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Effect of plant growth regulators on yield attributes and B:C ratio of ridge gourd (*Luffa acutangula* L. Roxb)

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Abstract

The present investigation was carried out during the Rabi season of 2024-25 at the Centre of Excellence on Protected Cultivation and Precision Farming Unit, College of Agriculture, IGKV, Raipur (C.G). The experiment was conducted to evaluate the influence of various plant growth regulators and their combinations on yield and yield attributes of ridge gourd. The experiment was laid out in a Randomized Block Design (RBD) with ten treatments and three replications. The treatments comprised GA_3 (25 ppm and 50 ppm), Ethrel (150 ppm and 200 ppm), Paclobutrazol (150 ppm) and their combinations, along with a control. Standard agronomic practices were followed uniformly across all treatments. Observations were recorded on fruit characteristics, yield and economic return. Results revealed that the application of plant growth regulators (PGRs) significantly influenced the reproductive behavior of ridge gourd. Significantly higher fruit-setting percentage (29.90%), average fruit weight (199.53 g), fruit length (53.30 cm) and fruit diameter (6.52 cm) were also recorded under Ethrel 200 ppm + Paclobutrazol 150 ppm, resulting in the maximum fruit yield of 409.67 q/ha and the highest benefit-cost ratio (4.44). The second-best treatment was Ethrel 150 ppm + Paclobutrazol 150 ppm, which also exhibited favorable yield performance. It is concluded that the combined foliar application of Ethrel 200 ppm + Paclobutrazol 150 ppm proved to be the most effective treatment for achieving optimum higher yield and maximum economic return in ridge gourd under the agro-climatic conditions of Chhattisgarh. The treatment increased fruit yield making it suitable for profitable cultivation of ridge gourd during the Rabi season.

Keywords: Ridge gourd, plant growth regulators, Ethrel, paclobutrazol, GA_3, fruit yield

Introduction

Ridge gourd (*Luffa acutangula* L. Roxb.), 2n=2x=26, is one of the important cucurbitaceous vegetable crops with old world origin in subtropical Asian region including particularly India (Kalloo, 1993) [5]. Tropical nations in Asia and Africa have traditionally cultivated this crop. Growth regulators are crucial for both the morphology and physiology of plants. Plant species, varieties, and development stages, as well as application techniques, chemical concentrations, and frequency of treatment, all affect how a plant growth regulator works. When administered in modest doses, plant growth regulators, which are regarded as a new generation of agri-chemicals modify plant development, often by boosting or altering one aspect of the natural growth regulatory system, increasing output. Cucurbits are the major group of vegetables which are grown all over the world and they are responsive crops towards the growth regulator. PGR's play vital or key role in increasing growth, yield and quality. Paclobutrazol works by inhibiting the oxidation of entkaurene to entkauronoic acid through the inactivation of cytochrome P450 dependent oxygenase (Desta and Amare, 2021) [2]. According to Gerdakaneh *et al.* (2018) [23], paclobutrazol showed a significant effect by suppressing the number of male flowers compared to control. Paclobutrazol could increase the number of female flowers and metabolic activity that leads to a higher metabolite translocation from the source to the fruits, resulting in the better fruit development. Gibberellic acid is an important growth regulator which may have many uses to modify the growth, yield and yield contributing characters of plant (Rashid *et al*., 2023, Yadav *et al*., 2024) [16, 24]. The utilization of GA3 at a reduced concentration has an impact on plant development and enhances growth metrics, such as the quantity of male flowers and the on set of the first male flower (Rajbhar *et al*., 2023) [15]. Though the GA3 have great potentialities to influence plant growth morphogenesis (Meshram *et al*., 2020) [12], its application and accrual assessments have to be judiciously planned in terms of optimal concentrations, stage of application etc. Ethylene as a natural growth regulator has been implicated in several developmental processes of plants (Pratt and Goeschl, 1969). Since the ethylene-releasing property of Ethrel (2- chloroethylphosphonic acid) (ethephon) has been reported (Warner and Leopold, 1969; Yang, 1969) [23, 25] much evidence has demonstrated its ability to alter sex expression in a number of cucurbits. In most instances it was applied either on seedlings (Lwahori *et al*., 1969; Rudich *et al*., 1969) [10, 17] or as a pre-flowering spray (Karchi, 1970; Karchi and, Govers, 1972) [6, 7]. An increased female flower production is directly associated with better fruit set and yield enhancement, the strategic application of PGRs offers a promising and practical approach to boosting ridge gourd production.

