

Full length Research paper

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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The present study was carried out at Field experimentation, Sam Higginbottom University of Agriculture Technology and Science, Prayagraj, Uttar Pradesh during rabi season of 2020-2021, in order to standardize the suitable pre-sowing seed treatment of Radish. To investigate the Study on the Effect of various organic, growth regulators and chemicals treatments on growth, yield and yield attributing traits in Radish (*Raphanus sativus*). Experiment was laid out in Randomized Block Design (RBD) with Thirteen treatments and three replications. Different pre-sowing treatment with T0 untreated (control), T1- FYM, T2-FYM, T3- (Gibberellic acid @ 50ppm for 12hrs), T4 -(Gibberellic acid @ 100ppm for 12hrs), T5- (KNO₃ @ 3% for 12hrs), T6 - (KNO₃ @ 5% for 12hrs), T7- (Naphthalene acetic acid @ 50ppm for 12hrs), T8- (Naphthalene acetic acid @ 100ppm for 12hrs), T9- (Potassium chloride @ 3% for 12hrs), T10-(Potassium chloride @ 5% for 12hrs), T11- (ZnSo₄ @ 3% for 12hrs), T12- (ZnSo₄ @ 5% for 12hrs). It was found that pre-sowing treatment with T7 (Naphthalene acetic acid @ 50ppm for 12hrs) and T6 - (KNO₃ @ 5% for 12hrs), significantly increased the emergence percent, Plant height, Days to 50percent flowering, Number of pods per plant, Seed yield per plant, Seed yield per plant, biological yield, Harvest index.

Key words: Radish, Growth Parameter, Yield Parameter, Growth regulators, NAA,

INTRODUCTION

Radish (*Raphanus sativus* L.) is a commonly known as Mooli came from Latin word Radix which means root belongs to family Brassicaceae and it is 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 is one of the most important and popular root vegetables grown in tropical, sub-tropical and temperate regions of the world. It is grown both as an annual and a biennial vegetable crop depending upon the purpose of which it is grown. Radish is predominantly a cool season vegetable crop. But Asiatic types can tolerate higher temperature than European varieties. In the mild climate, radish can be grown almost all year round except for few months in summer (PCARRD. Philippine Recommends for Radish;

2007). Radish is grown and consumed all over the world and is considered part of the human diet, even though it is not common among some populations. Its young tuberous roots can be eaten raw in salad or cooked as a vegetable. It has a pungent flavor and considered as an appetizer. The young leaves can also be cooked and eaten as vegetables. The preparations of radish are useful for liver and gall bladder troubles. The roots, leaves, flowers and pods are active against gram-positive bacteria, urinary complaints, piles and gastrodynia. Also, salt extracted from the root can be dried and burnt to white ash and can be used to mitigate stomach troubles (Satish D 2016). Plant growth regulators, organic and chemicals are utilized for seed treatment. 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 helps to increase in soil characters like water holding capacity, soil fertility to improve in seed germination, Chemicals also used as seed treatments helps in various benefits like improving emergence %, protection from seed borne diseases and soil borne

pathogens and insect. Plant growth Regulators improve growth and increase their yield as they enhance the growth of root.

MATERIALS AND METHODS

Location and Climate

Prayagraj is located in the South-East part of Uttar Pradesh, India. The site of experiment is located at 25.57° N latitude, 81.51° E longitude and 98 meter above the sea level. This region has subtropical climate with extreme of summer and winter. The temperature falls down to as low as 1°C - 2°C during winter season especially in the months of December and January. The mercury rises up to 46°C - 48°C during summer.

Experimental Material

The present study was conducted using 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 subtropical climate with

extreme of summer and winter. The temperature falls down to as low as 5-10°C during winter season especially in the month of December and January. Each plot size 1 m² containing 13 rows and leaving 0.5m² in 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@100ppm, 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, Days to 50 percent flowering, Number of pods per plant, Seed yield per plant, Seed yield per plot, Biological Yield, Harvest Index.

