JOURNAL LA LIFESCI

VOL. 01, ISSUE 06 (001-005), 2020
DOI: 10.37899/journallalifesci.v1i6.261

The Hormonal Seed Priming in Relation to Carrot Germination

Filza Ghafoor[1] Sana Liaqat[2] Waseem Iqbal[3]

[1]*University of Agriculture Faisalabad, Pakistan*

**Corresponding Author: Filza Ghafoor*

Article Info

Article history:
Received 18 November 2020
Received in revised form 9 December 2020
Accepted 26 December 2020

Keywords:
Plant Stress
Carrot Germination
Hormones

Abstract

Seed priming is a pre-sowing treatment used to reduce stress effects in crops .This technique has been used to increase the germination rate of seeds mainly under unfavorable environmental condition. Crop productivity faces many problems like that unavailability of suitable condition that causes unbalanced seedling growth and poor germination. Hormones are essential to improve plant growth, development, crop yield quality and quantity. Auxin is essential hormones that improves germination of seeds and reduce stress effects. Laboratory experiment was conducted to study the effect of seed priming using different concentrations of IAA and IBA on carrot seeds (Daucus carota). In laboratory experiment, three concentrations of IAA and IBA (75 ppm, 50ppm, 25ppm) treated with distilled water with priming duration of 24 hours. Experiment was laid out in CRD with three replications. Data was collected to investigate the effect of seed priming with IAA and IBA under these condition like that (fresh weight, dry weight, speed of germination, root length, seed length, seedling length, final germination rate, mean germination time and dry matter content). Maximum fresh weight, final germination percentage, seedling length, energy of germination, speed of germination and mean germination rate was recorded IBA 75ppm. Maximum dry weight and dry matter content was observed IBA 25ppm.Maximum shoot length was recorded IBA 50ppm. Non-significant difference was recorded in root length.

Introduction

The carrot (Daucus carota L. Apiaceae.) originated in Asia is a very common vegetable grown throughout the world. The word carrot was first recorded in English around 1530. They are scientifically classified as Daucus carota and categorized as root vegetable carrots come in different colors such as orange, white, purple, yellow, and red. Carrots contain vitamin A in form of betacarotene which help in improvement of vision (Afrigan et al., 2013).

Carrot productivity in developing countries including Pakistan faces many problems like that lack of suitable condition is said that causes decreasing in germination percent and unbalanced seedling growth (Khan et al., 2020). Carrot field reduced due to poor germination Temperature also effects on carrot field, lower temperature can reduce carrot field by 20% as well as increasing the risk of premature bolting when temperature above 350C than carrot seed germination can be erratic or reduced. Carrot seed germination best when soil temperature is between 50- and 85-degree Fahrenheit (Afzal et al., 2006).

Carrot seed germination problems may be occured due to unavailibility of hormones like that Auxin, GA, salicylic acid cytokinins. Germination may be slow or stop in dry or windy weather (Liaqat et al., 2020). For improvement of germination rate and to overcome all these problems seed priming technique is used. Actually priming is a form of seed planting preparation in which seeds are presoaked before planting. This technique involves imbibition of seeds in water under controlled condition to initiate early events of germination, followed by drying the seed back to its initial moisture content (Armin et al., 2010).

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

Most important function of plant hormone is controlling and coordinating cell division, growth and differentiation. Plant hormones can affect different plant activities including seed germination. ABA and gibberellins are necessary for seed germination. IAA or synthetic auxins to plants cause profound changes in plant growth and development. Ethylene can influence a wide range of plant activities. Ethylene is necessary for process of seed germination (Jima et al., 2015).

Keeping in view the importance of seed priming and role of hormones on plant metabolism an experiment has been conducted in Horticulture Laboratory at UAF sub-campus Burewala-Vehari to assess the impact of hormonal seed priming on seedling vigor of carrot. The objectives of the experiment were; (1) To compare the efficacy of IBA and IAA on seed germination and growth of carrot seedling, (2) To find out the dose of IAA and IBA for the effective seed priming of carrot seeds.

The experiment was conducted in completely randomized design (CRD) consisting three applications in Olericulture section of Horticulture laboratory at UAF Sub-Campus Burewala Vehari during 2018.

