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Effect of chemopriming on physiological quality of cucumber (*Cucumis sativus*)

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Abstract
Seed priming has gained a lot of importance in recent times as it emerged as a most promising area of seed quality enhancement technique. Cucumber seeds were subjected to seed priming with various chemicals - water, KNO_3 (1%), KH_2PO_4 (1%), GA_3 (25ppm), succinic acid (100ppm), salicylic acid (0.5%) and ethrel (100ppm) with different soaking durations of 6, 8, 10 and 12 h and evaluated the physiological quality parameters. The results revealed that among the chemo priming treatments, GA_3 (25ppm) and KNO_3 (1%) with 12 h soaking duration registered significantly higher values of germination (%), shoot and root length (cm), dry matter production(g 10 seedlings^{-1}) and vigour index. The percentage increase for vigour index of GA_3 and KNO_3 treatments was by 19.8% and 18.3 % respectively over hydro primed seeds.

Keywords: Cucumber, chemopriming, hydro priming, physiological quality.

1. Introduction
Cucumber (*Cucumis sativus* L.) belongs to family *Cucubitaceae* with chromosome number (2n=14) and originated in India (De Candole, 1967) [6]. It is commonly a monoecious, annual, trailing or climbing vine (Bailey, 1969) [2] and rich in minerals (0.3 g), Thiamine (0.3mg), Niacin (0.2 mg) and Vitamin C (78 mg). Cucumber is an important vegetable crop and cultivated throughout the year. Immature cucumber fruits are consumed as salad vegetables or pickled and also used as cooked vegetables. It is a warm season crop mainly grown in tropical and subtropical condition and grows best at temperature between 18˚ C to 24˚ C.

Seed is the basic input for crop production and if it is not having a good germination, the optimum population in the field can't be maintained which ultimately affect the crop yield. In cucumber, normally the germination is below 60 per cent and by any pre sowing treatment if the germination is improved it would help in maintaining the required population in the field. Seed priming is a pre-sowing treatment that involves controlled hydration of seeds, sufficient to allow pre germinative metabolic events to take place and to restrict radical protrusion through the seed coat (Heydecker *et al.*, 1973) [10]. Seed priming is a practical method to improve rates and uniformity of germination (Parera and Cantliffe, 1994) [16], priming methods differ depending on crop species and seed and germination conditions (Bush *et al.*, 2000; Khan, 1992; McDonald, 2000) [4, 12, 13]. This priming technique is being used in some vegetable seeds including cucumber to augment the germination rate, total germination and seedling uniformity etc., mainly under unfavourable environmental conditions. Selection of priming technique for a particular crop is very important. Treatments of KNO_3 and KH_2PO_4 salts were found to promote germination of gourd seeds at low temperatures (Chang *et al.*, 1996; Shik *et al.*, 1999) [5, 18]. But before priming any crop seeds the knowledge of safe limits of priming duration is very important to get maximum effect. After priming, the seeds are dried back to enable normal handling, storage and planting (Mehta *et al.*, 2013) [14]. Therefore this study was conducted to investigate the effect of seed priming on germination and seedling characters of cucumber.

2. Materials and methods
The experiment was carried out at the Department of Seed Science and Technology, Agricultural College and Research Institute, Madurai, India during 2018. Genetically pure and graded seeds of the variety Longi were subjected to priming using various priming agents *viz.*, Hydro (distilled water), Potassium nitrate (KNO_3-1%), Potassium dihydrogen phosphate (KH_2PO_4-1%), Gibberellic acid (GA_3-25ppm), Succinic acid (100ppm), Salicylic acid(0.5%) and Ethrel (100ppm) with different durations of 6, 8, 10 and 12 h.

The seeds were soaked in the respective priming agents at 1:1 ratio and dried back to their original moisture content (6%) under shade. Germination and vigour test were conducted as per ISTA using paper towel method (ISTA, 2008).Observations on seedling length, dry matter (g 10 seedlings$^{-1)}$ and vigour index was calculated (Abdul- Baki and Anderson (1973) [1]. The experiment was conducted using factorial completely randomized design with 3 replications and the statistical analysis was done as per design of the experiment as suggested by Gomez and Gomez (1984) [6].

