

The Crown Rot 'Deadhead' Phenomenon in Durum Wheat



Noel Knight and Mark W Sutherland

Centre for Crop Health • University of Southern Queensland • Toowoomba



Overview

- **Disease:** Crown rot of wheat, caused by *Fusarium pseudograminearum* (*Fp*).
- **Symptoms:** Tissue browning, deadheads (prematurely senescent stems) and yield loss.
- **Target Tissues:** Evidence indicates fungal interactions with xylem and phloem tissues have a role in the disease process.
- **Hypothesis:** Stems exhibiting the deadhead symptom have more *Fp* biomass and greater vascular tissue colonisation than comparable living stems.

Methods

- Susceptible durum wheats EGA Bellaroi (2011, 2012, 2013, 2014) and Hyperno (2014) were grown in *Fp* infested fields at Wellcamp, Qld and Narrabri, NSW, respectively.
- Each year plants exhibiting both senescent (deadhead) stems and non-senescent (living) stems were collected during early milk development.
- Paired stems from each plant were sectioned from the base into 0-6, 6-12 and 12-18 cm portions.
- Visual ratings of percentage browning were performed on each section.
- *Fp* biomass was estimated in each section using qPCR.
- Colonisation of each vascular bundle in sections taken at 1, 7 and 13 cm was scored as +/- based on the presence of at least one hypha in either xylem, phloem or both.

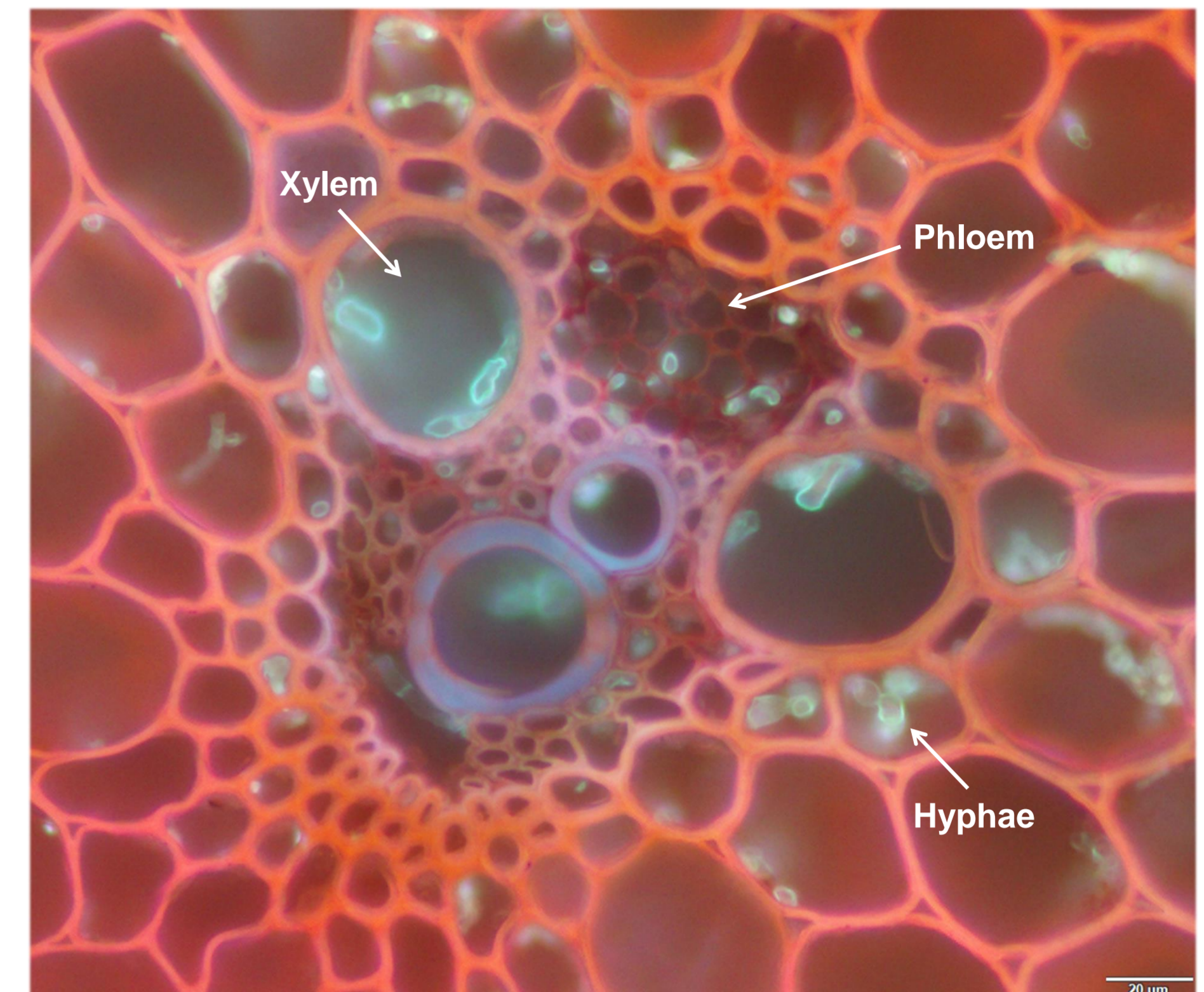


Figure 3. Vascular bundle of EGA Bellaroi with xylem and phloem colonisation.

