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Full length Research paper

Influence of botanicals, fungicides, plant growth regulator treatments on seedling characters of marigold (*tageteserecta*l.)" variety: pusabasanti and kalyan-2

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The present study was carried out at seed testing Laboratory of the Department of Genetics and Plant Breeding, SHUATS Allahabad, U.P during Rabi 2020-2021 with marigold varieties Pusabasanti and Kalyan-2 This experiment was carried out inCRD for lab experiment (9 Traits with 4 Replications). The experimental observations summarized below based on the objectives and traits under taken in the study. The study revealed that when varieties primed with T_{10} (GA3 100 ppm) resulted in increase of Germination percent, Speed of germination, Root length, Shoot length, Seedling length, Fresh weight, Dry weight, Vigour index I, Vigour index II . GA3 performed better among other treatments and enhanced seedling characters followed by T_9 (GA_3 50 ppm), T_{12} (NAA 50ppm). By the study it can be recommended that marigold seedlings characters are improved with the application of GA3.

Keywords*:* GA3, marigold, priming, speed of germination, seedling characters etc.

INTRODUCTION

African marigold (*Tageteserecta.* L) belongs to family Asteraceae of origin Mexico and south America. Chromosome number is 2n=24. There are about 33 species of genus tagetes .Plant is hardy annual, up to 30cm tall. Flowers are large sized with globular head. Flowers vary from lemon yellow to yellow, golden yellow or orange.

About 3,42,000 ha^{-1} of area is under floriculture 17,40,000 mt of marigold flowers and 7,39,000 mt of cut flowers are produced annually. Uttar Pradesh having small area for floriculture national commission on agriculture as recommended 5 lakh hectares of land under floriculture to raise its production. Flower cultivation support a family consisting of 5 to 6 members and improve standard of living of the people.

It requires mild climate for better for determinant growth and flowering. 18-30^0 c temperature is required to speed up germination. Best flowering is observed in winter season month (oct- apr). Soil should be well drained Ph range is 7.0- 7.5. Mari gold is propagated by seeds and by cuttings.
Flowers of marigold are used for garden decoration, and loose flowers used for making garlands in religious and social functions. It has gained more popularity of its easy culture and wide adaptability .The demand for flowers is high during dussehra and Diwali
Festivals. In united states it is known as friendship flower. It is suitable as land scaping and bedding plant. It is used as oil extraction The pigment xanthophyll are used as a nature colour to intensify yellow colour of egg yolk and boiler skin. Essential for colouring food stuff and textile industry
It has high medicinal value gold petals are used in poultry industry oil is used to obtain high grade perfume. It is very expensive flower.
Botanicals help in radicle emergence and improve standing capacity of seed. It helps in obtaining synchronize maturity and determinant growth. It also help in synthesis of physiological and biochemical activity. It increases seed vigour seedling growth and yield. Ga3 help in enhancing

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root length, shoot length and seedling growth. Salicylic acid, IAA, NAA promotes significant increase in fresh weight and dry weight.. *Tageteserecta L*. has been used for the treatment of a wide variety of diseases and ailments. The infusion of the plant has been used against rheumatism, cold and bronchitis, juice of leaves for ear-ache, leaves and their infusion prescribed as a vermifuge, diuretic and carminative (Sing *et al.*, 2020). Its florets have been used for the treatment of eye diseases and ulcers and an extract of the roots credited as laxative (Gupta and Vasudeva, 2010). The plant growth regulators consist of a large group of naturally occurring or synthetically produced organic chemicals and considered as helping tool in the modern production system of ornamentals. The use of growth regulators play an important role by increasing, reducing or modifying the physiological process within plant and which ultimately affect the all the growth stages of plants (Tandel*et al.*, 2021).

Application of growth regulators played an important role in asexual reproduction, inhibition of abscission, prevented bud dormancy, growth control, promotion of flowering, retarding senescence, etc. Gibberellic acid application to plants results in a variety of responses like cell division, a change in leaf shape or size and a retardation of root growth. Gibberellic acid, NAA plays a vital role in improving the vegetative growth characters of the plants as it enhances the elongation and cell division.

