

Original Research Article

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Exploration on Pre Sowing Seed Invigoration with Growth Regulators on Germination of Small Onion (*Allium cepa* var. *aggregatum*)

P. Sujanthiya^{1*}, V. Swaminathan¹, R. Arunkumar¹ and T. Siva Kumar²

¹Department of Horticulture, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, India

²Department of Plant Physiology, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, India

*Corresponding author

ABSTRACT

Keywords

Onion, Seed, Priming, GA₃, Germination

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Small onion (*Allium cepa* var. *aggregatum*) is a popular Rabi bulb vegetable in the peninsular India. It is propagated by both seed and bulb. Hence experiment was conducted to study the effect of seed priming on small onion var. Co (On) – 5. The experiment was laid out in Completely Randomized Design (CRD) with two replications. Onion seeds were primed with following priming agents such as GA₃, NAA, water at different concentration (50ppm, 100ppm) and different time periods (12, 18, 24 hrs). Data was recorded on germination percentage, shoot length, root length and vigour index. The experimental findings revealed that, seeds primed with GA₃ 100ppm for 12 hrs showed higher germination percentage (69.50 to 94 %), shoot length (7.02 to 9.44 cm), root length (5.01 to 6.91 cm) and Vigour index I (696.69 to 1630.44) over control, respectively. Seeds treated with GA₃ 100ppm for 12 hrs produced vigorous seedling with good root system which results in earlier transplanting of seedling by 9 days.

Introduction

Onion (*Allium cepa* L.) belongs to the family Alliaceae is the second most valuable vegetable crop grown throughout the world. It is rightly called the “queen of the kitchen” (Selvaraj, 1976) and cultivated in several regions of the world. India, the second largest producer of onion in the world followed by China, ranks third in export next to Netherlands and Spain. India exported 24lakh MT of fresh onion to other countries worth of Rs. 3106.50 crores (APEDA, 2017). Bulb

used for edible purpose contains volatile oil known as allyl propyl disulphide (C₆H₁₂S₂) which is responsible for pungency. Onion is widely used in all parts of world as a flavouring agent among the vegetables. It is used as salad and in curries as boiled, fried and for making soups and pickles. Onion is also processed as dehydrated powder, rings and shreds.

Every 100g of edible portion of bulb contains 86.69g moisture, 1.2g protein, 0.1 g fat, 11.1g carbohydrate, 50kcal energy, 47mg calcium,

0.7g iron, 0.08mg thiamine, 0.01mg riboflavin, and 11mg Vit. C (Fageria *et al.*, 2006). The onion has effective germicidal properties. It acts as stimulant, reduces cough, used as remedy for tuberculosis, leprosy, piles, swelling and blood impurities.

Due to the huge post harvest loss in bulb storage, the seeds are popular among the farming community. However the transplants require 40 days in nursery. This increase the cropping season upto 130 days.

Small onion is an open pollinated crop, the germination percent is low. Seedlings need six weeks for transplanting and the total duration of the crop is of four months. The farmers harvest the bulbs earlier to get higher price per unit area. But earlier the harvest smaller the yield resulted by immature cropping. Instead of early harvest seedlings need to be transplanted earlier to minimise the duration.

Early transplanting of seedlings can be affected by seed priming treatments that accelerates the germination and seedling growth in most of the crops under normal and stress conditions (Finch *et al.*, 2004).

Pre-sowing treatments affects the pre-germination metabolic activities while enhancing the germination. Hence the present study was undertaken to study the effect of growth regulators on seed growth parameters.

Materials and Methods

The experiment was laid out in Completely Randomized Design (CRD) with two replications and conducted at Department of Horticulture, AC & RI, Madurai. Seeds of Co (On) – 5 having a minimum germination of 70 percent were subjected to 16 pre-sowing invigoration seed treatments.

Seed Treatments

The seeds were soaked in growth regulators solutions (GA₃ and NAA) in different concentration and durations. Table 1 includes the details of seed treatments imposed. The treated seeds were shade dried at room temperature (28 ± 2°C) to bring its original moisture content.