Results

- Sections from senescent stems (Fig. 1) exhibited higher levels of visual discolouration than non-senescent stems (Fig. 2).
- *Fp* biomass was greater in senescent stem sections than in non-senescent stems (Fig. 2).
- Senescent and non-senescent stems showed vascular colonisation (Fig. 3). Differences in colonisation between these stems were greatest at 1 cm (Fig. 4).

Conclusions

- *Fp* frequently grew to at least 18 cm above the crown in infected stems.
- Vascular colonisation is not a sufficient condition for stem death.
- However, more frequent vascular bundle colonisation and profuse hyphal growth were associated with senescent stems.

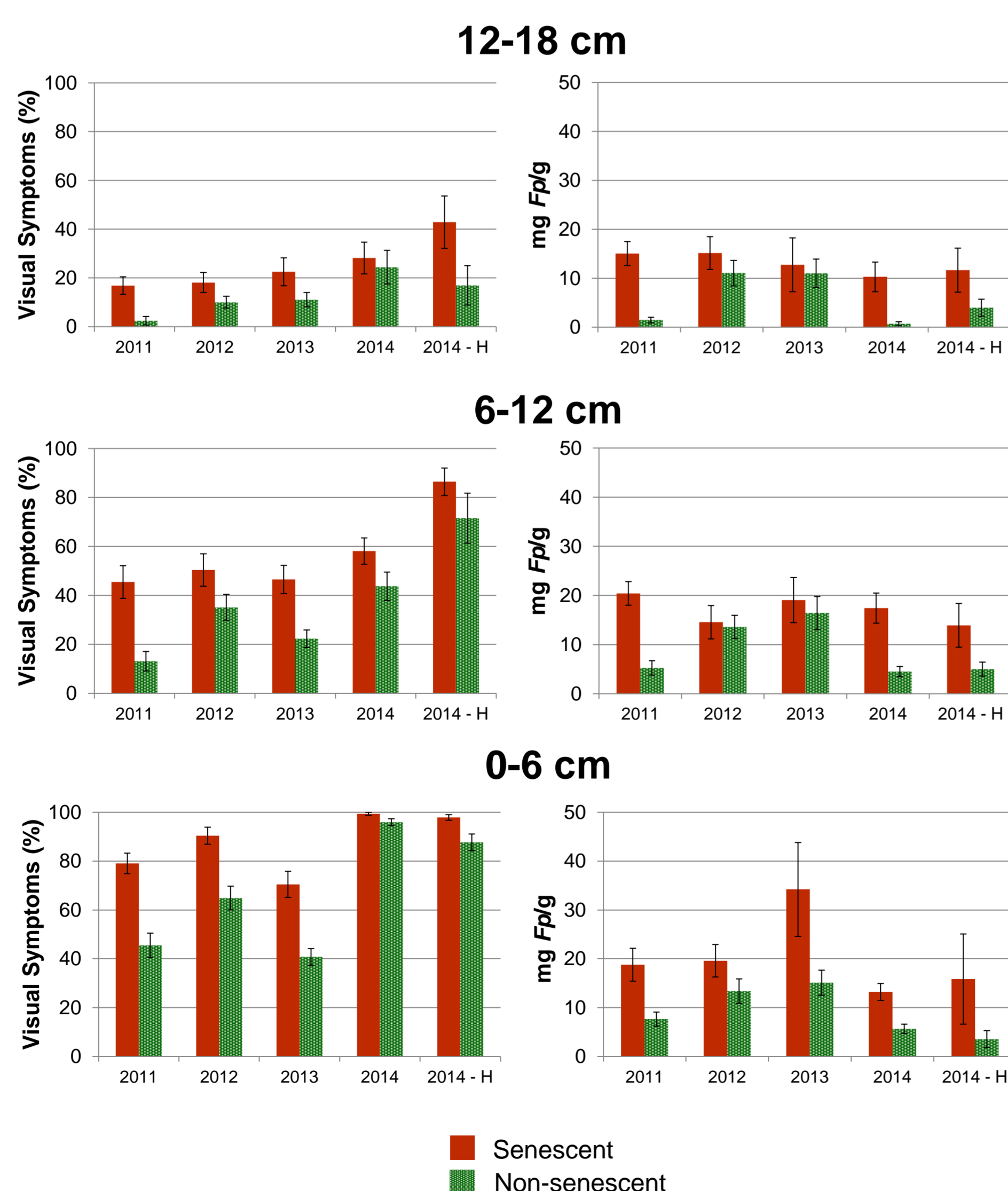


Figure 2. Visual symptoms (%) and *F. pseudograminearum* (*Fp*) biomass (mg *Fp* / g dry tissue) of senescent and non-senescent stems of EGA Bellaroi in 2011, 2012, 2013 and 2014, with Hyperno (H) also in 2014. Bars represent the standard error (n = ~30 stems).