MATERIAL AND METHODS

The present investigation entitled “Influence of Botanicals, Fungicides and Plant growth regulator treatments on seedling characters in Marigold (Tageteserecta L.)” is conducted during *rabi*of 2020-2021 at Post Graduate Laboratory of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences Allahabad, Uttar Pradesh, India. The details of the material used and techniques adopted during the course of the study are presented here.

Different methods and the material used in the present experiment, climatic condition prevalent in the locality where experiment was conducted, experimental details and the designs of experiment CRD was adopted, statistical analysis, experimental material used and sampling techniques adopted were furnished with in this chapter under the following heading

Experiment material:

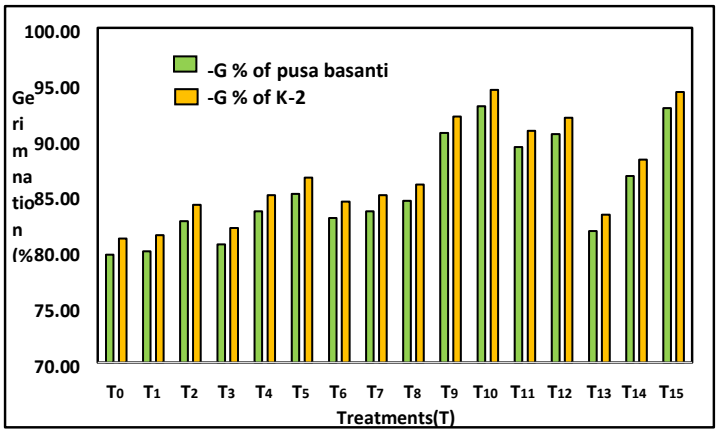
This experiment was conducted by using 16 treatments intwo varieties of Marigold. Variety: PusaBasanti, Kalyan-2 as follows.

Sr.no	Treatments	Concentration	Duratio n
T0	Control	Un-Primed seeds	
T1	Curry leaf extract	3%	8 Hours
T2	Neem oil	3%	8 Hours
T3	Tulsi leaf extract	3%	8 Hours
T4	Pongamia leaf extract	3%	8 Hours
T5	Thiram	2gm/kg	8 Hours
T6	Mancozeb	3gm/kg	8 Hours
T7	Vitavax	2gm/kg	8 Hours
T8	Formaline	2%	8 Hours
T9	GA3	50ppm	8 Hours
T10	GA3	100ppm	8 Hours
T11	IAA	50ppm	8 Hours
T12	NAA	50ppm	8 Hours
T13	PEG6000	50ppm	8 Hours
T14	Salicylic Acid	50ppm	8 Hours
T15	Kinetin	50ppm	8 Hours

RESULTS AND DISCUSSION

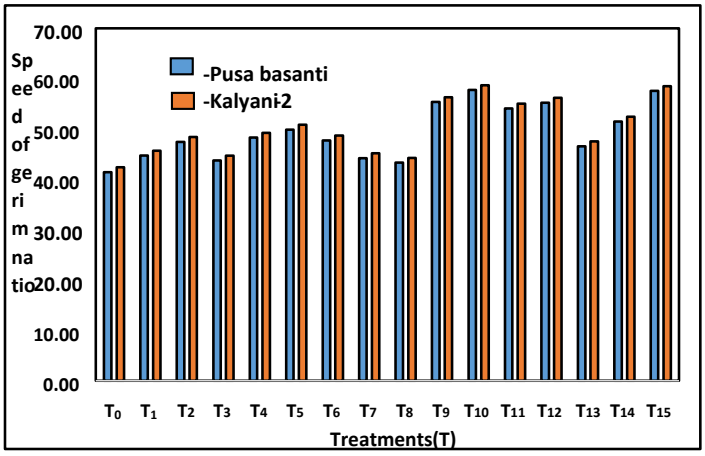
Impact of priming on germination percent of marigold