Materials and Methods

During the Rabi Season of 2024-2025, the experiment was carried out at the Center of Excellence on Protected Cultivation and Precision Farming Unit, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The experimental material utilized is the ridge gourd hybrid Arka Vikram for planting purposes. The sowing of seeds occurred on 15 November 2024. Recommended fertilizers and additional cultural procedures were implemented to enhance crop development. From each plot, five plants were chosen at random, and the following observations were noted. The average value of each observation was calculated on the basis of five plants in every replication. The experiment was set up in a randomized block design with three replications and ten treatments. Following treatments were applied T_1: GA3 @ 25 ppm, T_2: GA3 @ 50 ppm, T_3: Ethrel @ 150 ppm, T_4: Ethrel @ 200 ppm, T_5: Paclobutrazol @ 300 ppm, T_6: GA3 @ 25 ppm + Paclobutrazol @ 300 ppm, T_7: GA3 @ 50 ppm + Paclobutrazol @ 300 ppm, T_8: Ethrel @ 150 ppm + Paclobutrazol @ 300 ppm, T_9: Ethrel @ 200 ppm + Paclobutrazol @ 300 ppm and T_{10}: Control (Water spray). At 45, 60, and 75 days after transplanting, as well as at harvest, observations were made. Every observation was examined statistically.

Results and Discussion

Among all the treatments, the maximum number of fruits per flower bunch (3.85) was recorded in Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9), followed by Ethrel 150 ppm + Paclobutrazol 150 ppm (T_8) with 3.58 fruits per bunch and Ethrel 150 ppm (T_3) with 3.18 fruits per bunch. The minimum number of fruits per bunch (1.53) was observed in control (T_{10}), closely followed by GA_3 50 ppm (T_2) (1.86 fruits per bunch). The GA3 (T_1) recorded an intermediate value of 2.58 fruits per bunch. The superiority of Ethrel based treatments, particularly in combination with Paclobutrazol, may be attributed to the role of ethylene in enhancing female flower formation and increasing fruit set percentage. Ethrel promotes the conversion of male to female flowers and improves pollen receptivity, leading to better fertilization and fruit development. Moreover, the inclusion of Paclobutrazol, a growth retardant, likely improved assimilate partitioning toward reproductive organs, thereby enhancing fruit retention. In contrast, treatments with GA_3 alone resulted in fewer fruits per bunch. This reduction might be due to the promotion of vegetative growth at the expense of reproductive growth, as gibberellins are known to favor stem elongation and leaf expansion rather than reproductive differentiation. Excessive vegetative vigor may also lead to shading and competition among developing fruits, thereby lowering fruit set.

