Germination Treatments for Watermelon Seeds

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ABSTRACT

The need of different treatments is to solve the problem of seed germination percentages, which helps farmers to increase the more number of seedlings and for that requiring less number of seeds. The present study deals with the different germination treatments for watermelon [Citrullus lanatus (Thunb.) Matsum and Nakai] seeds. To increase the germination percentages and production of healthy seedlings Watermelon seeds of the cucurbitaceae family is selected; the reason for that is less number of seed germination ratio and and also the chances of disease occurrence. To overcome these problems physical (socking, nicking) and chemical (hydrogen peroxide, potassium nitrate, gibberellic acid, benzyl adenine) treatments were given with respect to the control (without any physical or chemical treatments). The treatments were given at different concentrations and kept for the germination in seed germination chamber by controlling environmental conditions and observations recorded after every 24 hrs up to four days. The highest seed germination ratio is obtained in H2O2 treatment followed by nicking socking control; KNO3, GA3 and BA. Healthy germinated seeds are observed in H2O2, socking, nicking, and control; in KNO3 the growth is normal while in GA3 and BA seed germination is quite abnormal.

Keywords: chemical treatments, physical treatments, seed germination, watermelon.

INTRODUCTION

Poor seed germination in watermelon is generally correlated with thick seed coat; poor embryo and high moisture content (Grange et al., 2000). In many seeds, germination can be inhibited by mechanical restriction exerted by the seed coat. Permeability limitation of water and gases is typical due to hard seed coat. The imbibed coat and large seed cavity in the watermelon form a continuous wet layer around the embryo by which the oxygen must transverse (Grange *et al*., 2003). Seed treatments have enhanced germination in various field crops and vegetables. Combined application of ethephon and GA4-7 has improved germination in diploid watermelon (Nelson and Sharples, 1980). Germination and emergence of watermelon seed was also improved

by priming in salt solution (Sachs, 1977) and redrying after priming was a critical step for maintaining seed quality (Parera and Cantliffe, 1992). Seed priming permits pre-germination physiological and biochemical changes to occur (Bradford, 1986). Mechanical weakening of the seed coat structure such as scarification, seed nicking and seed coat removal has been reported to successfully enhance germination of watermelon seed (Grange *et al*., 2000). Seed coat adherence to cotyledons in polyploid seeds is another problem in seedling emergence; however, seed orientation with the radicle end up decreased seed coat adherence (Maynard, 1989) but did not improve emergence. It is well known that the establishment of a good seedling stand is a prerequisite for improved yield and quality (Wurr and Fellows, 1983). This research was conducted to determine the effectiveness of seed alteration and chemical treatments on watermelon seed germination and seedling stand.

MATERIALS AND METHODS

Seed material: The diploid watermelon seeds of GEN-108 line was obtained from market and used for the experiment purpose.

Seed germination treatments: For each line, seed treatments included were control, nicking, and soaking (non-aerated) in distilled water, gibberellic acid (GA_3, 0.5 or 5 mM), benzyl adenine (BA, 0.5 or 5 mM), hydrogen peroxide (H_2O_2, 1 or 2%), and potassium nitrate (KNO_3, 3%) solution for 4 hr at 24ºC. In case of nicking, seeds were nicked at radicle end avoiding any damage to embryo. Each treatment was replicated four times. After each soaking treatment, seeds were washed thoroughly in running tap water and dried at 20°C with 40% humidity for 5 days before germination tests were conducted. Distilled water (4 ml) was added for 20 seeds placed in 9 cm Petri dishes and incubated at 30°C in a dark growth chamber. Germination was observed for three days after incubation. Seeds were considered germinated when the radicle protruded (H"2 mm) from the seed coat. (Muhammad *et al*., 2006)

