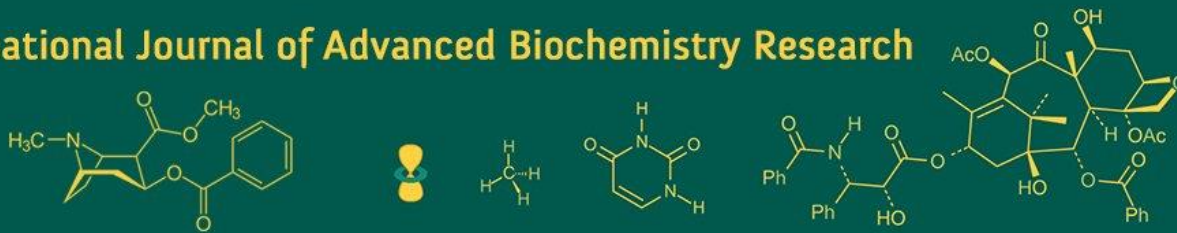


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
 ISSN Online: 2617-4707
 IJABR 2024; 8(6): 296-300
www.biochemjournal.com
 Received: 03-04-2024
 Accepted: 07-05-2024

Baishali Mohanta
 M Sc. Research Scholar,
 Department of Horticulture,
 University of Agriculture,
 Technology and Sciences,
 Prayagraj, Uttar Pradesh,
 India

Dr. Devi Singh
 Associate Professor,
 Department of Horticulture,
 University of Agriculture,
 Technology and Sciences,
 Prayagraj, Uttar Pradesh,
 India

Dr. C John Wesley
 Associate Professor,
 Department of Center for
 Geospatial Technologies Sam
 Higginbottom University of
 Agriculture, Technology and
 Sciences, Prayagraj, Uttar
 Pradesh, India

Dr. Kamin Alexander
 Assistant professor,
 Department of Biological
 Sciences, University of
 Agriculture, Technology and
 Sciences, Prayagraj, Uttar
 Pradesh, India

Dr. Poonam Prakash
 Associate professor and Head,
 Department of Forensic
 Science, University of
 Agriculture, Technology and
 Sciences, Prayagraj, Uttar
 Pradesh, India

Corresponding Author:
Baishali Mohanta
 M Sc. Research Scholar,
 Department of Horticulture,
 University of Agriculture,
 Technology and Sciences,
 Prayagraj, Uttar Pradesh,
 India

Study on the effect of foliar spray of NAA, GA₃ and Ethrel on yield and yield attributing traits of ridge gourd (*Luffa acutangula*)

Baishali Mohanta, Dr. Devi Singh, Dr. C John Wesley, Dr. Kamin Alexander and Dr. Poonam Prakash

DOI: <https://doi.org/10.33545/26174693.2024.v8.i6d.1324>

Abstract

A field experiment entitled effect of foliar spray of NAA, GA₃ and Ethrel on yield and yield attributing traits of ridge gourd (*Luffa acutangula*) was conducted at Sam Higgin bottom University of Agriculture, Technology & Science, involving two distinct varieties of ridge gourd, namely TMRG 1509 and Ridge gourd Check Aneeta. 12 combinations were applied, consisting of various concentrations of GA₃ (50 to 200 ppm), Ethrel (50 to 150 ppm), and NAA (50 to 200 ppm), along with a control group receiving a water spray. The growth regulators were administered at three different growth stages, including four-leaf and flower initiation, flower and fruit initiation, and four-leaf, flower, and fruit initiation. The experimental design employed a Randomized Block Design with a Factorial concept.

The results of the study revealed significant variations in yield and yield attributing traits of the two ridge gourd varieties in response to the different treatments and growth stages. Overall, the application of GA₃ at 200 ppm during the flower and fruit initiation stage exhibited the highest increase in yield and several yield attributing traits, such as fruit size, number of fruits per plant, and average fruit weight, for both ridge gourd varieties. Results revealed that maximum vine Length (300.27 cm), germination percentage (96.67%), Seed Index (12.62), number of seed per fruit (129.60), fruit weight (147.78) TSS (1.35) and Ascorbic acid (11.00) is recorded in Treatment with GA₃ 200 ppm. The maximum number of fruits per vine (13.60), fruit Girth (38.20 mm) and fruit yield per Vine (2.09kg) is recorded in Treatment with Ethrel 200 ppm. The maximum fruit Length (29.08cm), days taken for flower initiation male (38.20) female (44.40) was recorded in Treatment with NAA 200 ppm. Ethrel and NAA treatments also showed positive effects on yield and yield attributes, albeit to a lesser extent.