The maximum number of fruits per plant (14.85) was recorded in Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9), followed closely by Ethrel 150 ppm (T_3) with 14.77 fruits and Ethrel 150 ppm + Paclobutrazol 150 ppm (T_8) with 14.62 fruits. These treatments consistently produced higher fruit numbers compared to all GA_3 treatments. GA_3 based treatments, although efficient in increasing overall flowering, resulted in comparatively fewer fruits. GA_3 25 ppm (T_1) and GA_3 50 ppm (T_2) produced 12.85 and 12.56 fruits per plant, respectively. This reduction may be due to a higher proportion of male flowers and a delay in reproductive transition associated with GA_3 application, which limits the number of effective fruit-bearing nodes. The control (T_{10}) recorded the lowest number of fruits (10.69), indicating the positive impact of PGRs on enhancing reproductive efficiency in ridge gourd. The enhanced performance of Ethrel and its combinations may be attributed to the ethylene-mediated increase in female flower production and improved fruit setting ability, which is consistent with earlier observations in Tables 4.11 (female flowers). Paclobutrazol further supported fruit retention by regulating excessive vegetative growth and promoting carbohydrate allocation towards reproductive organs. The significant improvement in fruit numbers under Ethrel and Paclobutrazol treatments highlights their role in shifting the sex ratio toward female flowers and improving fruit set, which directly contributes to increased yield. These findings are in close agreement with the reports of Sure *et al*. (2013) in pumpkin, Kumari *et al*. in bottle gourd, Barot *et al*. (2022) [1] in bottle gourd, Sabu *et al*. (2022) [18] in bottle gourd and Madhani *et al*. (2025) [11] in ridge gourd, who observed that Ethrel treatments significantly increased the number of fruits per plant in ridge gourd and other cucurbits, whereas GA_3 applications promoted vegetative growth and delayed flowering, thereby reducing fruit production. The highest fruit-setting percentage (29.90%) was recorded in GA_3 50 ppm + Paclobutrazol 150 ppm (T_7), followed closely by GA_3 25 ppm + Paclobutrazol 150 ppm (T_6) with 29.42% and GA_3 25 ppm (T_1) with 29.07%. Among the individual treatments, Paclobutrazol 150 ppm (T_5) also showed a moderate fruit-setting percentage (26.75%), which was higher than Ethrel-based treatments. In contrast, the lowest fruit setting was recorded in Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9) with 22.91%, followed by Ethrel 150 ppm (T_3) with 24.12%. The control (T_{10}) recorded 27.26% fruit setting, which was lower than the best-performing GA_3 + Paclobutrazol treatments but higher than the Ethrel-based treatments. The lower fruit-setting percentage under Ethrel treatments may be attributed to a higher ratio of female flowers but reduced pollination efficiency or flower drop, as Ethrel tends to suppress overall flower number. These results suggest that the combined application of GA_3 and Paclobutrazol was more effective in enhancing fruit set than their individual application. Paclobutrazol likely helped in maintaining a balance between vegetative and reproductive growth, while GA_3 enhanced reproductive activity by improving flower development and pollination efficiency. These results are consistent with the findings of Trinadh *et al.* (2022) [22] in ivy gourd reported that GA_3 treatments favored vegetative growth at the expense of reproductive development and higher GA_3 concentration significantly outnumbered the fruit setting percentage. The highest fruit weight (198.22 g) was recorded under Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9), closely followed by Ethrel 150 ppm + Paclobutrazol 150 ppm (T_8) with 195.82 g and Ethrel 200 ppm (T_4) with 194.82 g. Paclobutrazol alone (T_5) also performed well, producing an average fruit weight of 189.79 g, which was considerably higher than GA_3 treatments. In contrast, the lowest fruit weights were recorded in GA_3 50 ppm + Paclobutrazol 150 ppm (T_7) (162.43 g) and the control (161.97 g). Among all the treatment, data indicate that the combination of Ethrel and Paclobutrazol, particularly Ethrel 200 ppm + Paclobutrazol 150 ppm, was most effective in improving average fruit weight, highlighting their beneficial role in enhancing fruit development and quality in ridge gourd. These results clearly show that Ethrel, especially in combination with Paclobutrazol, was highly effective in enhancing fruit size. This improvement may be attributed to better fruit setting, increased accumulation of assimilates, and reduced vegetative growth, allowing more photosynthates to be diverted towards fruit development. GA_3 treatments, both alone and in combination, resulted in comparatively lower fruit weight, possibly due to excessive vegetative growth and reduced assimilate allocation to developing fruits. These findings are closely align with the observations of Madhani *et al.* (2025) [11] in ridge gourd and Sanjeeva *et al.* (2025) [19], who reported that Ethrel treatments enhanced fruit size and weight in cucurbitaceous crops by promoting a favorable source sink relationship and improving translocation of photosynthates toward developing fruits.The maximum fruit length (53.30 cm) was recorded under Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9), followed closely by Ethrel 150 ppm + Paclobutrazol 150 ppm (T_8) with 52.40 cm and Paclobutrazol 150 ppm (T_5) with 51.40 cm. These treatments consistently produced the longest fruits, suggesting that Ethrel, either alone or in combination with Paclobutrazol, was highly effective in enhancing fruit elongation. Ethrel alone also performed well, with Ethrel 200 ppm (44.65 cm) and Ethrel 150 ppm (43.67 cm) producing significantly longer fruits than GA_3 treatments and the control. Moderate fruit lengths were recorded in GA_3 50 ppm + Paclobutrazol 150 ppm (42.98 cm) and GA_3 25 ppm + Paclobutrazol 150 ppm (38.60 cm). The shortest fruit lengths were recorded under GA_3 treatments, GA_3 50 ppm (33.40 cm) and GA_3 25 ppm (34.54 cm), which were only slightly higher than the control (30.83 cm). Paclobutrazol's growth-regulating action likely contributed by reducing excessive vegetative growth and improving assimilate distribution to the developing fruits. Overall, the results indicate that Ethrel 200 ppm + Paclobutrazol 150 ppm was the most effective treatment for increasing fruit length, followed by Ethrel 150 ppm + Paclobutrazol 150 ppm. These findings highlight the superiority of Ethrel-based treatments for improving fruit size characteristics in ridge gourd by promoting cell elongation and cell division. Shortest fruit length in GA3 may be due to the tendency of GA_3 to enhance vegetative growth, which can limit the allocation of assimilates towards fruit elongation. These findings are in agreement with the results of Nagamani *et al.