The germination test was conducted using roll towel paper method as per ISTA procedure. The laboratory observation on germination percentage, length of shoot (cm), length of root (cm) and vigour. index were recorded on 14th day of sowing. The data obtained from various treatments were analysed statistically adopting the procedure described by (Panse and Sukatme, 1985).

Results and Discussion

Significant differences were observed in all the treatments. Among the treatments, GA₃ 100ppm significantly increased the germination percentage, shoot length (cm), root length (cm) and Vigour index of the seedlings (Table 2).

The germination percentage ranged from 69.50 to 94% (Figure 1). GA₃ role in breaking the dormancy, promoting earlier and uniform germination may be the reason for enhanced germination percentage (Thejeshwini *et al.*, 2018).

GA₃ plays a major role in in seed germination through a-amylase synthesis which converts the stored starch into sugar by respiration of cells (Finch-Savage and Leubner, 2006). Similar findings were supported by Hiroshi and Thimann (1960) in lettuce, Maurya and Lal (1972) in onion, Vanangamudi *et al.*, (1988), Balaguera *et al.*, (2009) in tomato, Das *et al.*, (2014), Agung and diara (2017).

Table.1 Treatment details

Treatment Name	Treatments used
T ₁	GA ₃ 50ppm +12hrs
T ₂	GA ₃ 50ppm + 18hrs
T ₃	GA ₃ 50ppm + 24hrs
T ₄	GA ₃ 100ppm + 12hrs
T ₅	GA ₃ 100ppm + 18hrs
T ₆	GA ₃ 100ppm + 24hrs
T ₇	NAA 50ppm + 12hrs
T ₈	NAA 50ppm + 18hrs
T ₉	NAA 50ppm + 24hrs
T ₁₀	NAA 100ppm + 12hrs
T ₁₁	NAA 100ppm + 18hrs
T ₁₂	NAA 100ppm + 24hrs
T ₁₃	Water + 12hrs
T ₁₄	Water + 18hrs
T ₁₅	Water + 24hrs
T ₁₆	Dry seed (control)

Table.2 Effect of seed priming on co (on) – 5

Treatments	Germination percentage (%)	Shoot length (cm)	Root length (cm)	Vigour Index I
T ₁	86.50	8.26	6.02	1270.87
T ₂	82.50	8.80	5.35	1245.15
T ₃	86.00	7.82	5.62	1202.04
T ₄	94.00	9.44	6.91	1630.44
T ₅	85.50	8.36	5.63	1290.80
T ₆	80.50	8.42	5.84	1147.53
T ₇	85.00	8.29	5.64	1192.16
T ₈	81.00	8.37	5.14	1094.93
T ₉	84.00	7.55	4.89	1044.96
T ₁₀	82.00	8.42	5.08	1106.96
T ₁₁	79.50	8.34	4.04	983.73
T ₁₂	83.50	8.06	4.85	1078.03
T ₁₃	78.50	8.04	4.28	1024.51
T ₁₄	76.50	7.99	3.90	947.04
T ₁₅	79.00	7.63	4.04	922.11
T ₁₆	69.50	7.02	2.99	696.26
MEAN	82.09	8.17	5.01	1089.50
S.Ed	2.92	0.21	0.40	54.28
CD (0.05)	6.19	0.44	0.86	115.08