3. Results and discussion

Significant differences were observed among the chemo priming treatments. Among the treatments, highest germination was recorded in the seeds primed with GA_3 (96%) and KNO_3 (96%) compared to hydro priming (92%). Among the durations 12 h recorded higher values (Fig 1). Similar results were obtained by Demir and Oztokat, (2003); Warley and Fernando, (2004) [22]; Sowmya *et al.*, 2013 [20]; Shahzad *et al.*, 2014 [17] and Vinayak Kamra *et al.*, 2017 [21] in different crops. Gibberellins are known to regulate developmental and physiological processes such as germination, synthesis of food, transporting and partitioning it and stimulating transcription of hydrolytic enzymes' mRNA in various plants and enhances membrane permeability and nutrient absorption (Pawar and Laware, 2018).

Potassium nitrate (KNO_3) also promotes germination in various plant species and generally as a priming agent or germination media (Bush *et al.*, 2000; McDonald, 2000; Sowmya *et al.*, 2013) [4, 13, 20] Seeds primed with GA_3 recorded higher root length (19.94cm), followed by KNO_3 (19.82cm). The hydro primed seeds recorded 15.98cm. Among the durations, 12 h recorded higher values (Fig 3). Similarly shoot length observed higher value in GA_3 treatment (19.55cm), followed by KNO_3 (18.90cm) and succinic acid (18.82cm). The hydro primed seeds recorded shoot length of about 17.05cm (Fig 2). Among the treatments seeds primed with GA_3 recorded highest value of dry matter production (0.165g 10 seedlings^{-1}) and vigour index (3791) followed by KNO_3 treatment of 0.155g 10 seedlings^{-1} and 3717 for dry matter and vigour index respectively. The hydro primed seeds recorded values of dry matter production (0.140 g 10 seedlings^{-1}) and vigour index (2940) which is lower than GA3 and KNO_3 treatments (Fig 4 and 5).Similar findings reported by Pandita and Nagarajan, (2000) [15]; Sowmya *et al.*,2013 [20]; Vinayak Kamra *et al.*,2017 [21] and Sudeshna *et al.*,2017 [19]. This effect of priming has been attributed to metabolic repair and activation of seed during water imbibitions (Basra *et al.*, 2005; Ghassemi and Esmaeilpour, 2008; Sudeshna *et al.*, 2017) [8, 19]

4. Conclusion

It could be concluded that cucumber seeds primed with GA_3 (25ppm) or KNO_3 (1%) for 12 h soaking duration can be recommended as presowing seed treatment.

