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Seed Invigoration Treatments and Durations on Seedling Parameters of Onion (*Allium cepa* L cv - Indrayani)

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ABSTRACT

The present investigation was carried out for Seed invigoration treatments and durations on seedling parameters of onion (*Allium cepa* L.cv- Indrayani). Analysis of variance for the laboratory data revealed that significance mean sum of squares due to seed priming treatments were observed for all the characters under study. The mean performance of seed germination % ranged from 72.75 to 85 with a grand mean of 81.13%. All the treatments were significantly higher in comparison to control. Among the significant treatments for Root length, Shoot length, Seedling length (cm), Seedling fresh weight (mg) and Seedling dry weight (mg), T₅ (GA₃@100ppm) (24 hrs) was found significantly higher in comparison to other treatments. The mean performance of seedling vigour index I ranged from 897.00 to 1449.25 with a grand mean of 1190.96. The mean performance of seedling vigour index II ranged from 200.79 to 327.25 with a grand mean of 277.81. For seedling vigour index I and II, Treatment, T₅ (GA₃@100ppm) (24 hrs) was significantly higher in comparison to other treatments. It is concluded from the present investigation of seed treatments with different kind of priming exhibited significant effect on seed germination and seedling characteristics. Seed priming with GA₃@100ppm for a duration of 24 hrs affected all the characters significantly in laboratory experiment. Thus, seed priming with GA₃@100ppm for a duration of 24 hrs followed by T₁₀ Garlic extract solution @1:5 for the duration of 6 hrs is useful for improving germination and seedling characteristics of onion (*Allium cepa* L cv.- Indrayani).

Keywords

Onion and GA₃
@100ppm, Garlic
extract solution
@1:5

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Introduction

Onion (*Allium cepa* L.) belongs to the family Amaryllidaceae is the most important bulb crop cultivated commercially all over the world and it is the second most important horticultural crop after tomato in the world. Onion is also known as “Queen of the

Kitchen”. Onion is used through out year in the form of spices as a condiments and its known for its medicinal values (Sunil pareek, 2017).

The key basis of all pre sowing is to hydrate the seed under controlled conditions, so that they become physiologically active. Onion

seeds usually have a low quality, resulting in slow and asynchronous germination as well as seeds producing a high number of abnormal seedlings (Borowski and Michałek, 2006).

Seed priming is one of the pre-sowing seed management techniques where the seeds are partially soaked and subsequently dried back for invigorative effect that expresses on field emergence and extend up to yield. Priming applications contribute to significant improvement in seed germination and seedling growth in vegetables (Dursun and Ekinci, 2010; Korkmaz, 2005; Korkmaz and Pill, 2003). Seed Invigouration techniques are to improve standard establishment under sub-optimal conditions (Ashraf and Foolad, 2005)

Materials and Methods

The present research work was carried out in the post graduate laboratory, Department of Genetics and Plant Breeding, Sam Higginbottom university of agriculture technology and sciences seed material comprised of Onion variety Indrayani the treatments were represented as T₀–Control, T₁-KNO₃@2% for 24 hrs, T₂-NaCl @ 1% for 24 hrs, T₃-KH₂PO₄ @ 2% for 24 hrs T₄-KI @ 1% for 24 hrs, T₅-GA₃@ 100ppm for 24 hrs T₆-GA₃ @50ppm for 24hrs T₇-cowsurine@1:2for6hrs, T₈-light treatment-24hrs, T₉-Fermentedbuttermilk @ 1:2 for 6hrs, T₁₀ Garlic extract solution @1:5-6hrs, T₁₁-Kinetin-50ppm for 24hrs, T₁₂Tobacco leaf extract @ 1:2 for-6hrs.

GA₃ can be used for breaking the seed dormancy and enhancement in seed germination causes changes in seed coat ultrastructure membrane repair triggering enzyme activity lead to germination KNO₃ attributes the potassium ions which improve the water relations which can affect the water potential of seeds and help in imbibition

Results and Discussion

The results shown in table-1 indicate the parameters *i.e.*, germination%, root length, shoot length(cm), seedling length(cm), fresh weight(g), dry weight(g), vigour index-I, vigour index-II. In the present experiment the suitable seed invigouration treatment is T₅-GA₃@100ppm for 24 hrs in the present investigation the best performed seed invigouration treatment is T₅- GA₃@100ppm for 24 hrs when compared to other treatments and control, followed by T₁₀- garlic extract solution@1:5 for 6 hrs.