Fig1 Effect of seed priming on germination percentage of onion

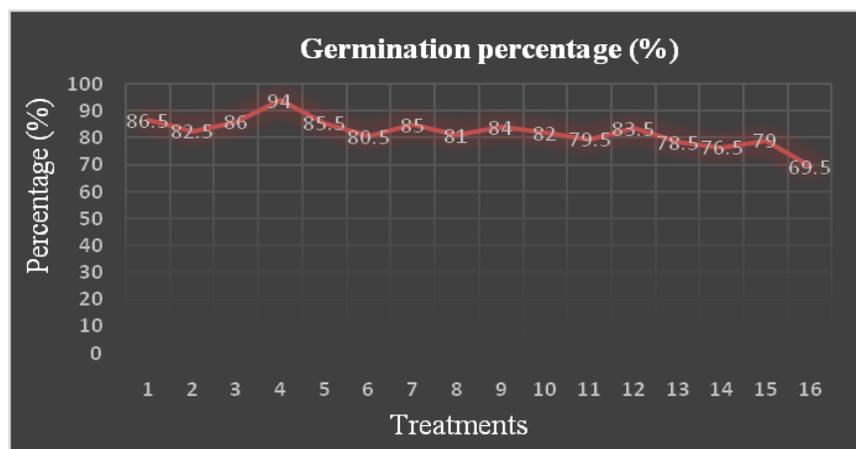
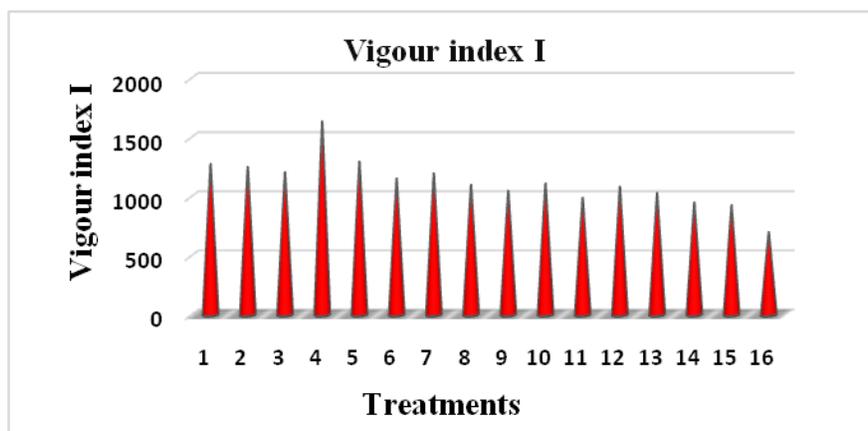


Fig.2 Effect of seed priming on Vigour Index of onion



The length of shoot and vigour index was observed to be higher in GA₃ at 100ppm soaked for 12hrs followed by GA₃ 50ppm for 12 hrs (Table 2). GA₃ mainly promotes cell elongation and also contributes to seedling length. GA₃ also shows positive influence on photosynthetic activity in the plants. Similar results were observed by Demir *et al.*, (1994) in egg plant, Demir and Van de Venter (1999) on watermelon, Yarnia and Tabirizi (2012) in onion. The seedling vigour index was increased from 696.69 to 1630.44. Higher seedling vigour is due to high respiration rate, metabolic activity and better translocation of metabolites to the growing point (Figure 2). Higher seedling vigour index is an indicator of the ability of the seedlings to survive under

unfavorable condition (Agung and Diara, 2017). Similar results were supported by Vanangamudi *et al.*, (1988) in onion, Yogananda *et al.*, (2004) in bell pepper, Balaguera *et al.*, (2009) in tomato, Kumar and Singh (2013) in bittergourd, Vinayak *et al.*, (2017) in ridgegourd and summer squash.

In conclusion on the basis of the results obtained from the present investigation, it could be considered that pre sowing seed treatment with GA₃ at 100 ppm for 12hrs accomplished best results followed by GA₃ 50ppm for 12 hrs which improves the germination percentage, shoot length, root length and vigour index. Hence seed priming with GA₃ at 100 ppm for 12 hrs can be used

for Co (on) 5 to increase the germination percentage and uniform germination. The seeds when treated with GA₃ 100ppm for 12hrs will reduce the transplanting duration over untreated ones. The seedlings can be transplanted 9 days earlier than untreated seedlings. Further testing with different varieties and different media would confirm the utility of GA₃ as seed primer in onion.

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