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Effect of seed hardening with nitrate salts on physiological attributes at ear head emergence stage and yield of wheat (*Triticum aestivum* L.)

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ABSTRACT

A pot experiment was conducted to investigate the effect of seed hardening treatments with distilled water(DW) and nitrate (15mM) salts *viz*. Mg $(NO_3)_2$ and KNO_3 on some physiological attributes at ear head emergence stage and yield of two wheat varieties (HUW-234 and HUW-468). The use of nitrate salt KNO_3 is effective to improve physiological and morphological attributes like number of tillers, plant height, number of leaves, leaf area, fresh and dry weight of shoot at ear head emergence stage in comparison to Mg $(NO_3)_2$ and followed by DW and control whereas the fresh and dry weight of root, total chlorophyll and nitrogen contents were found to increase with Mg $(NO_3)_2$ hardened sets in respect to other treatments. Nitrate reductase (NRase) activity in flag leaf was also found maximum in KNO_3 hardened sets. The application of KNO_3 showed significant effect at harvest stage. Plants hardened with nitrate salts produced higher dry matter, number of ear head, number of grains and weight of grains per plant in comparison to DW and control sets. Mg $(NO_3)_2$ hardened plants were found with maximum test weight and superior over rest of seed hardening treatments.

Key words : Hardening, Nitrate salts, Wheat, Ear head emergence stage, Yield

INTRODUCTION

A major challenge for the first two to three decades of 21st century is going to food and nutrition security for specially the families living below poverty line. Wheat is the world's leading cereal crop cultivated over an area of about 226.45 million h. In India wheat is cultivated over an area of 26.6 million h with a total production of 72.1 mt. with average productivity of 27.01 qt.h^{-1} during 2003-2004. In Utter Pradesh wheat is often sown late due to late harvest of rice or stagnation of water after flooding in diara areas of Indo-gangatic plains of India. Late sown wheat seeds suffer from slow rate of seedling emergence due to very low temperature, which causes a delay in vegetative growth as a result hot desiccating winds cause premature ripening of spike of this crop. Consequently it reduces the yield and productivity which make it unprofitable. Therefore, early seedling emergence in the field followed by rapid vegetative growth and early flowering are desired attributes for wheat cultivators. The expected demand of wheat accounts 900 mt. by the year 2020 for exponential increase in the world's population. Indian point of view the projected demand of wheat is 109 mt. by the year 2020, which is a challenging tusk for Indian as well as world wide wheat planners.

From the study of literature it is realized that number of seed treatments like pre-sowing soaking, hardening etc. by various salts and plant growth regulators (PGR) improve germination/emergence in field and increase further vegetative growth as well as yield of plants (Pfahler *et al.*, 1991; Bose *et al.*, 1992; Bose, 1997; and Bose and Mishra, 2001). Seed hardening with distilled water and nitrate salts are found to improve seed germination, seedling emergence and vegetative growth of wheat (Sharma and Bose, 2006). Hence, a study has been carried out on wheat by hardening it's seeds with nitrate salts {$Mg(NO_3)_2$ and KNO_3} in respect to physiological attributes at ear head emergence stage (75 days after sowing) and at harvest stage of two wheat varieties (HUW-234 and HUW-468).

MATERIALS AND METHODS

Treatments description and sampling:

Surface sterilized (0.1% $HgCl_2$) wheat (var. HUW-234 and HUW-468) seeds were hardened with DW, nitrate (15mM conc.) salts (Mg $(NO_3)_2$ and KNO_3). In the hardening treatments seeds were soaked either in DW or in the salt solution for 16 h in normal light condition at an average temperature of 20±2 ^{0}C and then seeds were dried back to their original weight at room temperature by placing them under a blower. These seeds were stored in paper bags for two months for further studies. Hardened and non-hardened (control) seeds were sown in earthen pots of 30 cm diameter and 40 cm height filled with garden soil for the study of plant growth attributes at ear head

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