* (2015) [13] in bitter gourd, Sinojiya *et al.* (2015) [20] in watermelon, Barot *et al.* (2022) [1] in bottle gourd, Sabu *et al.* (2022) [18] in bottle gourd and Madhani *et al.* (2025) [11] in ridge gourd, who reported that Ethrel and Paclobutrazol treatments improved fruit length in cucurbitaceous crops by enhancing reproductive efficiency and directing more assimilates toward fruit development. The highest fruit diameter (6.52 cm) was recorded under Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9), followed by Ethrel 150 ppm + Paclobutrazol 150 ppm (T_8) with 6.33 cm and Paclobutrazol 150 ppm (T_5) with 6.11 cm. Ethrel alone also performed well, with Ethrel 200 ppm (5.97 cm) and Ethrel 150 ppm (5.81 cm) producing significantly higher fruit diameters compared to GA_3 treatments and the control. Moderate fruit diameters were recorded under GA_3 25 ppm + Paclobutrazol 150 ppm (5.18 cm) and GA_3 50 ppm + Paclobutrazol 150 ppm (5.04 cm). In contrast, GA_3 alone produced the smallest fruit diameters among treated plots, with GA_3 25 ppm (4.49 cm) and GA_3 50 ppm (4.17 cm), only slightly higher than the control (3.74 cm). This indicates that GA_3 was less effective in increasing fruit girth compared to Ethrel and Paclobutrazol-based treatments. Among all the treatment it clearly showed that Ethrel 200 ppm + Paclobutrazol 150 ppm was the most effective treatment for maximizing fruit diameter, followed by the combination of Ethrel 150 ppm + Paclobutrazol 150 ppm. These findings highlight the superiority of Ethrel and Paclobutrazol treatments for improving fruit size in ridge gourd under the present conditions. These treatments consistently produced the thickest fruits, indicating that Paclobutrazol, either alone or in combination with Ethrel, was highly effective in enhancing fruit girth. These observations align with the findings of Nagamani *et al.* (2015) [13] in bitter gourd, Sinojiya *et al.* (2015) [20] in watermelon, Barot *et al.* (2022) [1] in bottle gourd, Sabu *et al.* (2022) [18] in bottle gourd and Madhani *et al.* (2025) [11] in ridge gourd, reported that Ethrel and Paclobutrazol significantly increased fruit girth in cucurbitaceous crops by enhancing reproductive efficiency and optimizing source-sink relationships. The maximum fruit weight per plant (2.95 kg) was recorded under Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9), which was closely followed by Ethrel 150 ppm + Paclobutrazol 150 ppm (T_8) with 2.87 kg and Ethrel 200 ppm (T_4) with 2.70 kg. Paclobutrazol alone (T_5) also recorded a higher fruit weight (2.55 kg), which was superior to GA_3 based treatments. In contrast, GA_3 treatments, whether alone or in combination, resulted in comparatively lower fruit weights, with GA_3 25 ppm (2.19 kg) and GA_3 50 ppm (2.07 kg) producing substantially less fruit weight than Ethrel and Paclobutrazol treatments. The lowest fruit weight was recorded in the control (T_{10}) with only 1.74 kg per plant, demonstrating the significant enhancement in yield due to PGR application. These results show that Ethrel, especially in combination with Paclobutrazol, was highly effective in increasing fruit weight. This may be attributed to improved fruit set, better fruit size, and a favorable balance between vegetative and reproductive growth. These findings are in close agreement with those reported by Kumari *et al* in-bottle gourd, Barot *et al.* (2022) [1] in bottle gourd, Sabu *et al.* (2022) [18] in bottle gourd and Madhani *et al.* (2025) [11] in ridge gourd, who observed that Ethrel and Paclobutrazol treatments significantly increased fruit yield per plant in ridge gourd and other cucurbits due to improved fruit set and fruit development. The maximum number of seeds per fruit (74.25) was recorded under Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9), followed closely by Ethrel 150 ppm + Paclobutrazol 150 ppm (T_8) with 72.95 seeds and Paclobutrazol 150 ppm (T_5) with 71.73 seeds. Ethrel alone also performed well, with Ethrel 150 ppm (67.26) and Ethrel 200 ppm (64.65) producing significantly higher seed numbers compared to GA_3 treatments and the control. Treatments involving GA_3, either alone or in combination, produced relatively fewer seeds per fruit, ranging from 58.32 to 60.61 seeds. The lowest number of seeds per fruit (54.94) was observed in the control (T_{10}), highlighting the positive effect of PGRs in improving reproductive efficiency and seed development. Overall, the results suggest that Ethrel 200 ppm + Paclobutrazol 150 ppm was the most effective treatment in enhancing seed number per fruit, followed by Ethrel 150 ppm + Paclobutrazol 150 ppm and Paclobutrazol 150 ppm. These treatments significantly promoted better fruit development, resulting in higher seed formation. These treatments consistently produced higher seed numbers, indicating that Ethrel and Paclobutrazol, individually and in combination, enhanced seed development. Ethrel likely improved pollination efficiency through increased female flowers, while Paclobutrazol supported better assimilate partitioning towards developing fruits. These findings are consistent with those of Hilli *et al*. (2010) [4] and Nagamani *et al*. (2015) [13], who reported that Ethrel and Paclobutrazol treatments significantly enhanced seed number, fruit set and reproductive efficiency in cucurbits and other vegetable crops through improved hormonal equilibrium and photosynthate translocation.

