

Electronic supplementary information

Details for the IRMS analysis and biodistribution of ^{13}C - C_{60} -OH in wheat.

Specifically, the δ value could be converted into $^{13}\text{C}/^{12}\text{C}$ ratio (r) following Equation 1. $(^{13}\text{C}/^{12}\text{C})_{\text{standard}}$ was the $^{13}\text{C}/^{12}\text{C}$ ratio of the VPDB sample (0.0111802). The r value was further converted into percentage of ^{13}C in mass ($\omega_{^{13}\text{C}}$) following Equation 2, which meant that the ratio of “total weight of ^{13}C atoms/total weight of carbon atoms”. The mass of ^{13}C -enriched fullerenols nanoparticles in tissue ($m_{^{13}\text{C}-\text{fullerenol}}$) could be obtained from Equation 3, where $\omega_{\text{carbon of tissue}}$ from IRMS was the mass percentage of carbon in the dry sample from exposed and unexposed plant (the value was constant for certain organ); m_{tissue} was the weight of tissues; $m_{\text{dry}}/m_{\text{wet}}$ was the weight ratio of tissue before and after drying. $\omega_{^{13}\text{C}}(\text{tissue})$ was the percentage of ^{13}C in mass for tissue samples from exposed plant. $\omega_{^{13}\text{C}}(\text{control})$ was the percentage of ^{13}C in mass for tissue samples from unexposed plant. And $\omega_{^{13}\text{C}-\text{fullerenol}}$ was the percentage of ^{13}C in ^{13}C -enriched fullerenol. The contents of ^{13}C -enriched fullerenol in wheat roots, stems and leaves were expressed as %ID/g (Equation 4) or %ID (Equation 5), where dose was the mass of dissolved ^{13}C -enriched fullerenols nanoparticles.

$$r = \left(\frac{\delta}{1000} + 1 \right) \times (^{13}\text{C} / ^{12}\text{C})_{\text{standard}} \quad (1)$$

$$\omega_{^{13}\text{C}} = \frac{r \times 13}{r \times 13 + 12} \times 100\% \quad (2)$$

$$m_{^{13}\text{C}\text{-fullerenol}} = \frac{[\omega_{^{13}\text{C}}(\text{tissue}) - \omega_{^{13}\text{C}}(\text{control})] \times (\omega_{\text{carbon of tissue}} \times m_{\text{tissue}} \times \frac{m_{\text{dry}}}{m_{\text{wet}}})}{\omega_{^{13}\text{C}\text{-fullerenol}}} \quad (3)$$

$$\%ID / g = \frac{m_{^{13}\text{C}\text{-fullerenol}}}{\text{dose}} \times 100\% \div m_{\text{tissue sample}} \quad (4)$$

$$\%ID = \frac{m_{^{13}\text{C}\text{-fullerenol}}}{\text{dose}} \times 100\% \quad (5)$$

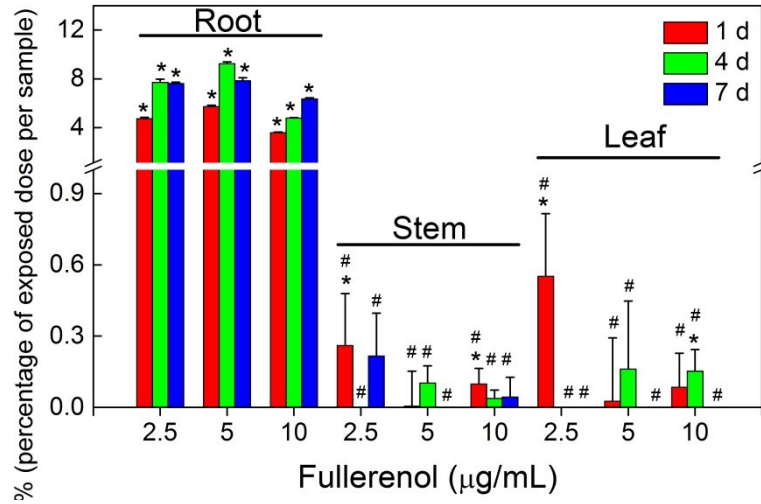


Fig. S1 Bioaccumulation of ^{13}C -fullerenol with the different concentrations in wheat during growth periods expressed by “%”. * $p < 0.05$ compared with control group; # $p < 0.05$ compared with root samples exposed to the same ^{13}C -fullerenol concentration.