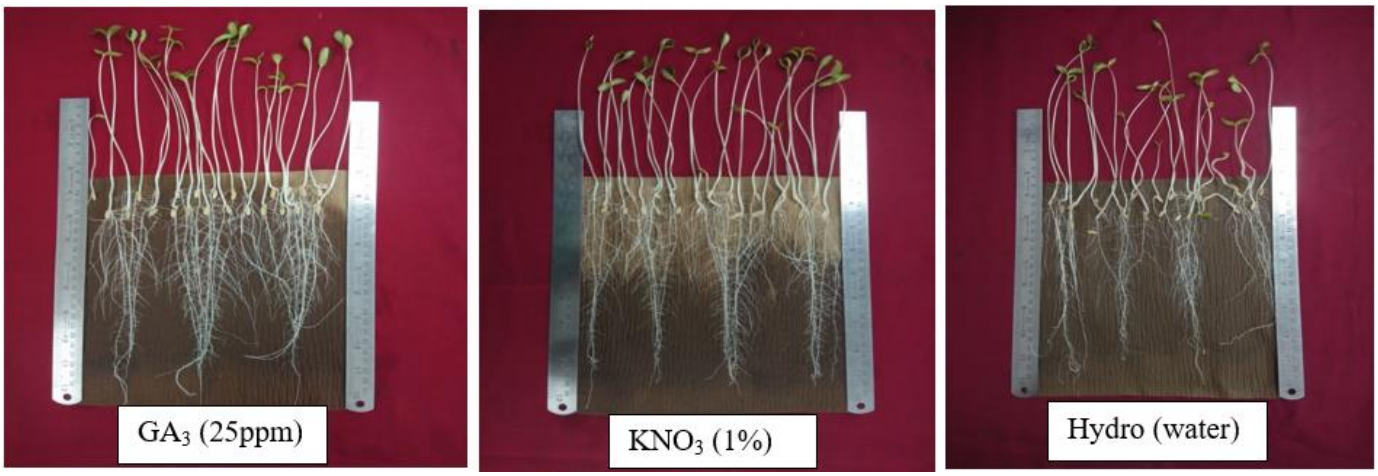

Plate 1: Influence of GA_3, KNO_3 and Hydro priming (12 h soaking) on seedling growth in cucumber

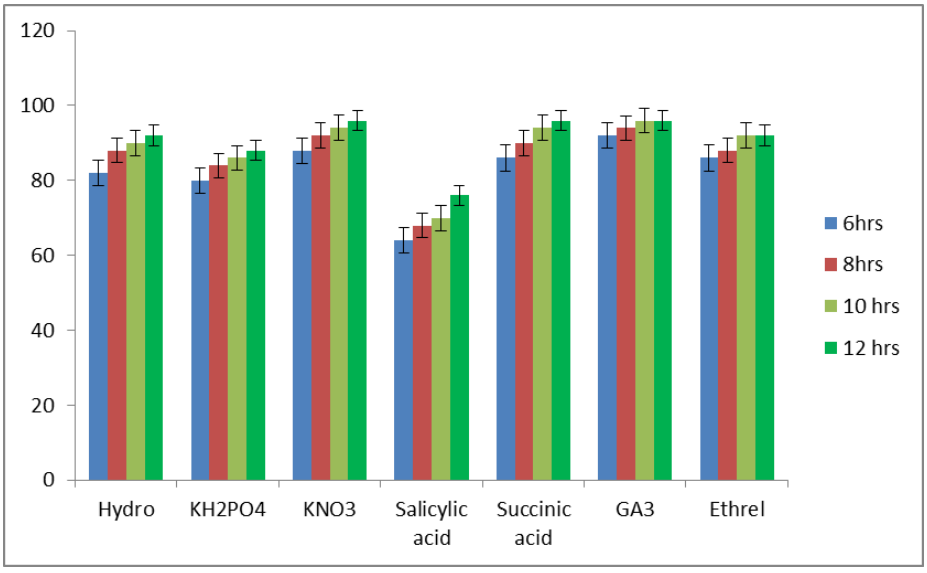

Fig 1: Effect of different chemopriming on germination (%) of cucumber.