Keywords: Ethrel, NAA, GA₃, PGR, yield, ridge gourd

Introduction

Ridge gourd, scientifically known as *Luffa acutangula*, has a chromosome count of 2n=26 and belongs to the Cucurbitaceae family. Widely cultivated in India, it serves both medicinal and culinary purposes. Its freshly harvested fruits are a staple in daily diets, boasting nutritional content such as 0.5g of fiber, 0.5 percent protein, 0.34 percent carbohydrate, 37 mg carotene, 5.0 mg vitamin C, 18 mg calcium, and 0.5 mg iron per 100 g of edible portion (Hazra and Som, 2017) [24]. Due to its significance in people's diets, there's a growing need to improve crop productivity through better management practices and seed quality. However, ridge gourd cultivation faces challenges, particularly concerning the excessive use of fertilizers, which diminishes profitability for farmers. Failure to supply timely and adequate doses of fertilizers results in decreased yield and nutritional quality.

Material and Methods

A field experiment entitled "Study on the Effect of Foliar spray of NAA, GA₃ and Ethrel on Yield and Yield attributing Traits of Ridge Gourd (*Luffa acutangula*)" was carried out during Kharif season of the year 2023. The study took place at the Horticulture Research Farm within the Department of Horticulture at Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) between 2023 and 2024. The Department provided all essential resources for cultivation, including labor. This

experiment was planned with two factors i.e. 1. Variety (V) and 2. Different doses of plant growth regulators (T) with 3 Replications under Factorial Randomized Block Design. The different doses of Plant growth regulators were T₀ (Control), T₁ (GA3 50 ppm), T₂ (GA3 100 ppm), T₃ (GA3 150 ppm), T₄ (GA3 200 ppm), T₅ (NAA 50 ppm), T₆ (NAA 100 ppm), T₇ (NAA 150 ppm), T₈ (NAA 200 ppm), T₉ (Ethrel 50 ppm), T₁₀ (Ethrel 100 ppm), T₁₁ (Ethrel 150 ppm) and T₁₂ (Ethrel 200). and the different varieties used in the experiment are V1(Aneeta) and V2 (TMRG-1509).

Climate and Weather Conditions

Prayagraj is situated at an elevation of 78 meters above sea level, positioned at 25.87 degrees North Latitude and 81.15 degrees East Longitude. This area experiences a subtropical climate, located in the southeastern part of Uttar Pradesh. It encounters both extremes of temperature, with cold winters and hot summers. In the chilly winters, temperatures can drop as low as 32 degrees Fahrenheit in December and January, while summers can be scorching, with temperatures soaring up to 115 degrees Fahrenheit in May and June. Frost is common during winters, and hot, drying winds are prevalent during the summer months. The average annual rainfall is approximately 1013.4 millimeters, with the heaviest rainfall typically occurring from July to September, although occasional showers can also happen during winters.

Results and Discussion

Growth Parameters

Germination

The data on germination as influenced by Plant growth regulator in different treatment combinations was recorded. Critical analysis of data displayed in the table clearly marked out the obvious differences among the treatments with respect to germination.

The germination was observed during the vegetative growth. The observations of germination as influenced by different levels of foliar spray of Plant Growth regulators are tabulated. Among the different treatments of plant growth regulator the maximum no of days taken to germinate was recorded in T₀ (Control) in variety TMRG 1509 (7.45) with germination % of (77.78%) and Minimum No. of days was recorded in variety Aneeta with Treatment GA3 200 ppm (5.47) with germination % of (100%).

Seed Index

The Maximum Seed Index was recorded in the variety TMRG 1509 with Treatment GA3 200 ppm (13.00) followed by variety Aneeta with Treatment NAA 100 ppm (12.80) and Minimum was recorded in the variety TMRG with Treatment GA3 200 ppm (10.53). Further, Gedam *et al.*, (1996) [31] reported significantly higher number of seeds, 100 seed weight and vigour index by spraying of NAA at 100 ppm as compared to control in bitter gourd.