The maximum percentage of germination (92.97 %) was recorded under seed primed with GA_3 100 ppm (T_{10}) which was followed by GA3 50ppm (T_9) with 90.58 % and NAA 50 ppm (T_{12}) with 90.47 %. While, minimum germination (79.66 %) was recorded with control (T_0) for marigold cv. PusaBasanti. Regarding marigold cv. Kalyani-2 the maximum amount of germination % (94.43) recorded with T_{10} (GA3 100ppm) Followed by T_9 (GA3 50ppm) (92.04) and T_{12} (NAA 50ppm) with 91.93 % minimum germination % (81.12) recorded with T_0 (control). Results were in synchronicity with the findings reported by Paleie*t al.* (2016), Murali (2018), Khan *et al*. (2020), Mazid (2014), Hong-Yun Ma *et al.* (2018), Jafri *et al.* (2015) and Kumarie*t al.* (2017)



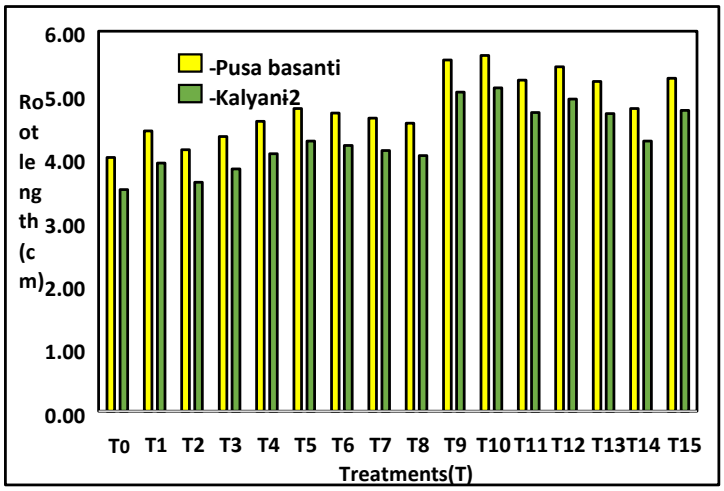
Impact of priming speed germination ofmarigold

The maximum speed of germination (57.72) recorded with T_{10} (GA_3 100ppm) Followed by GA_3 50 ppm(T_9) with (55.33) and NAA 50ppm (T_{12}) with (55.22). While, minimum speed of germination (41.41) was recorded with T_0 (control) for marigold cv. PusaBasanti. Regarding marigold cv. Kalyani-2 the maximum amount of speed of germination (58.68) recorded with T_{10} (GA3 100ppm) Followed by T_9 (GA_3 50ppm) (56.29) and T_{12} (NAA 50ppm) with 56.18 whereas minimum speed of germination (42.37) recorded with T_0 (control). Results were in synchronicity with the findings reported by **Murali (2018)** who stated that mean germination time was minimum under seeds primed with GA3 which was followed by KNO3 and least was recorded under control treatment. Similar results were also reported by Palei*et al.* (2016), Khan *et al*. (2020), Mazid (2014), Hong-Yun Ma *et al.* (2018), Jafri *et al.* (2015) and Kumari*et al.* (2017).



