

# The Crown Rot 'Deadhead' Phenomenon in Durum Wheat



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## 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.

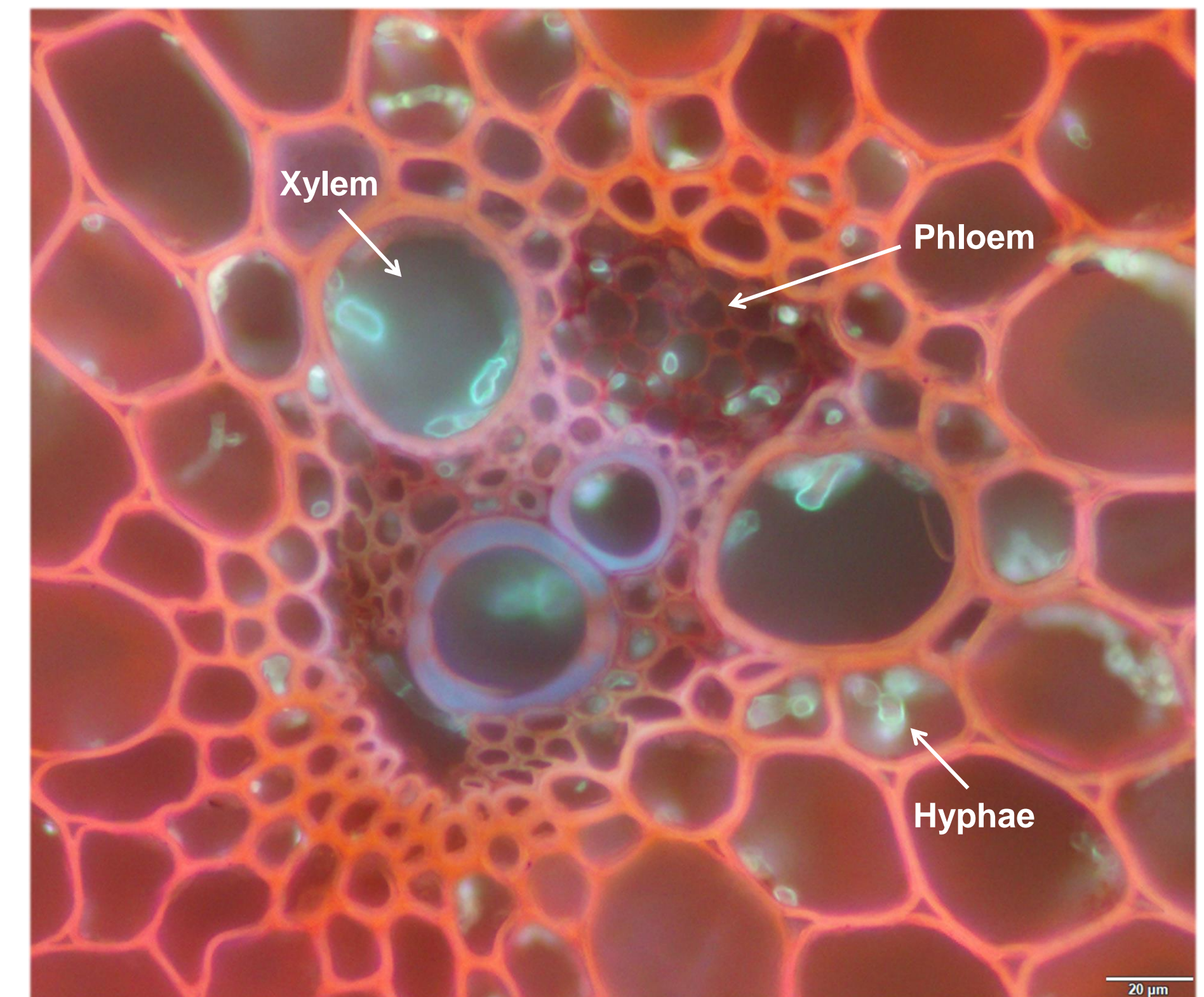


Figure 3. Vascular bundle of EGA Bellaroi with xylem and phloem colonisation.



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.

