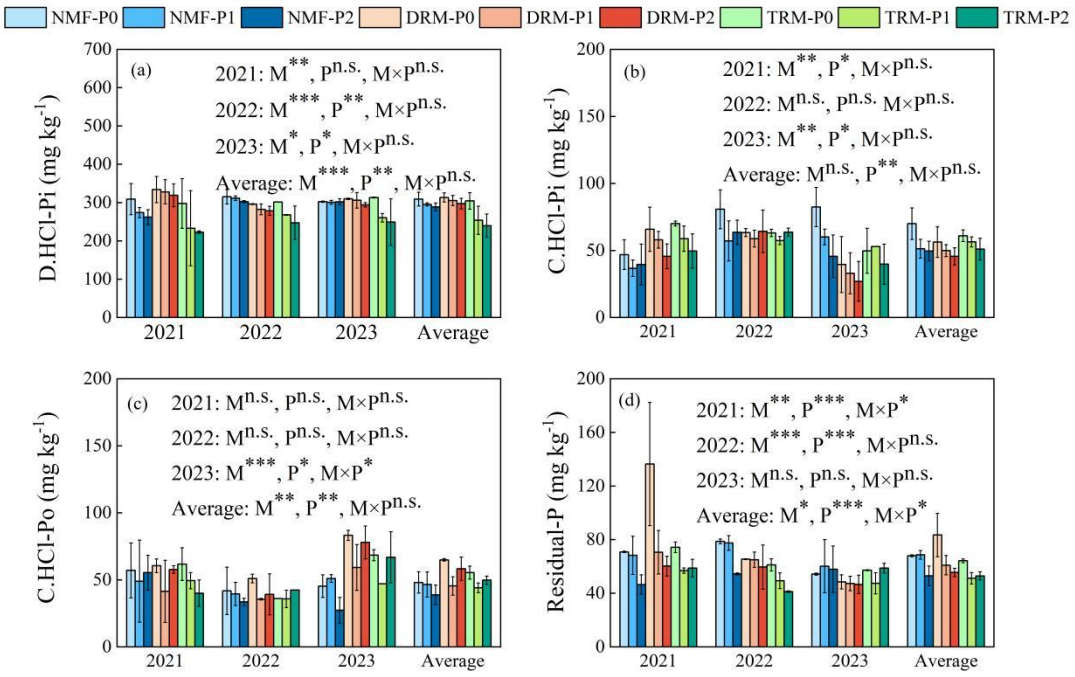

Figure S3. D.HCl-Pi (a), C.HCl-Pi (b), C.HCl-Po (c), and Residual-P (d) in the 2021-2023 growing seasons and the corresponding 3-year averages for three mulching treatments [no film mulching with flat planting (NMF), double ridges and furrows mulched with one plastic film (DRM), and three ridges and furrows mulched with one plastic film (TRM)] and three P levels [0 kg P ha^{-1} (P0), 9.10 kg P ha^{-1} (P1), and 18.2 kg P ha^{-1} (P2)]. M: mulching treatments; P: phosphorus levels; M×P: interaction between mulching and phosphorus levels. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$, and n.s. indicates no significant difference between treatments. Error bars are standard deviations.