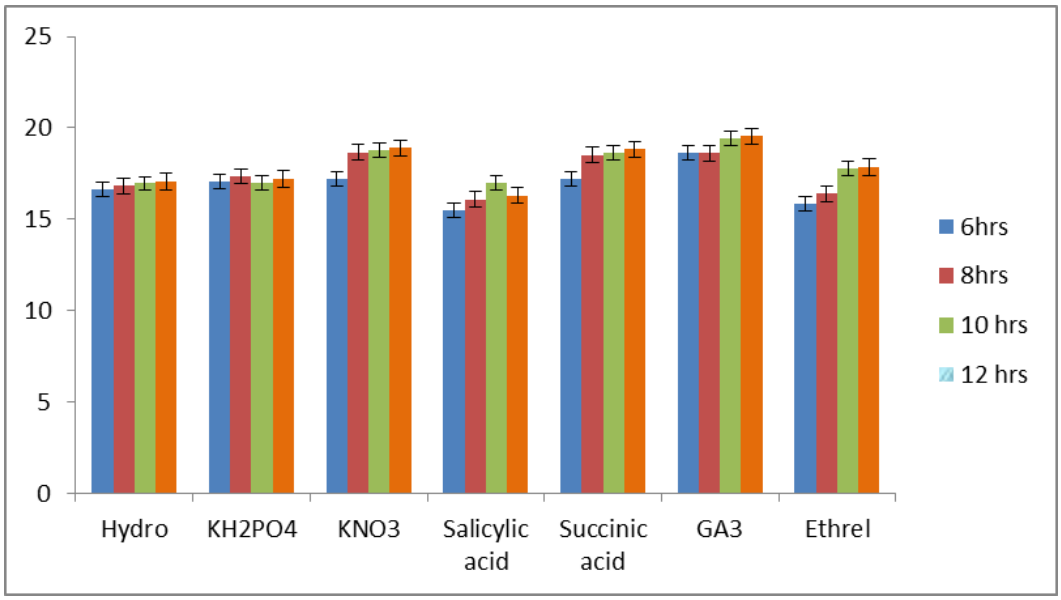

Fig 2: Effect of different chemopriming on shoot length (cm) of cucumber.

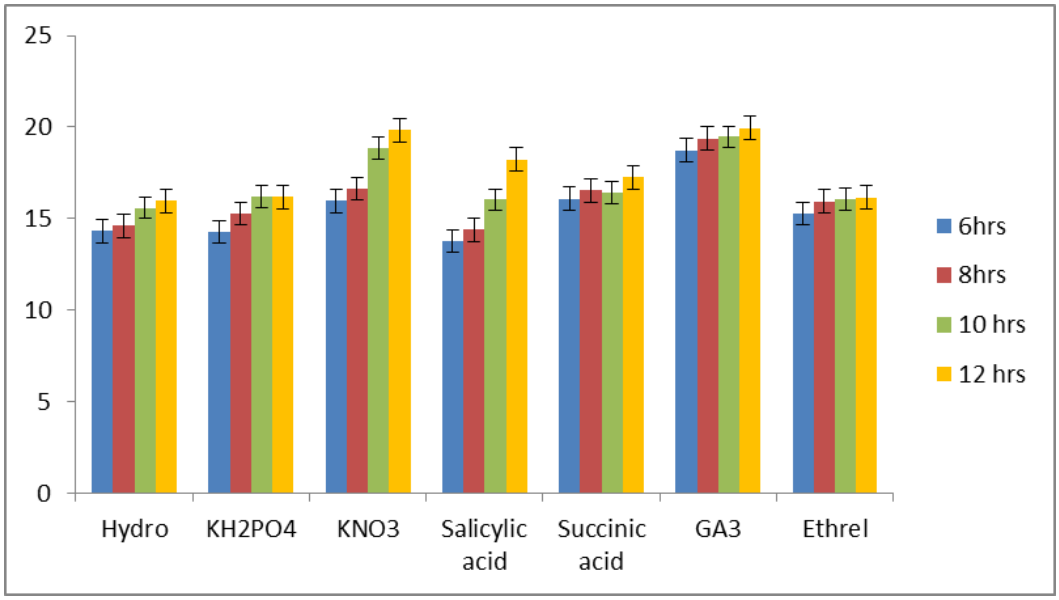

Fig 3: Effect of different chemopriming on root length (cm) of cucumber.