RESULT AND DISCUSSION

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

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

S.n o	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	Seed yield per plant	0.014	0.430**	0.0043
8	Seed yield per plot	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

Growth parameters

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).

Plant height (30Das): In the study, it was observed that maximum Plant height at 30days was found in T7NAA@ 50 ppm (23.50) and followed by T6Kno3@5% (23.03) whereas minimum observed in T0 control (21.60).

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 minimum observed in T0 control (78.13).

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).

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%\(53.80\)](#)

YEILD PARAMETERS:

Number of pods per plant: In the study, it was observed that maximum Number of pods per plant was found in T7NAA @ 50ppm (110.03) and followed by

T6Kno3@5% (108.76) whereas minimum observed in T0 control (102.33).

Seed yield per plant: In the study, it was observed that 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).

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

Biological Yield: In the study, it was observed that 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).

Harvest Index: In the study, it was observed that 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).

DISCUSSION

The findings from this research work revealed that, NAA recorded superior in growth and yield attributes. The 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). Seed will be emerged significantly due to higher metabolic activity before sowing due to pre- sowing seed

treatment that caused seeds get ready for germination early compared to untreated seeds. The maximum Plant height at 30 days was found in T7NAA@ 50 ppm (23.50) and followed by T6Kno3@5% (23.03) whereas minimum observed in T0 control (21.60). The maximum Plant height at 60 days was found in T7NAA@ 50 ppm (89.57) and followed by T6Kno3@5%(86.90) whereas minimum observed in T0 control (78.13). The 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). By treating with NAA showed significantly increased the plant height and also helps in vegetative propagation. NAA helps in root initiation thus increased in the plant height in radish. The maximum days to fifty percent flowering was recorded in T0 (56.20). Whereas, minimum days to fifty percent flowering value recorded in T7 (NAA) (52.67) and followed by T6Kno3@5% (53.80). 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 followed by T6Kno3@5% (108.76) whereas, minimum number of pods recorded in T0(102.33). Due to the seed treatment of NAA @ 50 ppm resulted in the early flowering which leads to the higher number of pods. The maximum seed yield per plant was recorded in T7 (NAA) (3.8) and followed by T6Kno3@5% (3.6). Whereas, minimum seed yield per plant value recorded in T0 (2.3). The maximum seed yield per plot was recorded in T7 (NAA) (19.2) and followed by T6Kno3@5% (3.6). Whereas, minimum seed yield per plot value recorded in T0(11.2). The seeds treated with NAA enhances in effective flower formation, pod formation, pod and seed development and enhancing the productivity of crop, which results in the increase in yield. The maximum biological yield was recorded as T7(NAA) (44.6) and followed by T6Kno3@5% (40.73). Whereas, minimum biological yield recorded in T0(34.3). The maximum harvest index was recorded in T7 (NAA) (8.6) and followed by T6Kno3@5% (8.5). However, minimum harvest index recorded in T0(6.6). By applying NAA to seed it enhances the yield in radish, NAA promote cell elongation and cell division thus help in the growth and yield of plant. PGR plays a significant effect in 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 promotes germination, early maturity rapid seed germination and seed development. However, chemicals and organics also showed good results. Seeds are treated with chemicals also shows good growth and yield. By treating seeds is free from disease and pests. Treating with hormones used in different concentration to improve seed germination and promoting embryo growth. However, by the application of growth regulators Naphthalene acetic acid shows

better result in growth and yield parameters when compare to chemicals and fym.

CONCLUSION

Based on this research study it concluded pre-sowing treatment increase the growth and development and yield of the crop, that the seeds are treated with T7 NAA@50ppm and followed by T6 Kno3@5% 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. T7NAA recorded highest among all parameters as compare to T0 untreated (control). These conclusions are based on the results of six months investigation and therefore further investigation is needed to arrive at valid recommendations.

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