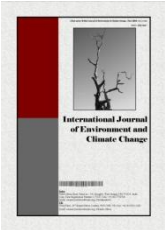

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Study of the Effect of Various Organics, Chemicals, Growth Regulators Treatments on Growth, Yield and Yield Attributing Traits in Radish (*Raphanus sativus L.*)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

University of Agriculture Technology and Science, Prayagraj, Uttar Pradesh during the rabi season of 2020-2021. To investigate the Study on the Effect of various organic, growth regulators & chemicals treatments on growth, yield, and yield attributing traits in Radish (*Raphanus sativus*). The experiment was laid out in Randomized Block Design (RBD) with Thirteen treatments and three replications. The treatments consist of FYM, NAA, GA3 KNo3, ZnSo4, KCl were subjected to study the growth, and yield parameters were recorded. The maximum field emergence percentage (93.30), plant height 30 das (23.50) plant height 60 das (89.57), plant height 90 das (148.23), days to 50% flowering (52.67), number of pods per plant (110.03), dry weight of plant (40.56), seed yield per plant (5.4), biological yield (343.3) harvest index (44.23) were observed in T7 (NAA). Whereas minimum was recorded in T0 (Control) (81.30, 21.60cm, 78.13cm, 139.83cm, 56.20%, 102.33, 32.20, 1.4, 132.20, 33.10).

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Keywords: Radish; growth parameter; yield parameter; growth regulators; NAA.

1. INTRODUCTION

Radish (*Raphanus sativus* L.) is commonly known as Mooli came from the Latin word Radix which means root belongs to the family Brassicaceae and it is the most popular root vegetable cultivated in India. It is cross-pollinated crop and diploidy (2n=18) in nature. It is grown in many tropical and sub-tropical parts of the world for its fleshy roots and leaves. West Bengal is the leading state in the production of radish. It was also considered a medicinal plant in ancient [1]. It is also used in making soap because it contains oil (George,1999) and its root contains anti-diabetic properties it is used for diabetic patients' worlds [2]. It is also useful in urinary complaints, problems of piles [3, 4]. Radish leaves are used to cure jaundice. Radish is a good source of vitamin-c15-40mg and also contains many nutrients and many minerals and vitamins are also present such as 0.7% of protein, (3.4-.8%) of carbohydrates, and (0.2%) of fat [5,6]. Radish is a fast-growing vegetable and also, a popular vegetable in both tropical as well as temperature regions. It also can be grown under glasshouse conditions for the early market but large-scale cultivation in the field is more. It is cultivated all over India especially near the city markets, mainly it is originated in China. Being a quick-growing crop, it can be easily planted as a companion crop or intercrop between the row of the other vegetables [7-9]. It can also grow on ridges and is also used as a trap crop. The edible roots are fusiform which are different in color from white to red. There are two distinct genetical groups in radish. They are Asiatic and European varieties. Whereas Asiatic are primarily for tropic climates, produces edible roots in the first season and seed in the second season as a biennial crop [10]. European varieties produce roots in plains of tropical and sub-tropical climates and the seed will produce in the hills of temperature climate. Seed treatment helps in control any of a number of pests that attack seeds, seedlings, and plants. Plant growth regulators, organic and chemicals are utilized for seed treatment [11,12,13]. In this PGRs are helpful to modify crop growth rate and growth pattern during various stages of development. FYM is known to provide decomposable organic matter that helps to increase soil characters like water holding capacity, soil fertility to improve in seed germination, Chemicals also used as seed treatments help in various benefits like improving emergence %, protection from seed-borne diseases and soil-borne pathogens, and insect [14,15,16]. Plant growth Regulators improve growth and increase their yield as they enhance the growth of the root [17].

2. MATERIALS AND METHODS

The present study was conducted using a completely randomized block design at the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture Technology and Sciences in Prayagraj, Uttar Pradesh. This region has a subtropical climate with the extreme of summer and winter. The temperature falls down to as low as $5\text{-}10^0$c during the winter season especially in the month of December and January. Each plot size 1 m^2 containing 13 rows and leaving 0.5m^2in the middle of each replication. The treatments consist of FYM, GA3, NAA, Kno3, ZnSo4, KCl. The treatments comprising of T0-control, T1-FYM@50g, T2- FYM@100g, T3-GA3@50ppm, T4-GA3@100ppm, T5-Kno3@3%, T6-Kno3@5%, T7- NAA@50ppm, T8-NAA@100 ppm, T9-KCl@3%, T10-KCl@ 100ppm, T11-ZnSo4@3%, T12-ZnSo4@5% they were replicated thrice in randomized block design. Observations were recorded by selecting five random plants in each replication on parameters are field emergence, plant height at 30, 60, 90 days, 50% flowering, no pods per plant, seed yield per plant, seed yield per plot, biological yield, harvest index

3. RESULT AND DISCUSSION

The analysis of variance among different treatments showed significant differences for all parameters as shown in Table1.

