Emergence of four weed species in response to rainfall and temperature

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Summary Fleabane (*Conyza bonariensis* (L.) Cronquist), sowthistle (*Sonchus oleraceus* L.), awnless barnyard grass (*Echinochloa colona* (L.) Link) and feathertop Rhodes grass (*Chloris virgata* Sw.) are becoming widespread in cropping areas of the northern region due in part to over-reliance on glyphosate. These species are most effectively controlled while still young. Therefore, an understanding of emergence patterns and triggers (rainfall/temperature) is important for their timely management. Some information about the emergence requirements of these species in relation to temperature and moisture is available. However, little is known about the interaction between these variables, particularly the amount of rainfall required for these species to emerge. Trials are being undertaken applying seven rainfall treatments (0, 2, 5, 10, 20, 30, 50 mm rainfall) at two temperature treatments (25°C day/15°C night, 30°C day/20°C night) to investigate the interaction between these variables.

Pots were filled with the same weight of a black self-mulching cracking clay. The top 5 cm of this soil had been sieved and sterilised in order to reduce potential germination of existing seeds. The pots were watered to 80% field capacity and maintained at this level. One hundred seeds of each of the four species were sprinkled on the surface of the soil prior to commencing the rainfall simulations. The treatments were applied in a spray cabinet fitted with a nozzle suitable for applying rainfall. A rain gauge, placed in the spray cabinet, was used to measure the amount of rainfall applied at each treatment. On completion of the rainfall treatment, pots were returned to a growth room that had been set to the relevant temperature treatment. For all trials the day/night length was 12 hours. Thermometers placed on the soil surface of two additional pots were used to monitor the soil temperature and compare to the temperature in the growth room. Seedling emergences were recorded daily until numbers had plateaued for three consecutive days.

Preliminary results show that no species emerged with less than 10 mm rainfall. Feathertop Rhodes grass and awnless barnyard grass had the highest number of seedlings emerge (6–54% and 10–37% respectively) across all rainfall treatments ≥10 mm at both temperature treatments. Feathertop Rhodes grass germinated consistently across all rainfalls at both temperature treatments while awnless barnyard grass germinated consistently at all rainfalls at 30°C/20°C.

Fleabane had more seedlings emerge (9–17%) across all rainfall treatments ≥10 mm at 30°C/20°C, with the majority of germinations occurring at 20 and 30 mm. Sowthistle had a greater range of emergences (1–34%) across all rainfall treatments ≥10 mm at 25°C/15°C with the best germination at 50 mm (34%). However at 30°C/20°C sowthistle germinated with more consistency at 20 to 50 mm (6–13%).

A significant proportion of the feathertop Rhodes grass emerged 2 DAT at 30°C/20°C and 3 DAT at 25°C/15°C. Awnless barnyard grass, sowthistle and fleabane all emerged 3 DAT at 30°C/20°C, while at 25°C/15°C sowthistle emerged 3 DAT and fleabane and awnless barnyard grass emerged 4 DAT. There were no new emergences of any of the four species after 7 DAT at 30°C/20°C. However at the lower temperature regime of 25°C/15°C low numbers of seedlings continued to emerge for sowthistle (10 DAT), feathertop Rhodes grass (11 DAT) and awnless barnyard grass (13 DAT). Soil moisture measurements showed that at the higher temperature, the soil surface had lost moisture to the same level as the treatment that received no rainfall within seven days. This is the most likely reason for no continued emergences at this temperature.

The speed at which feathertop Rhodes grass is able to emerge indicates an increased competitive ability both in crop and over other species. This fast recruitment and potential for rapid development could result in plants being sprayed past the optimal time therefore allowing the species to become increasingly problematic. Feathertop Rhodes grass also had consistent emergence over both temperatures indicating an ability to germinate under a wide range of temperature and moisture conditions.

In the field, awnless barnyard grass emerges in a number of cohorts throughout the season. This was illustrated in this study with it not reaching peak emergence at 25°C/15°C until 13 DAT. Awnless barnyard grass and feathertop Rhodes grass were also able to emerge at lower rainfalls (10 mm) than fleabane and sowthistle (20 mm) indicating they are

more likely to emerge in the field after smaller rainfall events.

This study will provide useful information on the interaction between temperature and rainfall in relation to emergence of these four species, and will assist in making timely weed management decisions. Further studies will investigate the impact of the number of rainfall days on the emergence of these species.

Keywords Emergence, rainfall, fleabane, *Conyza bonariensis*, sowthistle, *Sonchus oleraceus*, awnless barnyard grass, *Echinochloa colona*, feathertop Rhodes grass, *Chloris virgata*.

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