## 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.

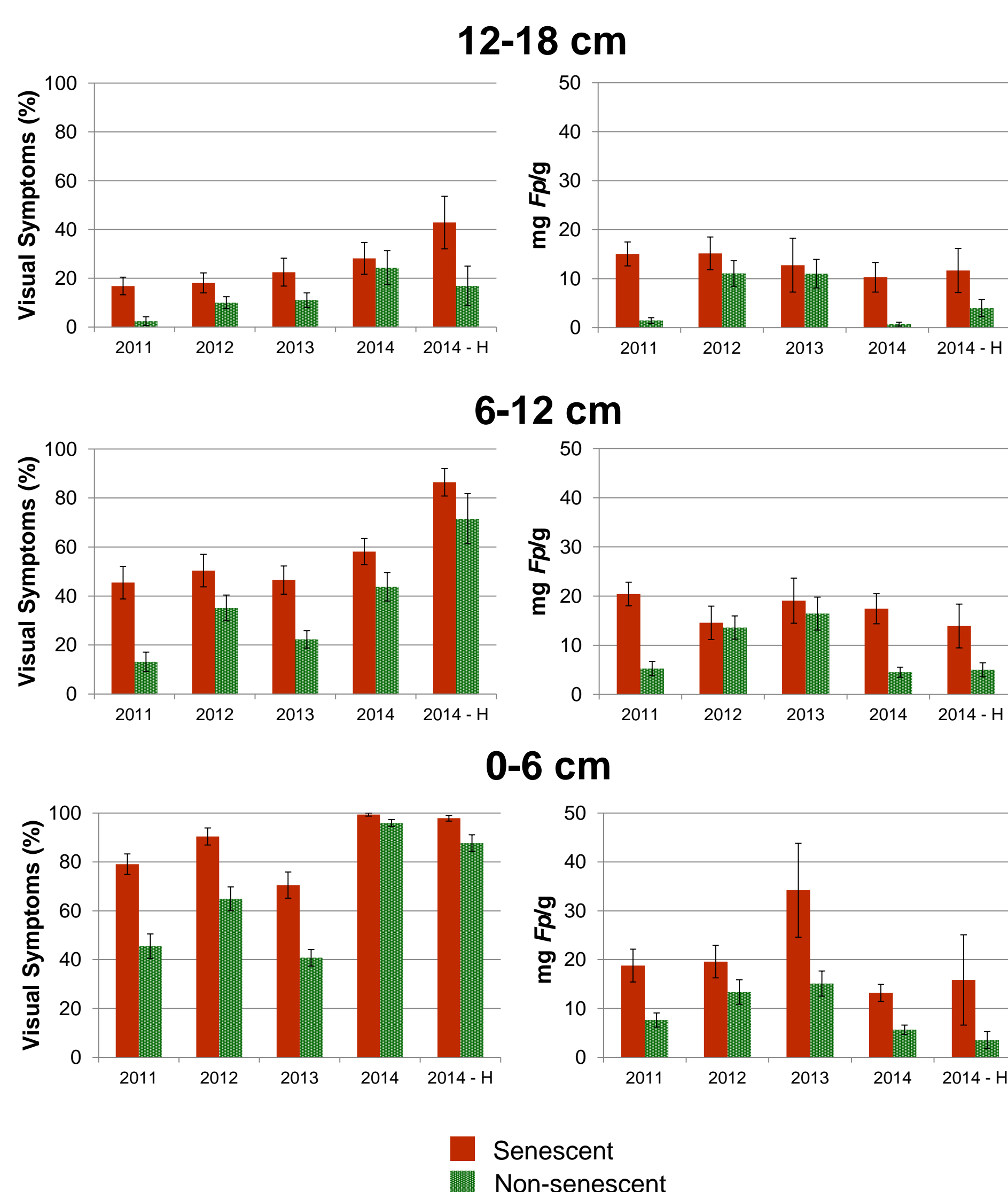


Figure 2. Visual symptoms (%) and *F. pseudograminearum* (*Fp*) biomass (mg *Fp* / g dry tissue) of senescent and non-senescent stems of EGA Bellaroi in 2011, 2012, 2013 and 2014, with Hyperno (H) also in 2014. Bars represent the standard error (n = ~30 stems).