Fruit Weight

The Maximum Fruit Weight (g) was recorded in the Variety Aneeta with Treatment Ethrel 100 ppm(170.63g) followed by variety Aneeta with Treatment GA3 200 ppm(159.47g) and Minimum was recorded in the variety TMRG – 1509 control treatment (99.17g). An increase in fruit weight may be attributed to the reason that plant remained physiologically more active to build up sufficient food stock

for developing flowers and fruits, ultimately leading to higher fruit weight, number of fruits/vine and yield. These findings are in conformity with those of Kshirsagar *et al.* (1996) [25] in cucumber, Kumar *et al.* (2006) [26, 27] in bottle gourd and Jadav *et al.* (2010) [28] in cucumber.

Fruit Length

The Maximum Fruit Length (cm) was recorded in the Variety TMRG 1509 with Treatment GA3 200 ppm (30.03cm) followed by variety TMRG 1509 with Treatment Ethrel 200 ppm (29.67cm) and Minimum was recorded in the variety Aneeta control treatment (21.67 cm). The fruit and seed traits were also highest in GA3 treated plants which could be due to better enzyme induction and endogenous synthesis of growth regulators. Similar findings were reported by (Akter and Rahman 2010) [30].

Fruit Girth

The Maximum Fruit Girth (mm) was recorded in the Variety Aneeta with Treatment GA3 200 ppm (39.67 mm) followed by Ethrel 100 ppm (38.33 mm) and Minimum was recorded by Variety Aneeta control Treatment (28.80 mm). The beneficial effect of Ethrel on fruit girth may be explained as that exogenous application of Ethrel increased endogenous levels of Auxins. The enlargement of cells of the fruit by Auxins is diametric leading to the simultaneous increase in fruit diameter. Similar result are reported by Kumari *et al.* (2019) [32].

Male Flower Initiation

The maximum days to male flower initiation was recorded in the variety TMRG-1509 control Treatment (37.67) followed by NAA 200 ppm (37.33) and minimum was recorded by variety Aneeta with Treatment GA3 200 ppm (30.67). These results are conformity with the findings of Ghosh and Basu (1982) [33] who reported that GA3 40 ppm and Ethrel 25 ppm applied at 8-10 leaf stage increased female flowers and suppressed male flowers in bitter gourd cv. Karela.

Female Flower Initiation

The maximum days to female flower initiation was recorded in the variety TMRG-1509 control Treatment (44.33) followed by NAA 200 ppm (44.13) and minimum was recorded by variety Aneeta with Treatment GA3 200 ppm (37.67). Certain growth regulating chemicals viz., NAA, GA3 and 2,4-D have been reported to influence sex expression in various cucurbits, leading to either suppression of male flowers or an enhancement in the number of female flowers. Similar findings are reported by (Dashora and Jain, 1994) [29].

Fruit Yield Per Vine

The maximum fruit yield per Vine was recorded in the variety Aneeta with Treatment Ethrel 200 ppm (2.23kg) and Minimum was recorded in variety TMRG- 1509 (1.17 Kg) control Treatment. The increase in no. of fruit set per plant might probably due to the treatment which suppressed male flower production and promoted female flower production, ultimately higher numbers of fruits per plant were harvested. The results are in conformity with the findings of Kumar and Rao (2019) [1] who have recorded foliar spray of ethrel 100 ppm and NAA 100 ppm increased number of fruit per

plant in ridge gourd. Similar findings are found in Singh and Choudhary (2014) [6].

