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Seed Germination of Rigid Ryegrass (*Lolium rigidum*) and Sterile Oat (*Avena sterilis*) under Water Salinity Conditions at Constant or Alternating Temperatures

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RIGID ryegrass (*Lolium rigidum*) and sterile oat (*Avena sterilis*) are well known grasses in many parts of the world. They grow in both grasslands and arable habitats and both are recorded as serious weeds of arable lands in many countries worldwide. Seed germination of both species was tested against four levels of water salinity (0, 100, 300, 500mM/L of NaCl) and five different temperature regimes, constant at 8°C or alternating temperatures at 6/14, 8/16, 10/18 and 10/20°C, all in dark/light photoperiods of 8/16h, respectively. *A. sterilis* seeds generally showed higher germination rates than *L. rigidum* in all tested temperature regimes. Germination was very high in both species at alternating 10/20°C, and in *A. sterilis* also at 10/18°C, with nearly 40% in both. *A. sterilis* seeds also showed higher germination than *L. rigidum* at a constant temperature of 8°C, the latter favoring alternating temperatures. *A. sterilis* seeds resisted water salinity as high as 100 mM/L of NaCl and germinated at about 25%, compared to *L. rigidum* seed, which, while also showing some resistance to 100mM/L of NaCl only germinated at a rate of about 20%. Both species gave poor germination at higher levels of water salinity of 300 and 500mM/L of NaCl. Results confirmed that germination of seeds of both species favoured moderate alternating temperatures and showed some resistance to water salinity, which may indicate how both species can invade and persist in arable lands especially in Mediterranean climates and subtropics conditions.

Keywords: Germination, Temperature, Water salinity, *Avena sterilis, Lolium rigidum.*

Introduction

Avena sterilis L (Sterile oat) is one the most widespread, common and harmful to arable crop weed species of Mediterranean climates (Damanakis, 1983 and Castellanos-Frias, 2014). It is also widespread across the whole of Europe (Tutin et al., 1980), India (Balyn et al., 1991), North America (Carlson & Hill, 1985) and Australia (Torner et al., 1984). Chaudhary (1989) confirmed the presence of this species as a serious weed of cereals in Saudi Arabia. *Lolium rigidum* Gaudin (Annual ryegrass) is also considered a major weed in Mediterranean climatic regions worldwide (Monaghan, 1980; Gracia Baudin, 1982; Jauzein & Montegut, 1983 and Recasens et al., 1997). Chaudhary (1989) confirmed that *L. rigidum* is the most serious narrow-leaf weed in cereal fields in Saudi Arabia. It has been also recorded in a check list of weed flora in Saudi Arabia (Elghazali & Alsoqeer, 2013). Germination is a crucial stage in the life cycle of the plant (Khan & Gulzar, 2003). Temperature affects the percentage and rate of germination, a crucial stage in the plant life cycle, through its effect on seed deterioration, loss of dormancy and the germination process itself (Roberts, 1988), moreover, temperature fluctuations can stimulate seed germination (Thompson & Grime, 1983). Temperature, light, water and salinity are all thought to interact at the soil-atmosphere interface to regulate seed germination (Xue et al., 2012), but soil temperature and salinity are the most important factors controlling germination in the saline soils of arid and semi-arid regions (Khan & Unger, 1999). Salinity generally causes a reduction in germination rates and delays germination and it is both in soil or water a major stress factor limiting seed germination (Shannon, 1998 and Ozdener & Kutbay, 2008). This paper investigates the effect of constant and fluctuating temperatures and a range of salinity concentrations on seed germination on two very well-known and destructive grass weed species, *Avena sativa* and *Lolium rigidum*. Since germination determines abundance, understanding the biological factors which affect it could contribute to both the prediction and control of expected populations.

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