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Effect of temperature treatment on leachate conductivity of *Pisum sativum* L. seeds during imbibition

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SUMMARY
Pisum sativum seeds exposed to temperature of 35, 40, 45 and 50°C retaining cent percent viability, were allowed to imbibe water at room temperature (30±2°C) and in cold condition (Refrigerator, 3±1°C) and electrical conductivity of steep water (leachate) was measured at intervals of 1 hr upto 12 hrs and at 24th hr. Highest values of conductivity observed in seeds treated at 45°C and 50°C when imbibed at room temperature are correlated to disorganized cell membranes and cracked testa at higher temperature. In the cold, the leachate conductivity was more compared to that of room temperature and more or less uniform in all seed samples due to reduced cellular membrane repair at low temperature. Significant increase in leachate conductivity of seeds treated out 50°C and imbibed under cold condition is discussed as a cumulative effect of imbibitional injury and chilling injury.

Key words : Temperature, Seeds, Leachate, Conductivity.

Orthodox seeds contain very low moisture content since desiccation results in ultra-low moisture content without any irrepairable damage to seeds (Roberts and Ellis, 1989). During hydration, rapid influx of water occurs due to high water potential gradient between dry seed and imbibition medium resulting in imbibitional injury as well as leakage of solutes and metabolites into the steep water (Bewley and Black, 1994).

Electrical conductivity of leachate is due to leakage of electrolytes during imbibition of seeds (Simon and Mathavan, 1986; Bewley, 1997). The electrolyte leakage occurs as a consequence of seed desiccation, subsequent imbibition and the measure of leachate is a reliable index of seed viability (Pandey, 1992). The ionic efflux is caused by physical broaching of cell membranes due to the out flow of water during desiccation (Zheng, 1991). Membrane damage causes depletion of inevitable ions and metabolites from cell cytoplasm which are required for retention of seed viability. Irreversible solute leakage has been correlated with loss of seed viability. (Becwar *et al.*, 1982, Fu *et al.*, 1990).

Adverse effect of high temperature on seed germination of *Catharanthus roseus* seeds showed that pre-treatment at 30°C, made the seeds more permeable and the leachate was significantly higher due to more permeability caused by high temperature treatment compared to the ambient temperature around 25°C (Choudhury and Gupta, 1995). More or less similar results have been reported in *Festiua* sp. (Brar and Palazzo, 1997). Germination response, leachate conductivity and vigour loss due to heat shock have been studied in wheat (Dell'Aquila and DiTuri, 1996; Dell'Aquila, 1999).

Exposure of seeds to temperature above ambient temperature may cause rupture of cell wall, cell membrane and during imbibition, seeds show more leakage of ions and metabolites into steep water. In the present study an attempt is made to analyse the rate of leachate conductivity in *Pisum sativum* seeds after treating the seeds at temperatures 35°C, 40°C, 45°C and 50°C and comparison is made in the conductivity of leachates effluxed during imbibition at room temperature (30±2°C) and in cold condition – refrigerator (3±1°C).

MATERIALS AND METHODS

Pisum sativum C V. Bonni willa seeds were purchased from National Seed Corporation, Thiruvananthapuram. Four seed lots consisting of 100 seeds each were selected and separately treated at 35, 40, 45 and 50°C in separate hot air ovens for 7 days. Seeds without treatment were considered as control. Germinability and moisture content of all treated and control seeds were determined by Petridish method at hot air oven dry method (ISTA 1985), respectively.

The electrical conductivity of leachate was considered as a measure of electrolyte leached out of the seeds during imbibition and the conductivity of leachate was measured using Toshniwall T.C.M. 15 auto ranging conductivity and TDS meter. Fifty seeds each in 5 replicates of all treatments and control were selected,

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