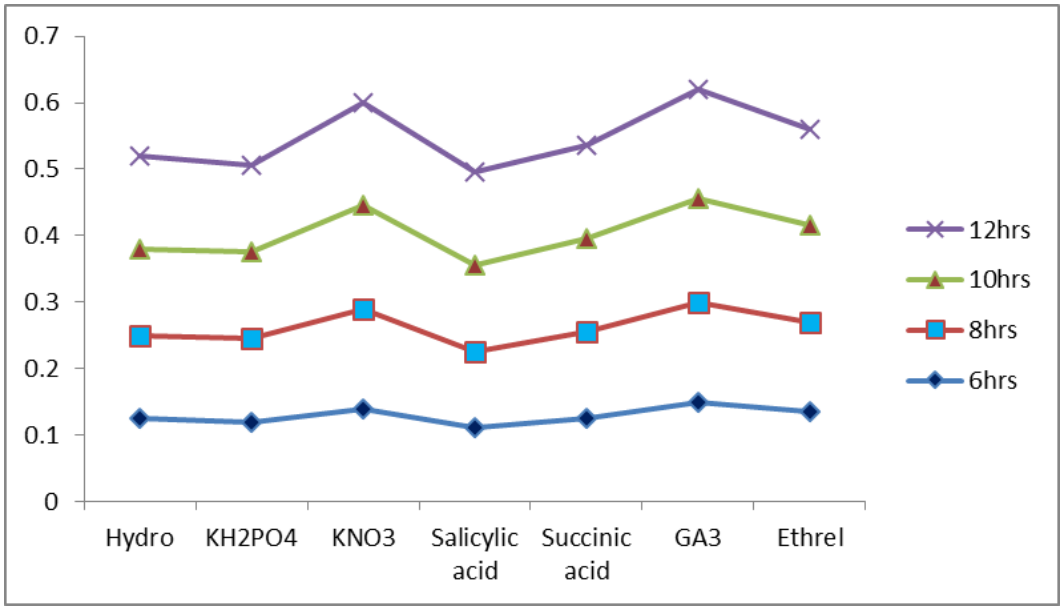

Fig 4: Effect of different chemo priming on dry matter production (g 10 seedlings^{-1}) of cucumber.

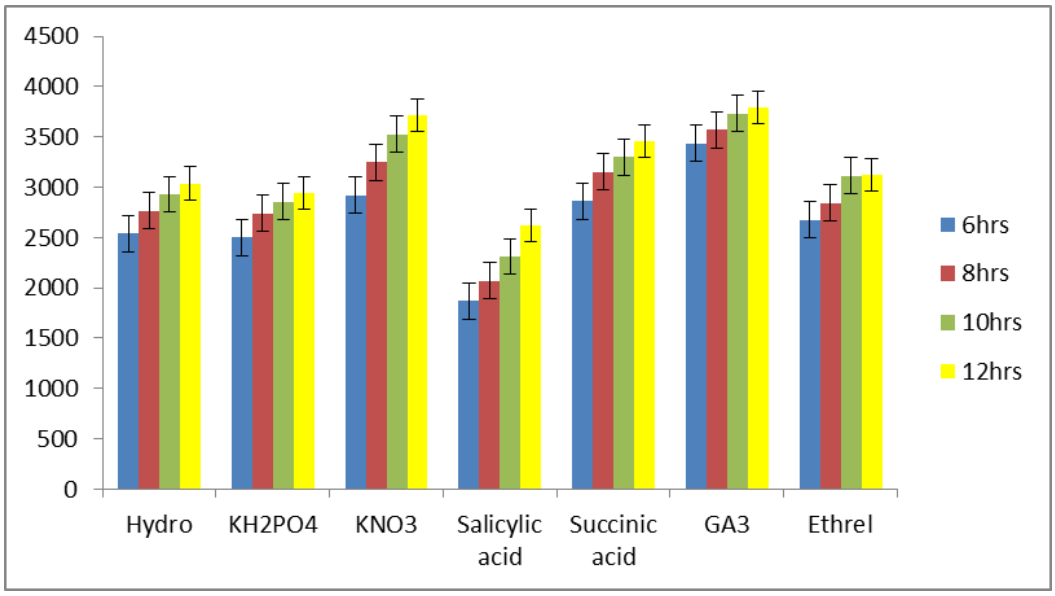

Fig 5: Effect of different chemopriming on vigour index of cucumber.

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