RESULT AND DISCUSSION

The thick seed coat and a large airspace between the underdeveloped embryo and seed coat tissues appear to have a major role in limiting seed germination of watermelon. However, seed nicking results indicate that polyploid seed germination is not inhibited by the seed coat alone (Grange *et al*., 2003) but also is very sensitive to increased moisture contents (Grange *et al*., 2000). Although soaking or nicking, the seed coat significantly increased seed germination (Grange *et al*., 2003). H_2O_2 was the best among other treatments as it increases availability of oxygen to seeds at high temperatures by providing supplemental oxygen for respiration and metabolic activities (Figure 1 & 2) (Katzman *et al*., 2001). The improved germination in the presence of 1% or 2% H_2O_2 may result from weakening of the seed coat (Chien and Lin, 1994) as H_2O_2 reacts with the seed coat. Batak *et al*., (2002) reported that nitrogenous compounds, such as potassium nitrate, potentiate germination of different species of light-requiring seeds; however, in our case KNO3 did not improve germination of watermelon seed. Seed treatments using GA_3 and benzyl adenine (BA), not show the proper growth of seedlings (Figure 1 & 2) (Cantliffe *et al*., 1987).

CONCLUSION

The results of the present studies would suggest that seed soaking, nicking and H_2O_2 enhanced seed germination of watermelon seeds.

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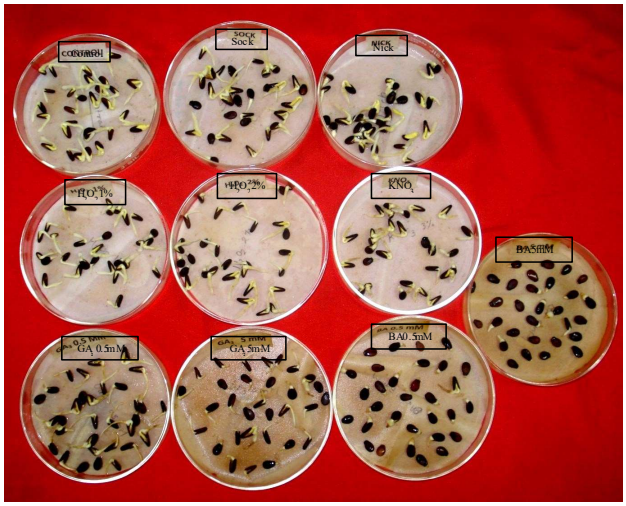

Fig-1 Watermelon seed germination

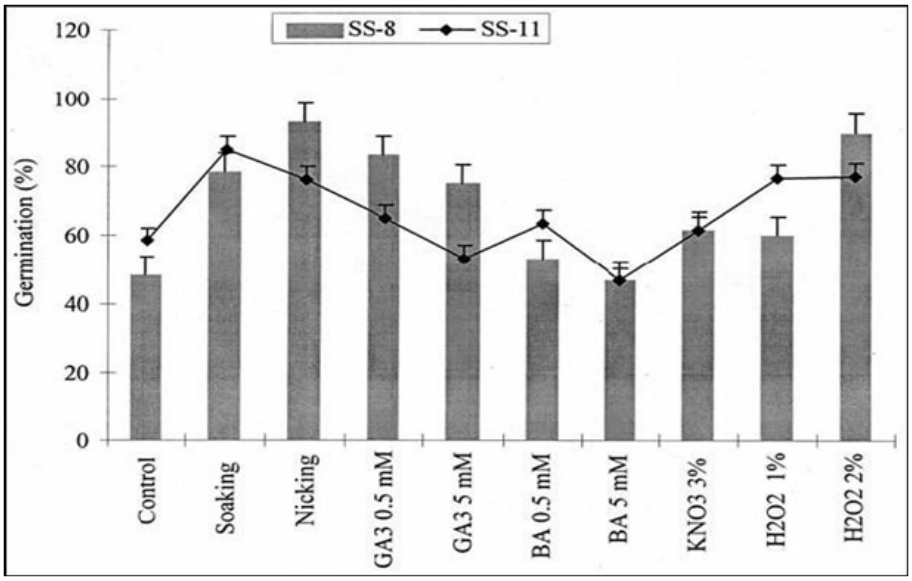

Fig-2 Seed germination ratio

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