Impact of priming on root length of marigold

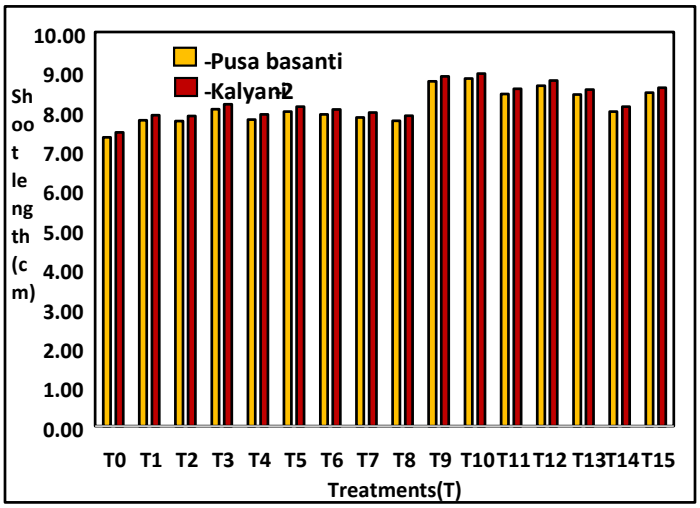
The maximum amount of root length (5.62) recorded with T10 (GA3 100ppm) Followed by T9 (GA3 50ppm) (5.55) and T12 (NAA 50ppm) (5.44) Whereas minimum root length (4.01) recordedwith T0 (control) for marigold cv. Pusa Basanti. Regarding marigold cv. Kalyani-2 the maximum amount of root length (5.11) recorded with T10 (GA3100ppm) Followed by T9 (GA350ppm) (5.04) and T12 (NAA 50ppm) (4.93) whereas minimum root length (3.50) recorded with T0 (control). Results were in synchronicity with the findings reported by Sunitha*et al.* (2007), Palei*et al.* (2016),Khan *et al*. (2020), Mazid (2014), Hong-Yun Ma *et al.* (2018), Jafri *et al.* (2015) and Kumari*et al.* (2017)



Impact of priming on shoot length of marigold

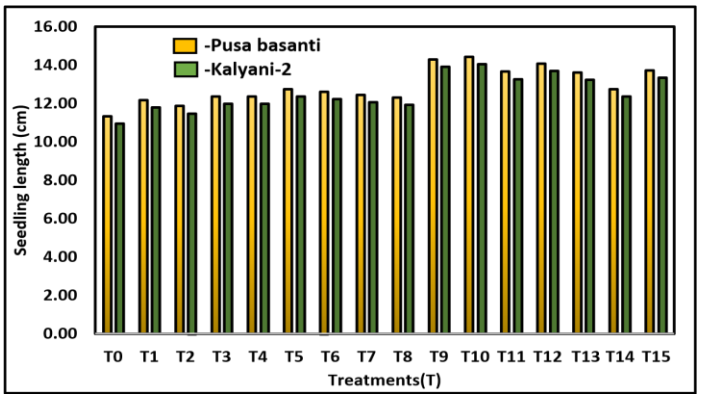
The maximum amount of shoot length (8.82) recorded with T_{10} (GA3 100ppm) Followed by T_9 (GA3 50ppm) (8.75) and T_{12} (NAA 50ppm) (8.64) Whereas minimum shoot length (7.33) recorded with T_0 (control) for marigold cv. PusaBasanti. Regarding marigold cv. Kalyani-2 the maximum amount of shoot length (8.94) recorded with T_{10} (GA3 100ppm) Followed by T_9 (GA3 50ppm) (8.87) and T_{12} (NAA 50ppm) (8.76) whereas minimum shoot length (7.45) recorded with T_0 (control). Results were in synchronicity with the findings reported by **Sunitha *et al.*, 2007 who**

reported maximum Shoot length of marigold was recorded under seed primed with GA3 @ 200 ppm which was followed by NAA @ 30 and 60 ppm and minimum shoot length was recorded with control. Similar results were also reported by Paleie*t al.* (2016),Khan *et al*. (2020), Mazid (2014), Hong-Yun Ma *et al.* (2018), Jafri *et al.* (2015) and Kumarie*t al.* (2017).



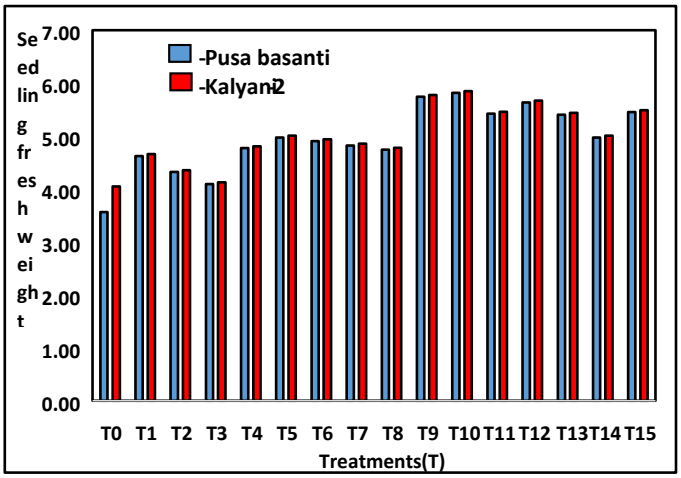
Impact of priming seedling length of marigold