Superior results were showed on enhancing the germination and seedling characteristics when onion seeds are treated with GA₃@100ppm for 6hrs compared to control (Thejeshwini *et al.*, 2018). Superior results were showed on enhancing the germination behaviour and seedling characteristics GA₃@100ppm for 72hrs compared to other treatments and control in onion (Anju thakur *et al.*, 2018)

Some authors found that physiological processes of germination in primed seeds might be due to the use of GA₃ which helps in breaking seed dormancy and promote faster seed germination in onion (Yarnia and Tabrizi *et al.*, 2012). Increase in germination percentage with GA₃ might be due to involvement of GA₃ in the activation of cytological enzymes (Padma *et al.*, 2013).

GA₃ treated seeds might be attributed to fact that the GA₃ help in breaking the seed dormancy which results in early germination due to the diffusion of endogenous gibberlin like substances (Gurung *et al.*, 2014). When GA₃ was applied artificially to *Crotalaria sessiliflora* and *Dysophyllaya tabeana* seeds dormancy was broken and the seeds are germinated (Kwon *et al.*, 2018).

Table.1

	Treatments	Germination %	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling fresh weight (mg)	Seedling dry weight (mg)	Seedling vigour Index I	Seedling vigour Index II
1	T ₀ (Control)	72.75	2.73	9.60	12.33	4.11	2.76	897.00	200.79
2	T ₁ (KNO ₃ @2%) (24 hrs)	77.25	3.70	10.05	13.75	4.41	3.16	1062.18	244.11
3	T ₂ (NaCl@1%) (24 hrs)	82.00	3.95	9.93	13.88	4.52	3.29	1138.16	269.78
4	T ₃ (KH ₂ PO ₄ @2%) (24 hrs)	80.75	4.08	11.07	15.15	4.55	3.38	1223.36	272.93
5	T ₄ (KI@1%) (24 hrs)	82.00	4.28	10.00	14.28	4.70	3.35	1170.96	274.70
6	T ₅ (GA ₃ @100ppm) (24 hrs)	85.00	4.90	12.15	17.05	4.95	3.85	1449.25	327.25
7	T ₆ (GA ₃ @50ppm) (24 hrs)	82.50	4.10	11.04	15.14	4.63	3.42	1249.05	282.15
8	T ₇ (Cows urine@1:2) (6 hrs)	82.25	3.68	10.72	14.40	4.78	3.36	1184.40	276.36
9	T ₈ (Light treatment) (24hrs)	84.25	3.70	10.53	14.23	4.72	3.39	1198.87	285.60
10	T ₉ (Fermented butter milk@1:2) (6hrs)	84.25	4.00	10.85	14.85	4.82	3.45	1251.11	290.66
11	T ₁₀ (Garlic extract solutions@1:5) (6hrs)	83.25	4.15	11.30	15.45	4.94	3.69	1286.21	307.19
12	T ₁₁ (Kinetin@50ppm) (24hrs)	79.25	4.13	10.50	14.63	4.81	3.68	1159.42	291.64
13	T ₁₂ (Tobacco leaf extract@1:2) (6hrs)	79.25	4.10	11.20	15.30	4.75	3.64	1212.52	288.47
	Grand Mean	81.13	3.96	10.68	14.64	4.66	3.41	1190.96	277.81
	S.Em	1.58	0.13	0.36	0.4	0.1	0.14	42.18	12.86
	CD (5%)	4.51	0.38	1.03	1.15	0.28	0.4	120.65	36.79
	CV	3.89	6.66	6.75	5.5	4.28	8.27	7.08	9.26

Seed priming with GA₃ might cause acceleration of metabolic reactions before germination made germination possible under salinity stress (Wang *et al.*, 2014).

In conclusion the invigouration seed treatments differed significantly with respect to storability of onion seeds. All the invigouration seed treatments are superior over control it is concluded from the present investigation that the seed treatments of onion priming exhibited significant effect on seed germination and seedling characteristics.

Among seed invigouration treatments initially

GA₃ treated seeds for a duration of 24 hrs effected maximum germination (85%), Root length(4.9cm), Shoot length (12.15cm), Seedling length (17.05cm) Seedling fresh weight (4.95mg), Seedling dry weight (3.85mg), Seedling vigour index-I (1449.25) Seedling vigour index-II (327.25) all the characters significantly in laboratory experiment was followed by Garlic extract solution@1:5 for 6 hrs. Thus, seed priming with GA₃@100ppm for a duration of 24 hrs was followed by Garlic extract solution@1:5 for 6 hrs is useful for improving germination and seedling characteristics of onion (*Allium cepa* L cv- Indrayani).

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