Carrot cultivar (Daucus Carrota) cv. T-29 was purchased from local market of Burewala. For seed priming, 3-Indole acetic acid (IAA) and Indole butyric acid (IBA) were obtained from Horticulture laboratory of UAF sub-campus Burewala-Vehari. Total of 18 petri plats were taken from Horticulture laboratory of UAF sub-campus Burewala, Vehari. Forceps and scissors, filter paper, distilled water, ethanol was used in experiment. Forceps were used for purpose of seeds picking. Filter paper was used as are growing medium. Ethanols were used for the sterilization of hands, petri plats, filter paper and forceps. Distilled water was used for irrigation purpose. Scissor was used for filter paper cutting (Gorgich et al., 2020). All the equipments were obtained from Horticulture laboratory of UAF sub-campus Burewala, Vehari.

Methods

Petri plates were washed with distilled water. Distilled water was used for solution preparation. Initially, 75ppm solutions of IAA and IBA were made by dissolving 75mg of IAA and IBA in 200ml distilled water separately in 1000ml volumetric flasks. After dissolving both solutions separately, volume of both volumetric flasks was made up to the mark. Solutions of 50 and 25ppm were made by using the following formula;

$$C_1V_1=C_2V_2$$

Where,
C_1 is concentration of stock solution (75 ppm)
V_1 is the volume of stock solution used to make further concentrations
C_2 is concentration of diluted solution
V_2 is the volume of diluted solution

Table 1. Treatments

Treatments	Details
T1	3-Indole acetic Acid 75 ppm
T2	3-Indole acetic Acid 50 ppm
T3	3-Indole acetic Acid 25 ppm
T4	Indole Butyric Acid 75 ppm
T5	Indole Butyric Acid 50 ppm
T6	Indole Butyric Acid 25 ppm

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

Seed treatment

Seeds of carrot were soaked into the prepared solution of 3IAA and IBA for 24-hours**.** On filter paper 15 seeds were placed in per glass Petri plate. Three replications of each solution carried out. Each replication were treated with distilled water. Finally petri dishes were transferred out from fume hood. Seed germination was recorded daily in a certain time for 7days. After 7 days fresh weight of all germinated seeds was measured. Root length and shoot length was measured of 5 germinated seeds of each Petri plate. Then seedlings were dried in oven for 24 hours at 80^0C and their weight was measured on weight balance.

Parameters Studies

Following parameters were recorded under different aspects using different methods: (a) Fresh Weight, (b) Dry weight, (c) Speed of germination, (d) Root length, (e) Shoot length, (f) Energy of germination, (g) Dry matter content

Dry matter content was measured by using following formula:

$$\text{Dry matter contents (\%)} = \frac{\text{Dry weight}}{\text{Fresh weight}} \times 100$$

Mean germination time

Mean germination time was measured on 7 day of germination by using following formula:

$$\text{Mean germination time} = \frac{\text{Germination of 7th day}}{7}$$

Final germination percentage

Final germination percentage was measured as:

$$\text{Final germination percentage} = \frac{\text{Germination at 7th day}}{20} \times 100$$

Results and Discussion

Weight

Significant differences were observed in treatment means for fresh weight (Table 4.1). Maximum fresh weight (0.50) was observed in seed treated with IBA 75ppm. Minimum fresh weight (0.76) was observed in seed treated with 3IAA 25ppm.

Table 2. Effect of seed priming on fresh weight, dry weight and dry matter content of carrot seedlings

Treatment	Chemical	Fresh weight (g)	Dry weight (g)	Dry matter content
75ppm	3IAA	0.45 c	0.00133 ab	0.3085 ab
50ppm	3IAA	0.7203 a	0.00113 b	0.1583 b
25ppm	3IAA	0.7646 a	0.0014 ab	0.184 b
75ppm	IBA	0.5015 c	0.00187 a	0.3829 a
50ppm	IBA	0.692 ab	0.00113 b	0.1649 b
25ppm	IBA	0.5665 bc	0.000867 b	0.1605 b

Length

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

Nonsignificant differences were observed in treatment means for root length of carrot seedling (Eisvand et al., 2011). Significant differences were observed in treatment means for speed of germination Maximum energy of germination (2.46) was observed in seed treated with IBA 50ppm which was at par with seeds treated with IBA 75ppm. Minimum energy of germination (4.2) was observed in seed treated with 3IAA 75ppm.