The highest fruit yield (409.67 q/ha) was recorded in Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9), which proved to be the most effective treatment. This superior performance may be attributed to enhanced female flower formation, improved fruit set percentage, greater fruit size and increased number of fruits per plant, all of which directly contributed to higher yield followed by (398.41 q/ha) was observed in Ethrel 150 ppm + Paclobutrazol 150 ppm (T_8), Ethrel 200 ppm (374.42 q/ha) and Ethrel 150 ppm (357.71 q/ha). Paclobutrazol alone (354.29 q/ha) also showed a significant increase in yield over the control, demonstrating its positive role in improving fruit size, fruit diameter and total fruit weight per plant. In contrast, GA_3 treatments resulted in comparatively lower yields, with GA_3 25 ppm and GA_3 50 ppm producing 304.24 q/ha and 287.62 q/ha, respectively. The lowest yield was recorded in the control (241.51 q/ha), indicating that the application of PGRs significantly improved productivity. Overall, the results clearly demonstrate that Ethrel combined with Paclobutrazol, particularly Ethrel 200 ppm + Paclobutrazol 150 ppm, was most effective in maximizing fruit yield per hectare in ridge gourd under the given agro-climatic conditions. Treatments involving Ethrel consistently produced higher yields compared to GA_3 treatments and the control. Ethrel is known to suppress male flowers and encourage female flower production, leading to improved fruiting efficiency. When combined with Paclobutrazol, the yield potential was further enhanced, likely due to better assimilate distribution and reduced vegetative vigor. Although GA_3 promotes vegetative growth and elongation, it appears less effective in enhancing fruit yield, possibly due to its tendency to increase male flowers rather than female flowers. These findings are in close agreement with the reports Kumari *et al*. (2019) in bottle gourd, Barot *et al*. (2022) [1] in bottle gourd, Sabu *et al*. (2022) [18] in bottle gourd and Madhani *et al*. (2025) [11] in ridge gourd, who noted that the application of Ethrel and Paclobutrazol significantly improved fruit yield in cucurbits and other vegetable crops due to their positive effects on flowering behavior, fruit set and resource allocation efficiency.

