Biochar additions may mitigate N₂O emissions from soil. The mechanisms underpinning the mitigation of emissions remain to be elucidated. A series of incubation experiments were performed to investigate the effects of biochar on N₂O production and reduction in columns with a low-fertility or high-fertility soil, with or without the injection of N₂O in the subsoil and with and without glucose (to stimulate denitrification). Biochar was added to the calcareous soils in 0 and 1% (w/w) amounts and moisture was maintained at 70% water-filled pore space (WFPS) over the incubation period. The results revealed that biochar reduced the emissions of soil-produced N₂O by 37−47% and those of injected N₂O by 23−44%. The addition of glucose solution strongly increased N₂O emissions, while biochar reduced total N₂O emissions by as much as 64−81% and those of injected N₂O alone by 29−51%. Differences between the low-fertility and high-fertility soils in the apparent N₂O emission mitigation by biochar were relatively small, but tended to be larger for the low-fertility soil. The results suggest that biochar addition can suppress the production of N₂O in soil and simultaneously stimulate the reduction of N₂O to N₂. Further studies are needed to elucidate the regulatory effects of biochar in soil.