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Root litter decomposition in a Sub-Saharan agroforestry parkland dominated by *Faidherbia albida*

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Fig. 1 Experimental Site – *Faidherbia-Flux* (Senegal)

The **objective** of this study was to measure the decomposition rate of root litters from annual and perennial species according to soil depth (down to 180 cm deep) and location (under and far from the trees) in a Sub-Saharan agroforestry parkland dominated by *Faidherbia albida* in Senegal.

Methods

Experimental set-up:

- 2 locations (under the tree and far (+30m) from the trunk)
- x 4 soil layers (0-20, 20-40, 40-90, 90-180 cm)
- x 3 plant species (*Faidherbia albida*, pearl millet and cowpea)
- x 3 replicates
- x 5 sampling dates

Soil characteristics were analysed. Fine root litter samples were buried in litterbags (1mm mesh size) on October 15th, 2018 (d0) for 15 months (Fig. 2) and soil moisture was monitored. Sampling of the litterbags occurred after 1.5 (d1), 3 (d2), 6 (d3), 9 (d4) and 15 months (d5) after d0 (Fig. 3) and remaining dry mass was measured.

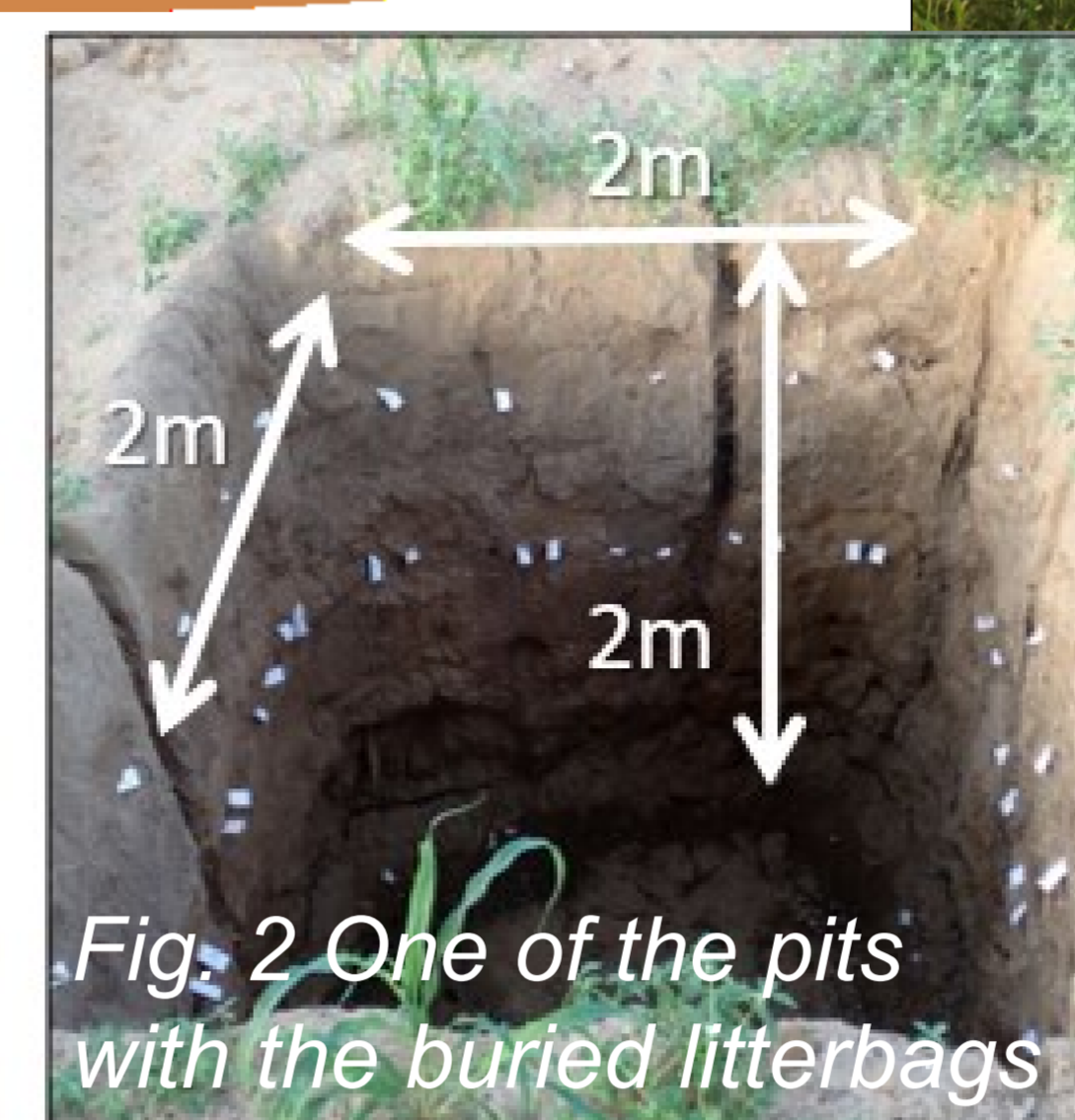


Fig. 2 One of the pits with the buried litterbags

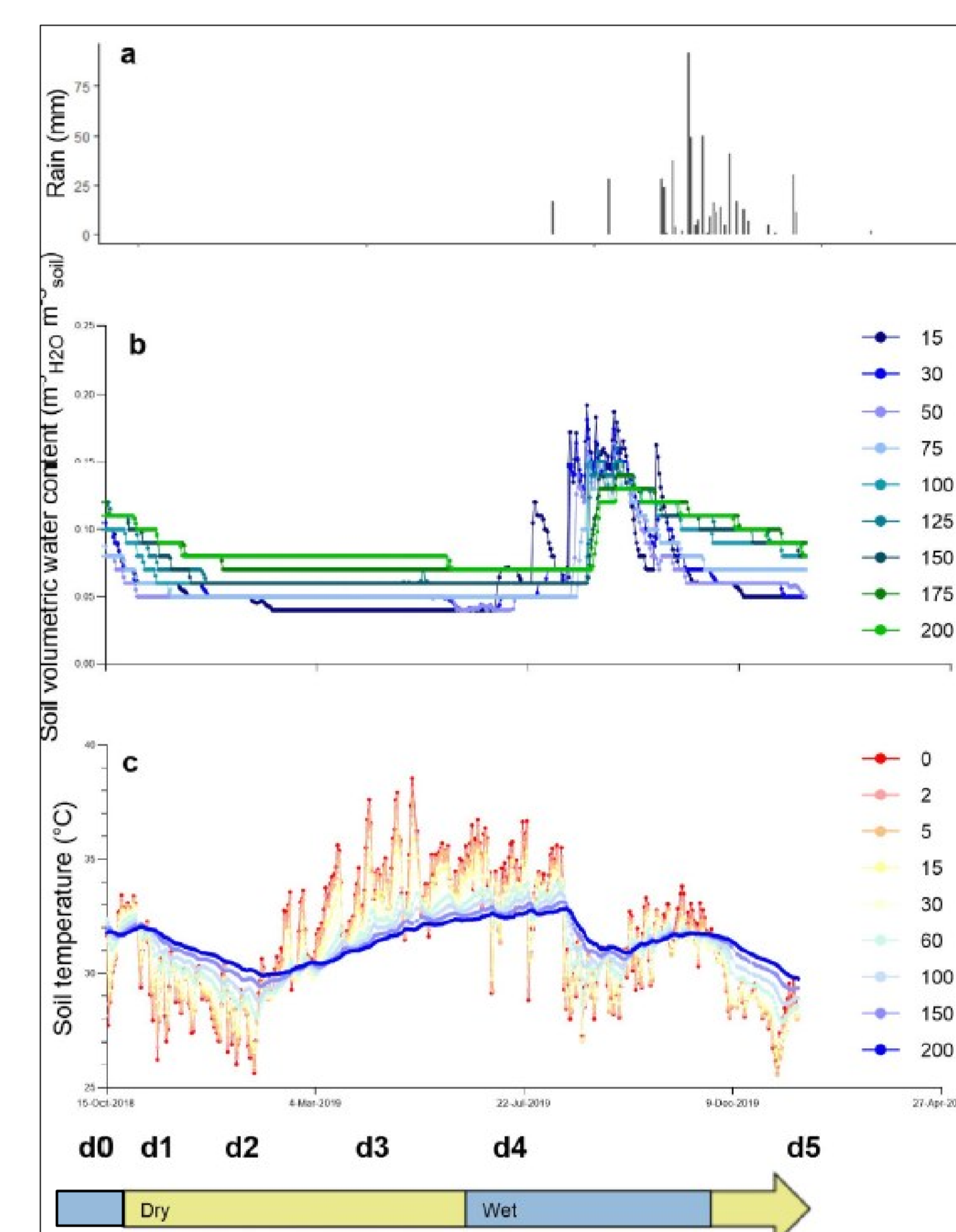


Fig. 3 Rainfall (a), soil water content (b) and soil temperature (c) along time and litterbag sampling

Results