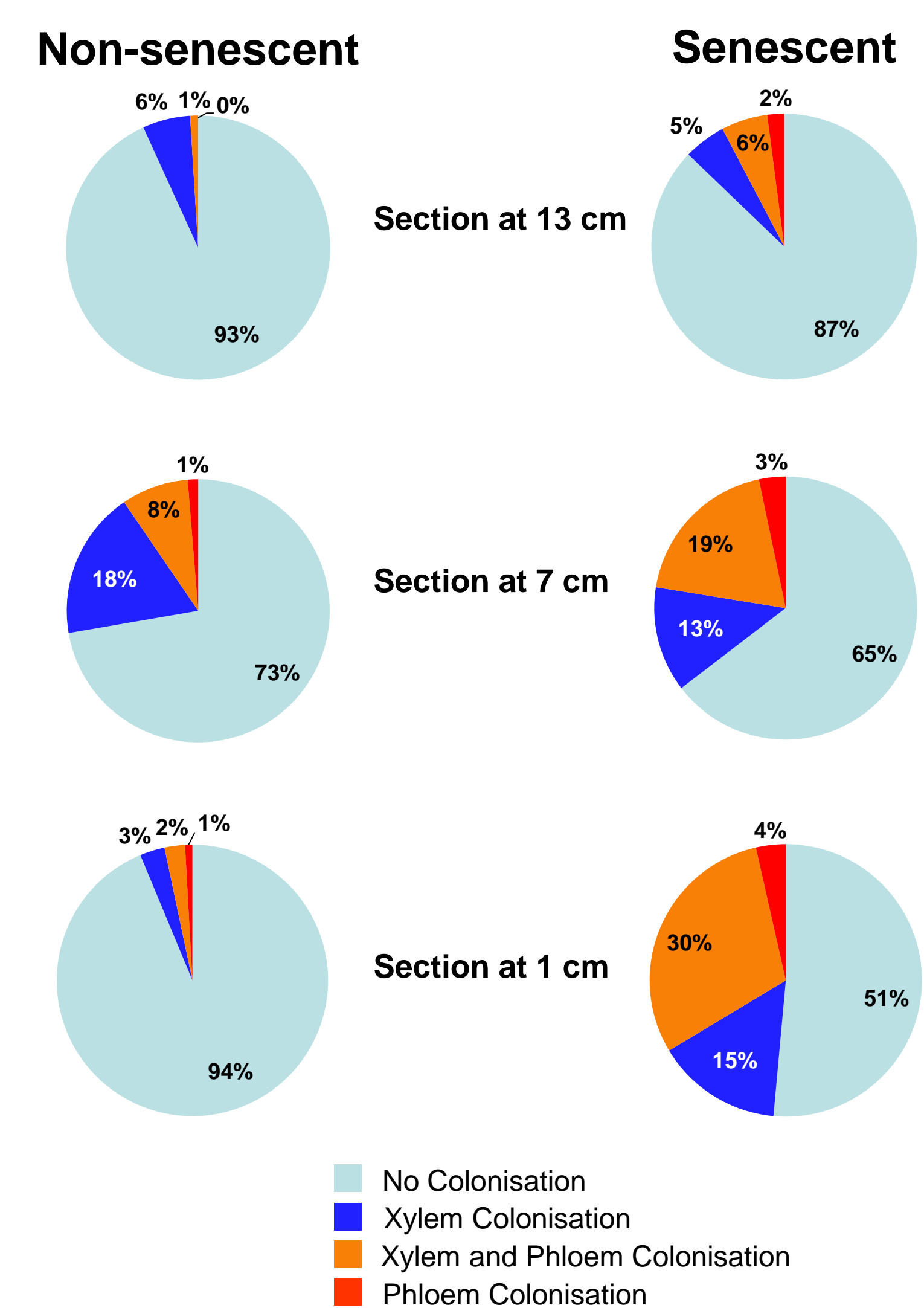


Figure 4. Comparative colonisation of xylem and phloem tissues at 1, 7 and 13 cm across 13 Hyperno plants with paired non-senescent and senescent stems in 2014.