The maximum amount of seedling length (14.43) recorded with T_{10} (GA3 100ppm) Followed by T_9(GA3 50ppm) (14.29) and T_{12} (NAA 50ppm) (14.07) Whereas minimum seedling length (11.33) recorded with T_0 (control) for marigold cv. Pusa Basanti. Regarding marigold cv. Kalyani-2 the maximum amount of seedling length (14.05) recorded with T10 (GA3 100ppm) Followed by T9 (GA3 50ppm) (13.91) and T12 (NAA 50ppm) (13.69) whereas minimum seedling length (10.95) recorded with T0 (control)Higher seedling length in GA_3-treated seeds, might be the result of higher cell division, cell elongation Results were in synchronicity with the findings reported by Sunitha*et al.*, 2007, Paleie*t al.* (2016),Khan *et al*. (2020), Mazid (2014), Hong-Yun Ma *et al.* (2018), Jafri *et al.* (2015) and Kumarie*t al.* (2017).



Impact of priming on fresh weight of marigold

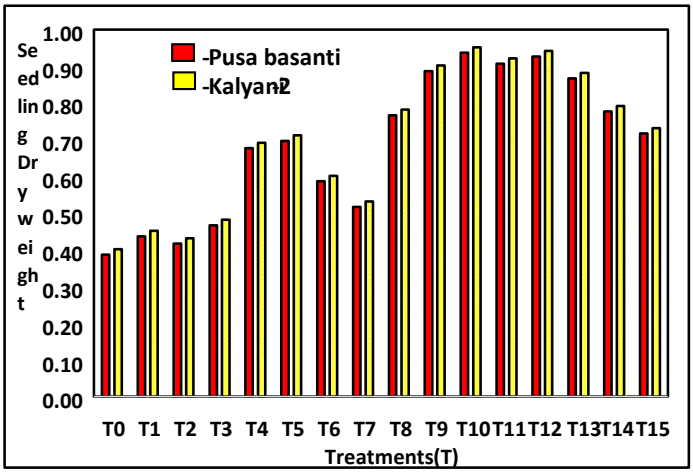
The maximum amount seedling fresh weight (5.81) recorded with T10 (GA3 100ppm) Followed by T9 (GA3 50ppm) (5.74) and T12 (NAA 50ppm) (5.63) Whereas minimum seedling fresh weight (3.56) recorded with T0 (control) for marigold cv. PusaBasanti. Regarding marigold cv. Kalyani-2 the maximum amount of seedling fresh weight (5.85) recorded with T_{10} (GA3 100ppm) followed by T_9 (GA3 50ppm) (5.78) and T_{12} (NAA 50ppm) (5.67) whereas minimum seedling fresh weight (81.12) recorded with T_0 (control). The promoting effect of GA_3 on DNA, RNA and protein synthesis and ribose and polyribosome multiplication would contribute towards enhancement of enzyme activity would also result in enhancing the capacity of the treated seeds for increase in the fresh and dry weight of seedlings. Results were in synchronicity with the findings reported by Sunitha *et al.* (2007), Paleie*t al.* (2016),Khan *et al*. (2020), Mazid (2014), Hong-Yun Ma *et al.* (2018), Jafri *et al.* (2015) and Kumari *et al.* (2017)