3.1 Growth Parameters

3.1.1 Field emergence%

In the study, it was observed that maximum Field Emergence was found in T7NAA@ 50 ppm (93.30) and followed by T6Kno3@5%(90.07) whereas minimum observed in T0 control (81.30).

3.1.2 Plant height (30 Das)

In the study, it was observed that maximum Plant height at 30 days was found in T7NAA@ 50 ppm (23.50) and followed by T6Kno3@5%(23.03)

whereas a minimum was observed in T0 control (21.60).

3.1.3 Plant Height (60 Das)

In the study, it was observed that maximum Plant height at 60 days was found in T7NAA@ 50 ppm (89.57) and followed by T6Kno3@5%(86.90) whereas the minimum was observed in T0 control (78.13).

3.1.4 Plant Height (90Das)

In the study, it was observed that maximum Plant height at 90 days was found in T7NAA@ 50 ppm (148.23) and followed by T6Kno3@5%(145.13) whereas minimum observed in T0 control (139.83).

3.1.5 Days to 50% Flowering

In the study, it was observed that maximum Field Emergence was found in T0 control (56.20) whereas minimum observed in T7NAA@ 50 ppm (52.67) and followed by T6Kno3@5%(53.80)

3.2 Yield Parameters

3.2.1 Number of pods per plant

In the study, it was observed that the maximum number of pods per plant was found in T7NAA@ 50 ppm (110.03) and followed by T6Kno3@5%(108.76) whereas the minimum was observed in T0 control (102.33).

3.2.2 Seed yield per plant

In the study, it was observed that the maximum number of pods per plant was found in T7NAA@ 50 ppm (3.8) and followed by T6Kno3@5%(3.6) whereas minimum observed in T0 control (2.3).

3.2.3 Seed Yield per Plot

In the study, it was observed that the maximum Number of pods per plant was found in T7NAA@ 50 ppm (19.2) and followed by T6Kno3@5% (18.1) whereas minimum observed in T0 control (11.7).

3.2.4 Biological Yield

In the study, it was observed that the maximum number of pods per plant was found in T7NAA@ 50 ppm (44.36) and followed by T6Kno3@5%(40.73) whereas minimum observed in T0 control (34.53).

3.2.5 Harvest Index

In the study, it was observed that the maximum number of pods per plant was found in T7NAA@ 50 ppm (8.6) and followed by T6Kno3@5%(8.5) whereas minimum observed in T0 control (6.6).

4. DISCUSSION

The findings from this research work revealed that NAA recorded superior growth and yield attributes. The maximum field emergence percent was recorded in T7 (NAA) (93.30) Whereas, minimum field emergence percent recorded in T0(81.30)Seed will be emerged significantly due to higher metabolic activity before sowing due to pre-sowing seed treatment that caused seeds to get ready for germination early compared to untreated seeds. The maximum Plant height 30, 60, 90 das was recorded in T7 (NAA) (23.50, 89.57, 148.23) Whereas, the minimum plant height recorded in T0(21.60). By treating with NAA showed significantly increased plant height and also helps in vegetative propagation. NAA helps in root initiation thus increased in the plant

Table 1. Analysis of Variance of growth and yield in Radish

S.no	Characters	Mean Sum of Square		
		Replications (df=2)	Treatments (df=12)	Error (df=24)
1	Field emergence%	5.48	35.37**	2.82
2	Plant height@30 DAS	1.04	0.88**	0.23
3	Plant height @60 DAS	10.91	34.63**	3.30
4	Plant height @90 DAS	0.49	12.91**	2.19
5	Days to 50% flowering	0.35	2.30**	0.49
6	Number of pods per plant	0.36	10.87**	0.43
7	Dry weight of plant	0.014	0.430**	0.0043
8	Seed yield per plant	0.22	11.34**	0.086
9	Biological yield	0.59	20.22**	0.450
10	Harvest index	0.008	1.004**	0.08