Quality parameters

Total soluble solid

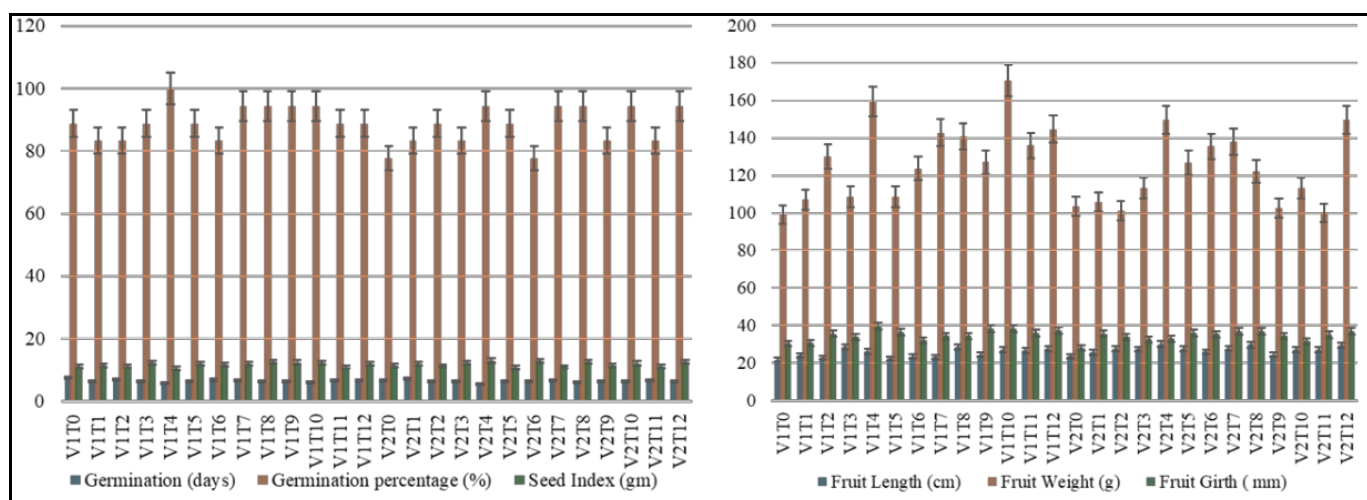
The Maximum TSS was recorded in the variety Aneeta with Treatment GA3 200 ppm (1.43) followed by Variety TMRG with Treatment NAA 200 ppm (1.42) and Minimum was recorded in Aneeta control Treatment (1.24). The increase in TSS. In the fruits seems probably due to accumulation of metabolites which stimulated functioning of a number of enzymes in physiological process. Which turns, hydrolized starch and helped in the metabolic activity during the

change of available starch into sugar and T.S.S. Similar findings was reported Randhawa (1974) [34] in muskmelon.

Ascorbic Acid: The Maximum Ascorbic Acid was recorded in the variety Aneeta with Treatment GA3 200 ppm (11.23) followed by variety TMRG- 1509 with Treatment NAA 150 ppm (11.20) and Minimum was recorded in the variety Aneeta with Treatment NAA 50 ppm (9.50). Plant growth regulators can stimulate metabolic pathways involved in the synthesis of various compounds, including ascorbic acid. They can enhance enzyme activity and gene expression related to the biosynthesis of ascorbic acid, leading to its increased production.

Table 1: Performance of Ridge gourd (*Luffa acutangula*) for different dose of Plant growth regulators.