Impact priming on dry weight of marigold

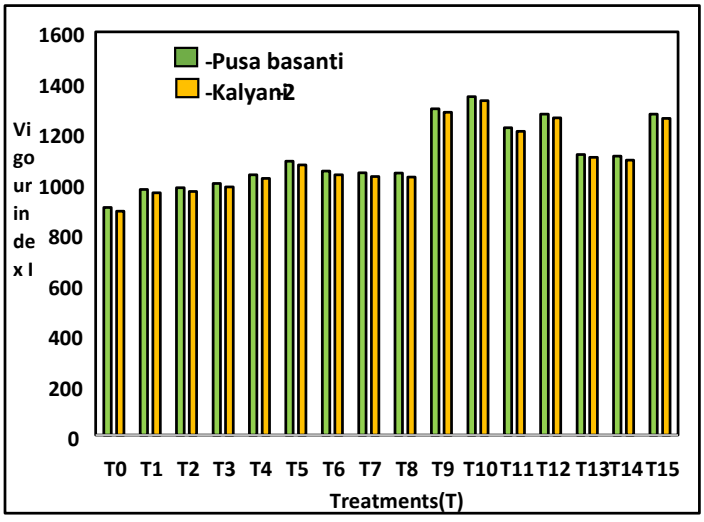
The maximum amount of seedling dry weight (0.94) recorded with T10 (GA3 100ppm) Followed by T9 (GA3 50ppm) (0.93) and T12 (NAA 50ppm) (0.89) Whereas minimum seedling dry weight (0.39) recorded with T0 (control) for marigold cv. PusaBasanti. Regarding marigold cv. Kalyani-2 the maximum amount of seedling dry weight (0.95) recorded with T_{10} (GA3 100ppm) followed by T_9 (GA3 50ppm) (0.94) and T_{12} (NAA 50ppm) (0.90) minimum seedling dry weight (0.40) recorded with T_0 (control). This might be due to fact that higher doses of gibberellic acid and cytokinin may improve germination and vigorous performance of lentil verified that the final emergence per cent, coefficient of uniformity of emergence and seedling dry weight had a marked increasing effect on seedling vigor. Results were in synchronicity with the findings reported by Sunitha*et al.*, 2007, Paleie*t al.* (2016),Khan et al. (2020), Mazid (2014), Jafri *et al.* (2015) and Kumarie*t al.*

(2017).



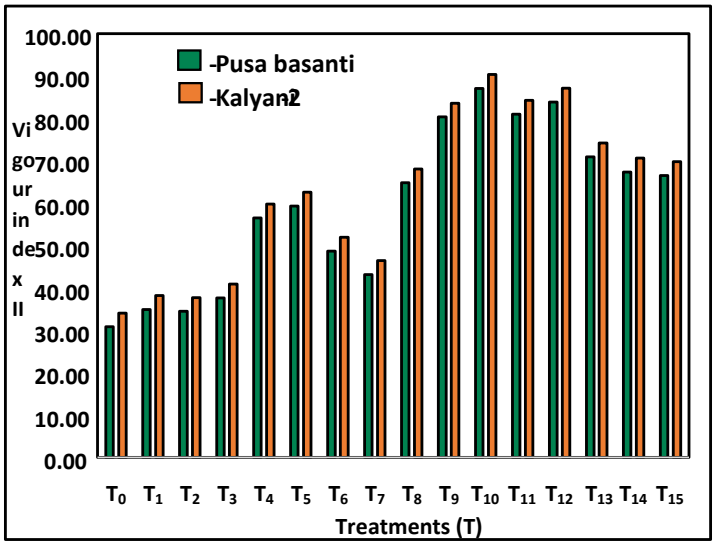
Impact of priming on Vigour index I of marigold

The maximum amount of vigour index I (1342) recorded with T10 (GA3 100ppm) Followed by T9 (GA3 50ppm) (1295) and T12 (NAA 50ppm) (1273) Whereas minimum vigour index I (903) recorded with T0 (control). Regarding marigold cv.Kalyani-2 the maximum amount of vigour index I (1327) was recorded with T10 (GA3100ppm) followed by T9 (GA3 50ppm) (1280) and T12 (NAA 50ppm) (1258) whereas minimum vigour index I (888) recorded with T0 (control). This might be due to fact that higher doses of gibberellic acid and cytokinin may improve germination and vigorous performance of lentil verified that the final emergence per cent, coefficient of uniformity of emergence and seedling dry weight had a marked increasing effect on seedling vigor. Results were in synchronicity with the findings reported by Sunitha*et al.*, 2007, Palei*et al.* (2016),Khan *et al*. (2020), Mazid (2014), Hong-Yun Ma *et al.* (2018), Jafri *et al.* (2015) and Kumari*et al.* (2017).