For all species and soil depths, root litter decomposition occurred mainly during the first 1.5 months (k1), when the soil is still wet from the previous wet season (Fig. 4).

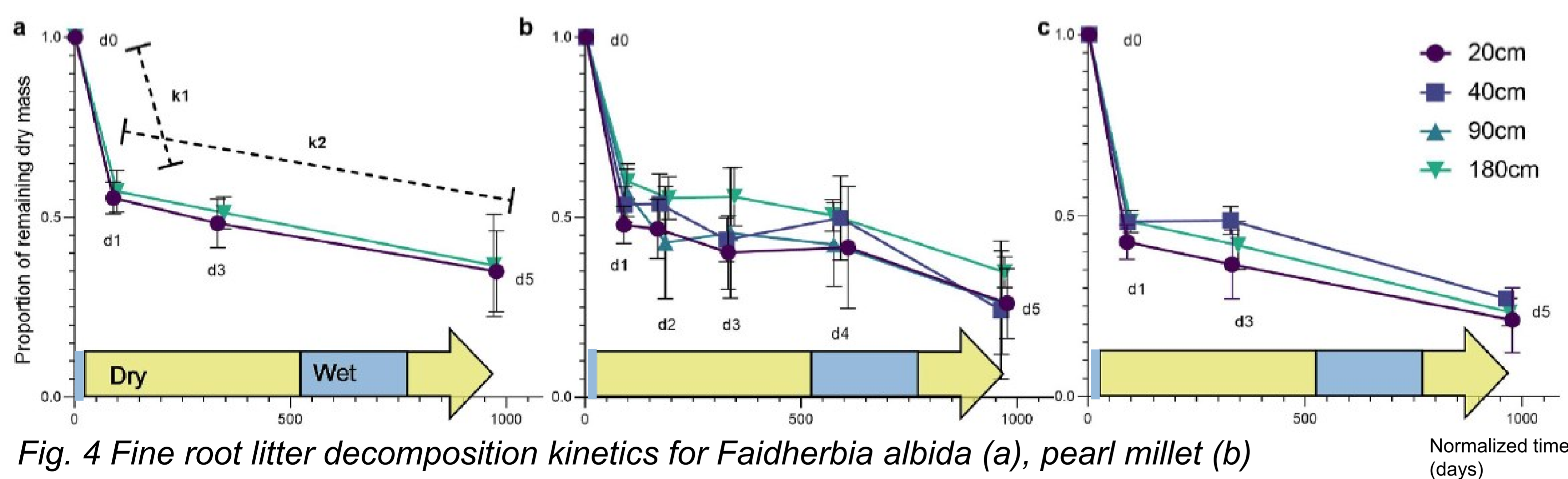


Fig. 4 Fine root litter decomposition kinetics for *Faidherbia albida* (a), pearl millet (b) and groundnut (c) at different soil depths

Due to their chemical recalcitrance, *Faidherbia* root litters decomposed more slowly (36% remaining mass after 15 months of decomposition) than cowpea and pearl millet roots (23 and 29%, respectively). Both annual plants exhibited lower rates of decomposition at depth than in the topsoil (Fig. 5), while the impact of depth on tree root litter decomposition was lower (Fig. 4).