Treatments	Germination (days)	Seed Index (g)	Fruit Length (cm)	Fruit Weight (g)	Fruit Girth (mm)	Male flower initiation (Days)	Female flower initiation (Days)	Total Soluble Solid (Brix)	Ascorbic Acid (mg)	Fruit Yield per Vine (Kg)
V1T ₀	7.45	11.07	21.67	99.17	30.33	34.33	41	1.26	9.77	1.22
V1T ₁	6.45	11.47	24.13	107.13	30.67	33.33	40.33	1.31	10.57	1.36
V1T ₂	6.89	11.23	22.90	130.33	35.67	33.00	40.00	1.30	10.73	1.71
V1T ₃	6.44	12.27	28.47	108.63	34.00	35.00	42.00	1.34	10.87	1.52
V1T ₄	5.78	10.53	26.27	159.47	39.67	30.67	37.67	1.43	11.23	1.77
V1T ₅	6.22	12.03	22.23	108.63	36.33	34.00	41.33	1.28	10.50	1.41
V1T ₆	6.78	11.67	23.40	123.77	32.00	35.00	42.00	1.34	10.87	1.55
V1T ₇	6.67	11.93	23.33	142.93	34.33	34.33	41.33	1.28	11.20	1.75
V1T ₈	6.22	12.47	28.30	140.97	34.33	36.33	43.33	1.42	10.27	1.72
V1T ₉	6.44	12.43	24.43	127.10	38.33	33.67	40.67	1.35	10.53	1.57
V1T ₁₀	6.11	12.20	27.27	170.63	38.33	34.67	41.67	1.28	10.40	1.97
V1T ₁₁	6.67	10.93	26.67	136.10	36.00	33.00	40.00	1.38	10.67	1.68
V1T ₁₂	6.56	11.87	27.60	144.77	37.33	34.00	41.00	1.33	10.47	2.23
V2T ₀	6.66	11.43	23.67	103.47	28.00	37.67	44.33	1.24	10.47	1.17
V2T ₁	7.22	11.93	25.63	105.83	35.67	34.33	42.33	1.29	10.40	1.17
V2T ₂	6.44	11.27	27.67	101.23	34.00	32.00	39.00	1.28	10.10	1.24
V2T ₃	6.33	12.33	27.33	113.40	32.67	35.00	42.00	1.36	10.43	1.46
V2T ₄	5.45	13.00	30.03	149.50	33.00	33.00	41.00	1.30	11.00	1.91
V2T ₅	6.45	10.87	27.43	126.90	36.00	33.00	40.00	1.34	9.50	1.49
V2T ₆	6.34	12.80	25.93	135.67	35.33	35.33	42.33	1.27	10.23	1.63
V2T ₇	6.56	10.97	27.77	138	36.67	31.33	38.33	1.35	10.13	1.63
V2T ₈	6.00	12.53	29.67	122.27	36.67	37.33	44.13	1.27	10.63	1.28
V2T ₉	6.44	11.40	24.37	102.50	34.33	35.33	42.33	1.28	10.27	1.39
V2T ₁₀	6.44	12.13	27.27	113.47	31.67	33.33	40.33	1.29	10.40	1.39
V2T ₁₁	6.55	11.13	26.97	100.10	35.00	33.33	40.33	1.30	9.90	1.20
V2T ₁₂	6.22	12.60	29.47	149.63	37	36.33	44.00	1.27	10.67	1.98
S.E.	0.603	0.965	2.097	29.865	3.731	2.549	2.542	0.069	0.872	0.105
C.D.	1.212	1.940	4.213	59.962	7.494	5.121	5.105	0.140	1.751	0.211



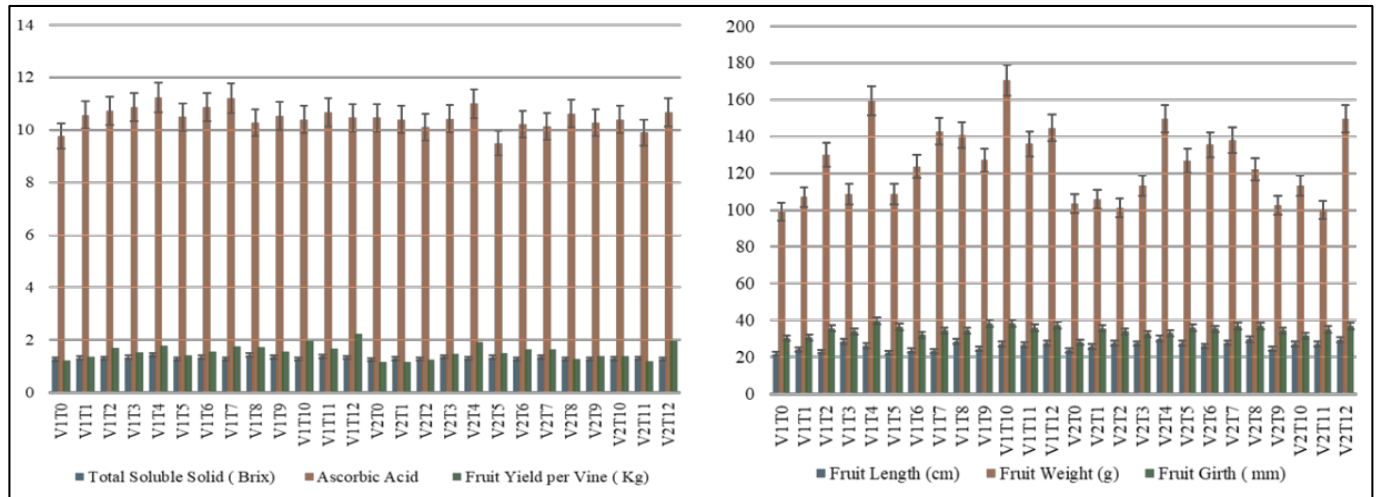


Fig 1: Performance of Ridge gourd (*Luffa acutangula*) for different dose of Plant growth regulators

Conclusion

From the present investigation, it was concluded that the influence of Plant growth Regulator with different combinations played their significant effect on, growth, yield and quality of Ridge gourd. Variety Aneeta and treatment GA3 200 ppm was recorded best in Vine length, Fruit per vine, average fruit weight, fruit girth, No. of fruit per plant, TSS, Ascorbic Acid, Yield per Vine with Net Return of (Rs. 494032.5) with Benefit Cost Ratio (3.92).