Impact of priming on Vigour index II of marigold

The maximum amount of vigour index II (87.07) recorded with T10 (GA3 100ppm) Followed by T9 (GA3 50ppm) (84.23) and T12 (NAA 50ppm) (80.52) Whereas minimum vigour index II (30.79) recorded with T0 (control). Regarding marigold cv. Kalyani2 the maximum amount of vigour index II (90.34) recorded with T10(GA3 100ppm) followed by T9 (GA3 50ppm) (86.51) and T12 (NAA 50ppm) (82.73) whereas minimum vigour index II (34.06) recorded with T0 (control) The improvement in vigour II index might be attributed to improved germination which was due to stimulation of enzymatic activities. This might also be due to good seedling growth caused by improved mobilization of food reserves. Results were in synchronicity with the findings reported by Sunitha*et al.*, 2007, Palei*et al.* (2016), Khan *et al*. (2020), Mazid (2014), Hong- Yun Ma *et al.* (2018), Jafri *et al.* (2015) and Kumari*et al.* (2017)



Mean performance of lab parameters for marigold (Kalyan-2)

Treatments	METHODS	Concentration	G%	SPG	RT	SL	SDL	SFW	SDW	VI	VII
T0	Control	Un-Primed seeds	81.12	42.37	3.50	7.45	10.95	4.05	0.40	888	34.06
T1	Curry leaf extract	3%	81.41	45.66	3.92	7.88	11.80	4.66	0.45	961	38.17
T2	Neem oil	3%	84.13	48.38	3.62	7.86	11.48	4.36	0.43	966	37.70
T3	Tulsi leaf extract	3%	82.05	44.70	3.83	8.16	11.99	4.13	0.48	984	40.87
T4	Pongamia leaf extract	3%	85.00	49.25	4.07	7.90	11.97	4.81	0.69	1017	59.79
T5	Thiram	2gm/kg	86.58	50.83	4.27	8.10	12.37	5.01	0.71	1071	62.56
T6	Mancozeb	3gm/kg	84.43	48.68	4.20	8.03	12.23	4.94	0.60	1033	51.93
T7	Vitavax	2gm/kg	85.00	45.16	4.12	7.95	12.07	4.86	0.53	1026	46.42
T8	Formaline	2%	85.96	44.26	4.04	7.87	11.91	4.78	0.78	1024	68.04
T9	GA3	50ppm	92.04	56.29	5.04	8.87	13.91	5.78	0.94	1280	86.51
T10	GA3	100ppm	94.43	58.68	5.11	8.94	14.05	5.85	0.95	1327	90.34
T11	IAA	50ppm	90.77	55.02	4.72	8.55	13.27	5.46	0.92	1204	84.23
T12	NAA	50ppm	91.93	56.18	4.93	8.76	13.69	5.67	0.90	1258	82.73
T13	PEG6000	50ppm	83.25	47.50	4.70	8.53	13.23	5.44	0.88	1101	74.14
T14	Salicylic Acid	50ppm	88.18	52.43	4.27	8.10	12.37	5.01	0.79	1091	70.61
T15	Kinetin	50ppm	94.25	58.50	4.75	8.58	13.33	5.49	0.73	1256	69.76
		MEAN	**86.91**	**50.24**	**4.31**	**8.22**	**12.54**	**5.02**	**0.70**	**1093**	**62.46**
		MIN	**81.12**	**42.37**	**3.50**	**7.45**	**10.95**	**4.05**	**0.40**	**888**	**34.06**
		MAX	**94.43**	**58.68**	**5.11**	**8.94**	**14.05**	**5.85**	**0.95**	**1327**	**90.34**
		CV	**3.23**	**4.58**	**2.64**	**5.59**	**8.45**	**6.25**	**1.26**	**7.29**	**6.51**
		SED	**3.14**	**2.27**	**1.22**	**0.75**	**1.57**	**1.06**	**0.33**	**10.80**	**3.41**
		CD at 5%	**6.30**	**4.56**	**2.45**	**1.50**	**3.17**	**2.12**	**0.67**	**25.63**	**8.86**
		CD at 1%	**8.41**	**6.08**	**3.27**	**2.01**	**4.22**	**2.83**	**0.89**	**28.96**	**9.14**