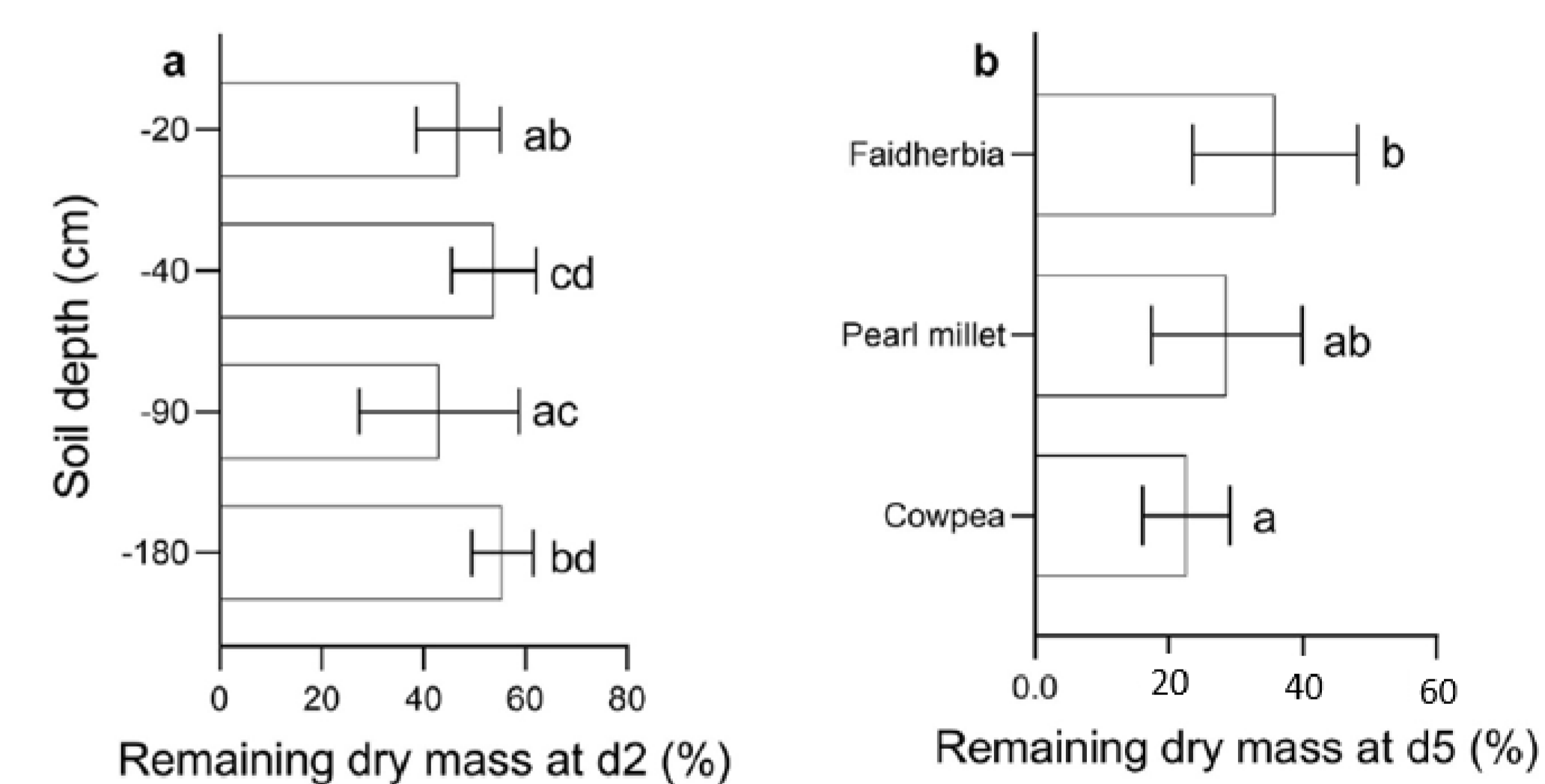


Fig. 5 Remaining dry mass in the root litterbags at d2 (effect of soil depth for all species) and at d5 (effect of plant species at all depths)

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Highlights

- Root litter decomposition occurs mostly in the first 1.5 months
- No difference of root litter decomposition between both locations (under and far from the tree)
- Tree root litters decompose more slowly compared to crop root litters
- Crop root litter amounts are greater in topsoils but decompose more slowly at depth
- Tree fine roots might contribute significantly to soil C stocks