Reference

- Aishwarya K, Syam SRP, Syed S, Ramaiah M, Rao SG. Influence of plant growth regulators and stage of application on sex expression of bitter gourd (*Momordica charantia* L.) cv. Vk-1-Priya. *Plant Archives*. 2019;19(2):3655-3659.
- Baqi A, Manohar RK, Shankar AG. Effect of GA3 and NAA with pruning levels on growth, sex expression and yield attributes of cucumber (*Cucumis sativus* L. Malini F1) under protected condition. *International Journal of Chemical Studies*. 2018;6(4):1991-1996.
- Ansari AM, Chowdhary BM. Effect of boron and plant growth regulators on bottle gourd [*Lagenaria siceraria*]. *Journal of Pharmacognosy and Phytochemistry*. 2018;1:202-206.
- Acharya SK, Thakar C, Brahmabhatt, Joshi N. Effect of plant growth regulators on cucurbits. *Journal of Pharmacognosy and Phytochemistry*. 2020;9(4):540-544.
- Barholia AK, Gurjar PKS, Singh L, Lekhi R, Vasure N, Haldar A, *et al*. Effect of plant growth regulators on cucumber (*Cucumis sativus* L.) under protected cultivation in Madhya Pradesh, India. *Ecology, Environment and Conservation*. 2017;23(Suppl. Issue):85-90.
- Choudhary BR, Kumar S, Sharma SK. Evaluation and correlation for growth, yield and quality traits of ridge gourd (*Luffa acutangula*) under arid conditions. *Indian Journal of Agricultural Sciences*. 2014;84(4):498-502.
- Chaurasiya J, Verma RB, Ahmad M, Adarsh A, Kumar R, Pratap T. Influence of plant growth regulators on growth, sex expression, yield and quality of muskmelon (*Cucumis melo* L.). *Ecology, Environment & Conservation*. 2016;22
- Dubale MM, Jalgaonkar VN, Golvankar GM. Evaluation of insecticides in the management of fruit flies infesting ridge gourd. *International Journal of Chemical Studies*. 2018;6(5):2428-2432.
- Dinesh A, Prasanth P, Lakshminarayana D, Nagaraju K, Gouthami P. Efficacy of plant growth regulators on growth and flowering of cucumber (*Cucumis sativus* L.) cv. Malini under shade net conditions. *International Journal of Current Microbiology and Applied Sciences*. 2019;8(09):313-317.
- Devi YR, Madhanakumari P. Effect of plant growth regulators on flowering and yield of muskmelon (*Cucumis melo* L.). *Plant Archives*. 2015;15(2):899-901.
- Dalai S, Singh MK, Singh KV, Kumar M, Malik S, Kumar V. Effect of foliar application of GA3 and NAA on growth, flowering, yield and yield attributes of cucumber (*Cucumis sativus* L.). *Annals of Horticulture*. 2015;8(2):181-194.
- Gosai S, Adhikari S, Khanal S, Bahadur P. Effects of plant growth regulators on growth, flowering, fruiting and fruit yield of cucumber (*Cucumis sativus* L.). *Archives of Agriculture and Environmental Science*. 2020;5(3):268-274.
- Ghani MA, Amjad M, Iqbal Q, Nawaz A, Ahmad T. Efficacy of plant growth regulators on sex expression, earliness and yield components in bitter gourd. *Pakistan Journal of Life and Social Science*. 2013;11(3):218-224.
- Hidayatullah T, Mahmood M, Farooq MA, Khokhar SI, Hussain SI. Plant growth regulators affecting sex expression of bottle gourd (*Lagenaria siceraria* Molina) plants. *Pakistan Journal of Agriculture Research*. 2012;25(1):50-54.
- Hirpara AJ. Effects of plant growth regulators on flowering, fruiting and fruit yield in bitter gourd (*Momordica charantia* L.). *Journal of Pure and Applied Microbiology*. 2015;9(4):3099.
- Jyoti S, Patel NB, Patel JB. Effect of growth regulators and stages of spray on seed yield and seed quality parameters of ridge gourd (*Luffa acutangula* Roxb). *Journal of Applied and Natural Science*. 2016;8(3):1551-1555.
- Krishnamoorthy V. Evaluation of ridge gourd (*Luffa acutangula* Roxb) hybrids during summer season for growth, yield and quality traits. *Asian Journal of Horticulture*. 2019;14(2):17-22.