Table 3. Effect of seed priming on root length shoots length seedling length of carrot seedlings

Treatment	Chemical	Root length (cm)	Shoot length (cm)
75ppm	3IAA	3.04 a	4.2267 a
50ppm	3IAA	2.3133 a	4.0867 a
25ppm	3IAA	1.9867 a	4.0667 a
75ppm	IBA	1.8067 a	2.4867 b
50ppm	IBA	2.44 a	2.4667 b
25ppm	IBA	2.9867 a	4.2267 a

Speed of germination

Significant differences were observed in treatment means for speed of germination Minimum speed of germination(17.25) was observed in seed treated with IBA75ppm which was at par with seeds treated with 3IAA 25ppm. Maximum speed of germination (43.8) was observed in seed treated with IBA 25ppm.

Final germination percentage

Significant differences were observed in treatment means for speed of germination Maximum energy of germination (45.6) was observed in seed treated with IBA75ppm which was at par with seeds treated with 3IAA 25ppm.Minimum energy of germination (85)was observed in seed treated with 3IAA 50ppm.

Table 4. Effect of seed priming on energy of germination speed of germination and final germination percentage

Treatment	Chemical	Energy of germination	Speed of germination	Final germination percentage
75ppm	3IAA	81.667 a	33.461 b	81.667 ab
50ppm	3IAA	76.667 a	35.44 ab	85 a
25ppm	3IAA	83.333 a	36.162 ab	85 a
75ppm	IBA	46.667 b	17.256 c	45.667 c
50ppm	IBA	76.667 a	30.646 b	76.667 b
25ppm	IBA	86.667 a	43.832 a	86.667 a

Conclusion

Hormonal seed priming is useful to mitigate stress situations faced by plants and it should be exercised for better plant growth and better performance. The study plays an important role in improvement of plant growth in stress.

References

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

Afrigan, A., Javdani, Z., Jahantab, E., Jahanbin, R., & Bahari, A. A. (2013). The effect of plant hormone gibberellic acid on germination indices Secale montanum in vitro and pot experiments under drought conditions. *Annals of Biological Research*, *4*(6), 1-9.

Afzal, I., Basra, S. M., Farooq, M., & Nawaz, A. (2006). Alleviation of salinity stress in spring wheat by hormonal priming with ABA, salicylic acid and ascorbic acid. *Int. J. Agric. Biol*, *8*(1), 23-28.

Armin, M., Asgharipour, M., & Razavi-Omrani, M. (2010). The effect of seed priming on germination and seedling growth of watermelon (Citrullus lanatus). *Advances in Environmental Biology*, *4*(3), 501-505.

Eisvand, H. R., Shahrosvand, S., Zahedi, B., Heidari, S., & Afrougheh, S. (2011). Effects of hydro-priming and hormonal priming by gibberellin and salicylic acid on seed and seedling quality of carrot (Daucus carota var. sativus).

Gorgich, M., Mata, T. M., Martins, A., Caetano, N. S., & Formigo, N. (2020). Application of domestic greywater for irrigating agricultural products: A brief study. *Energy Reports*, *6*, 811-817.

Jima, D. U. G. A., Dechassa, N., & Dessalegne, L. (2015). Effect of Seed Priming with Potassium Nitrate on Bulb Yield and Seed Quality of Onion (Allium Cepa L.), under Rift Valley Conditions, Central Ethiopia. *International Journal of Crop Science and Technology*, *1*(2), 1-12.

Khan, H. S., Chaudhry, K. M., Ashraf, I., Usman, M., Ejaz, R., & Khadaim, M. M. (2020). An investigation of the problems faced by vegetable growers regarding post-harvest practices in district Faisalabad. *Biol. Clin. Sci. Res. J, 2020*, e015

Liaqat, S., Masroor, A., Maqsood, Z., & Tasleem, W. (2020). Effect of Glycine Betaine as a Growth Promoter and Stress Mitigator in Brassica oleraceavar. Italica. *Journal La Lifesci*, *1*(4), 31-35.

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)