Table 2. Mean performance of growth and yield attributes in Radish

S.no	Treatment	Field emergence %	Plant height (30) days	Plant height (60) days	Plant height (90) days	Days to 50% flowering	Number of pods per plant	Seed yield per plant	Seed yield per plot	Biological yield	Harvest index
01	T0	81.30	21.60	78.13	139.83	56.20	102.33	2.3	11.7	34.53	6.6
02	T1	83.53	22.60	83.13	143.46	54.60	106.20	2.7	13.3	35.83	7.4
03	T2	87.53	22.26	79.53	140.73	54.20	105.36	3.1	15.4	38.23	8.0
04	T3	86.80	22.57	80.83	142.63	54.76	106.23	2.9	14.8	37.4	8.2
05	T4	87.53	21.87	84.47	142.73	53.97	105.90	3.2	16.3	39.36	7.5
06	T5	83.30	23.03	78.80	141.20	54.53	108.06	3.0	15.2	40.10	8.2
07	T6	90.07	23.03	86.90	145.13	53.80	108.76	3.6	18.1	40.73	8.5
08	T7	93.30	23.50	89.57	148.23	52.67	110.03	3.8	19.2	44.36	8.6
09	T8	88.87	22.17	81.37	143.96	54.67	107.56	3.4	17.2	42.36	8.0
10	T9	87.73	22.97	80.30	143.40	54.57	106.86	3.3	16.5	39.43	8.3
11	T10	84.20	22.30	85.97	143.40	54.53	108.13	3.2	16.0	37.83	8.1
12	T11	83.30	22.00	83.87	143.33	54.63	108.13	2.9	14.8	40.13	7.1
13	T12	90.00	22.26	81.53	142.93	55.90	106.43	3.1	15.9	40.26	7.7
	Grand Mean	86.73	20.76	82.65	143.15	54.54	106.92	3.1	15.7	39.26	7.9
	CD@5%	2.85	0.82	3.08	2.15	1.17	1.12	0.11	0.49	1.31	0.50
	SE(m)	0.97	0.28	1.05	0.85	0.40	0.38	0.03	0.16	0.34	0.17
	SE(d)	1.37	0.39	1.48	1.20	0.57	0.53	0.05	0.23	0.54	0.24
	CV	1.94	2.25	2.20	1.03	1.28	0.61	2.1	1.86	1.7	3.7

height in radish. The maximum days to fifty percent flowering was recorded in T0 (56.20). Whereas, minimum days to fifty percent flowering values were recorded in T7 (NAA) (52.67). The seeds treated with NAA showed early flowering due to early emergence at the beginning. Therefore, more days to 50 %flowering was taken by control with untreated seeds The maximum number of pods per plant was recorded in T7(NAA) (110.03), and whereas, the minimum number of pods was recorded in T0(102.33). The seed treatment of NAA @ 50 ppm resulted in the early flowering which leads to a higher number of pods. The maximum seed yield per plant was recorded in T7 (NAA) (3.8). Whereas, minimum seed yield per plant value was recorded in T0(2.3). The maximum seed yield per plot was recorded in T7 (NAA) (19.2). Whereas, minimum seed yield per plant value was recorded in T0(11.2). The seeds treated with NAA enhance effective flower formation, pod formation, pod, and seed development, and enhancing the productivity of the crop, which results in an increase in yield. The maximum biological yield was recorded as T7(NAA) (44.6). Whereas, the minimum biological yield was recorded in T0(34.3). The maximum harvest index was recorded in T7 (NAA) (8.6)and. However, the minimum harvest index was recorded in T0(6.6). By applying NAA to seed it enhances the yield in radish, NAA promotes cell elongation and cell division thus help in the growth and yield of the plant [18]. PGR plays a significant effect on the growth and yield of radish by comparing with chemicals and organic. Seeds were treated with NAA recorded maximum in early emergence, plant height, early flowering, and good yield. Plant growth regulators also promote germination, early maturity rapid seed germination, and seed development. However, chemicals and organics also showed good results. Seeds that are treated with chemicals also show good growth and yield. By treating seeds is free from disease and pests. Treating with hormones used in different concentrations to improve seed germination and promoting embryo growth. However, by the application of growth regulators Naphthalene acetic acid shows better results in growth and yield parameters when compared to chemicals and fym.

5. CONCLUSION

Based on this research study it concluded that the seeds are treated with NAA@50ppm for 12hrs enhanced the field emergence, plant height (cm), 50% flowering, number of pods, dry weight, seed yield, biological yield, harvest index give good results on field conditions among all treatments. T7 NAA recorded highest among all parameters whereas T0 (control) recorded lowest for all parameters recorded. So, growth regulators are showed the best results in comparison to chemicals and organics.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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