Mean performance of lab parameters for Marigold (PusaBasanti)

Treatments	METHODS	Concentration	G%	SPG	RT	SL	SDL	SFW	SDW	VI	VII
T0	Control	Un-Primed seeds	79.66	41.41	4.01	7.33	11.33	3.56	0.39	903	30.79

T1	Curry leaf extract	3%	79.95	44.70	4.43	7.76	12.18	4.62	0.44	974	34.90
T2	Neem oil	3%	82.67	47.42	4.13	7.74	11.86	4.32	0.42	981	34.43
T3	Tulsi leaf extract	3%	80.59	43.74	4.34	8.04	12.37	4.09	0.47	997	37.60
T4	Pongamia leaf extract	3%	83.54	48.29	4.58	7.78	12.35	4.77	0.68	1032	56.51
T5	Thiram	2gm/kg	85.12	49.87	4.78	7.98	12.75	4.97	0.70	1085	59.29
T6	Mancozeb	3gm/kg	82.97	47.72	4.71	7.91	12.61	4.90	0.59	1046	48.66
T7	Vitavax	2gm/kg	83.54	44.20	4.63	7.83	12.45	4.82	0.52	1040	43.15
T8	Formaline	2%	84.50	43.30	4.55	7.75	12.29	4.74	0.77	1039	64.77
T9	GA3	50ppm	90.58	55.33	5.55	8.75	14.29	5.74	0.93	1295	84.23
T10	GA3	100ppm	92.97	57.72	5.62	8.82	14.43	5.81	0.94	1342	87.07
T11	IAA	50ppm	89.31	54.06	5.23	8.43	13.65	5.42	0.91	1219	80.96
T12	NAA	50ppm	90.47	55.22	5.44	8.64	14.07	5.63	0.89	1273	80.51
T13	PEG6000	50ppm	81.79	46.54	5.21	8.41	13.61	5.40	0.87	1113	70.87
T14	Salicylic Acid	50ppm	86.72	51.47	4.78	7.98	12.75	4.97	0.78	1106	67.34
T15	Kinetin	50ppm	92.79	57.54	5.26	8.46	13.71	5.45	0.72	1272	66.48
		MEAN	**85.45**	**49.28**	**4.82**	**8.10**	**12.92**	**4.95**	**0.69**	**1107**	**59.18**
		MIN	**79.66**	**41.41**	**4.01**	**7.33**	**11.33**	**3.56**	**0.39**	**903**	**30.79**
		MAX	**92.97**	**57.72**	**5.62**	**8.82**	**14.43**	**5.81**	**0.94**	**1342**	**87.07**
		CV	**4.36**	**5.17**	**3.36**	**4.56**	**8.78**	**5.56**	**1.26**	**11.64**	**8.64**
		SED	**3.26**	**2.70**	**1.23**	**0.79**	**1.56**	**1.16**	**0.36**	**10.52**	**3.88**
		CD at 5%	**6.55**	**5.42**	**2.47**	**1.58**	**3.14**	**2.33**	**0.72**	**24.39**	**9.01**
		CD at 1%	**8.74**	**7.23**	**3.30**	**2.11**	**4.19**	**3.11**	**0.97**	**28.22**	**10.41**

SUMMARY AND CONCLUSION

Among this investigation marigold seeds both Kalyan-2, PusaBasanti when primed with T_{10} (GA_3 100 ppm) Germination percent, Speed of germination, Root length, Shoot length, Seedling length, Fresh weight, Dry weight, Vigour index I, Vigour index II increased. GA_3 is the best seed treatment for seedling growth traits of both Kalyan-2, Pusa&Basanti seeds followed by T_9 (GA_3 50 ppm), T_{12} (NAA 50ppm).

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