18. Kore VN, Khade HP, Nawale RN, Patil RS. Effect of growth regulators on growth, flowering and yield of bottle gourd variety Samrat under Konkan conditions. *Journal of Soils and Crops*. 2013;13:18-21.
19. Rosales RJG, Galinato RG. Effect of gibberellic acid on the flowering and yield performance of hybrid variety of *Momordica charantia*. *International Journal of Research in Agricultural Sciences*. 2018;5(6):2348-3997.
20. Roopa V, Syed SS, Sundar SRP, Kadiri L. Effect of growth regulators on morphological parameters, phenology, yield attributes and yield of muskmelon under graded levels of moisture stress. *International Journal of Current Microbiology and Applied Sciences*. 2020;9(11):983-990.
21. Sood M, Indiresk KM, Harshitha S. Variability and heritability studies for horticultural traits in ridge gourd. *International Journal of Bio-resource and Stress Management*. 2019;10(4):335-339.
22. Sha K, Seerangan GS. Effect of plant growth regulators and micronutrients on growth and yield of ridge gourd (*Luffa acutangula* L.) cv. PKM-1. *Bulletin of Environment, Pharmacology and Life Sciences*. 2019;8(5):95-98.
23. Thappa M, Kumar S, Rafiq R. Influence of plant growth regulators on morphological, floral and yield traits of cucumber (*Cucumis sativus* L.). *Kasetsart Journal (Natural Science)*. 2011;45:177-188.
24. Hazra B, Dutta S, Kumar S. TOC calculation of organic matter rich sediments using Rock-Eval pyrolysis: Critical consideration and insights. *International Journal of Coal Geology*. 2017 Jan 2;169:106-115.
25. Kshirsagar A. Anthrosols from Balathal: A chemical study. *Man and Environment*. 1996;21(1):111-6.
26. Gill AB, Kimber JA. The potential for cooperative management of elasmobranchs and offshore renewable energy development in UK waters. *Journal of the Marine Biological Association of the United Kingdom*. 2005 Oct 1;85(5):1075-1081.
27. Kumar A, Roberts D, Wood KE, Light B, Parrillo JE, Sharma S, Suppes R, Feinstein D, Zanotti S, Taiberg L, Gurka D. Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. *Critical care medicine*. 2006 Jun 1;34(6):1589-1596.
28. Jadav OP, Padamani DR, Polara KB, Parmar KB, Babaria NB. Effect of different level of sulphur and potassium on growth, yield and yield attributes of sesame (*Sesamum indicum* L.). *Asian Journal of Soil Science*. 2010;5(1):106-108.
29. Dashora LD, Jain PM. Effect of growth regulators and phosphorus levels on growth and yield of soybean. *Madras Agric. J*. 1994;81:235-237.
30. Akter S, Rahman MM. Duration of breastfeeding and its correlates in Bangladesh. *Journal of health, population, and nutrition*. 2010 Dec;28(6):595.
31. Gedam VM, Patil RB, Suryawanshi YB, Mate SN. Seed quality as influenced by growth regulators in bitter gourd. *Seed Res*. 1996;24:158-159.
32. Kumari B, Mallick MA, Solanki MK, Solanki AC, Hora A, Guo W. Plant growth promoting rhizobacteria (PGPR): modern prospects for sustainable agriculture. *Plant Health Under Biotic Stress: Volume 2: Microbial Interactions*; c2019. p. 109-127.
33. Ghosh S, Basu PS. Effect of some growth regulators on sex expression of *Momordica charantia* L. *Scientia Horticulturae*. 1982 Jun 1;17(2):107-112.
34. Randhawa KS, Singh D. Influence of Nitrogen, Phosphorus, Potassium and Planting Distance on the Maturity and Yield of Onion (*Allium Cepa* L.). *Indian journal of horticulture*. 1974;31(1):66-68.