Figure 1. Example of a crown rot affected wheat stem exhibiting a deadhead. Ruler shows the three sections from 0-6 cm, 6-12 cm and 12-18 cm that were collected from the base of each stem.

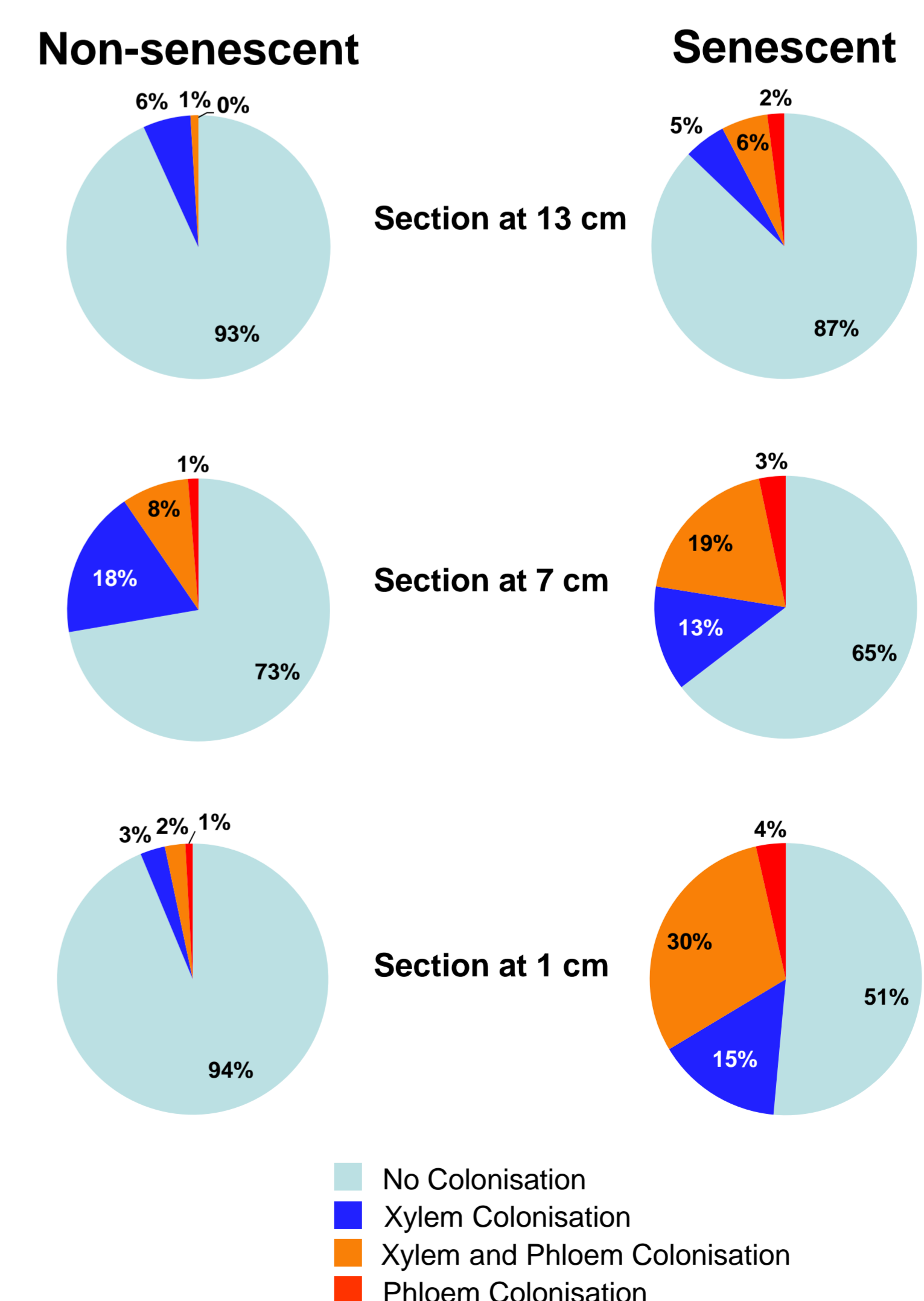


Figure 4. Comparative colonisation of xylem and phloem tissues at 1, 7 and 13 cm across 13 Hyperno plants with paired non-senescent and senescent stems in 2014.