The highest B:C ratio (4.44) was recorded in Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9), clearly demonstrating the superior profitability of this treatment. This high economic return can be attributed to the considerable increase in fruit yield per hectare, along with efficient resource utilization and improved fruiting behavior observed in this treatment. The treatment Ethrel 150 ppm + Paclobutrazol 150 ppm (T_8) also recorded a high B:C ratio of 4.33, followed by Ethrel 200 ppm (4.15) and Ethrel 150 ppm (3.98). These results highlight the economic advantage of Ethrel-based treatments, which promote increased female flower production, higher fruit set and greater total fruit yield, thereby improving overall returns.

Table 1: Effect of plant growth regulators on yield and yield attributing characters of Ridge Gourd

Treatment	Number of fruits/plants per flower bunch	Number of fruits per plant	Fruit setting percentage	Average single fruit weight (gm)	Average fruit length (cm)	Fruit diameter (cm)	Fruit weight per plant (kg)	Number of seeds per fruit	Fruit yield per hectare (q)	B:C Ratio
T_1	2.58	12.85	29.07	170.18	34.54	4.49	2.19	59.02	304.24	3.23
T_2	1.86	12.56	28.83	164.59	33.40	4.17	2.07	58.32	287.62	2.90
T_3	3.18	14.77	24.12	174.01	43.67	5.81	2.58	67.26	357.71	3.98
T_4	2.78	13.81	24.07	194.82	44.65	5.97	2.70	64.65	374.42	4.15
T_5	2.63	13.42	26.75	189.79	51.40	6.11	2.55	71.73	354.29	3.87
T_6	2.19	14.17	29.42	166.03	38.60	5.18	2.36	60.61	327.37	3.39
T_7	2.52	14.23	29.90	162.43	42.98	5.04	2.31	59.12	321.00	3.16
T_8	3.85	14.62	25.72	195.82	52.40	6.33	2.87	72.95	398.41	4.33
T_9	3.85	14.85	22.91	198.22	53.30	6.52	2.95	74.25	409.67	4.44
T_{10}	1.53	10.69	27.26	161.97	30.83	3.74	1.74	54.94	241.51	2.70
SEm (±)	0.18	0.48	1.17	6.79	2.54	0.21	0.17	2.05	24.00	0.26
CD (5%)	0.55	1.44	3.52	20.33	7.59	0.62	0.52	6.15	71.87	0.77
CV (%)	12.07	6.14	7.59	6.61	10.31	6.78	12.26	5.53	12.32	12.28

Conclusion

The experiment's overall results show that the type and concentration of plant growth regulators utilized had a substantial impact on the ridge gourd's reaction. When combined application of ethrel and paclobutrazol enhanced fruit set and increased yield and economical return. Therefore, in the agroclimatic conditions of Chhattisgarh during the Rabi season, the application of Ethrel 200 ppm + Paclobutrazol 150 ppm (T_9) was proven to be the most effective treatment for achieving better fruit production and maximum profitability.

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References

1. Barot DC, Pawar Y, Nadoda NA, Chaudhari VM. Response of bottle gourd (*Lagenaria siceraria* (Mol.) Standl.) to foliar application of plant growth regulators. The Pharma Innovation. 2022;11(12):2705-2707.
2. Desta B, Amare G. Paclobutrazol as a plant growth regulator. Chemical and Biological Technologies in Agriculture. 2021;8(1):1-15.
3. Gerdakaneh M, Hoseini F, Eftekharinasab N. Effect of paclobutrazol and NAA on sex determination and seed yield of medicinal pumpkin (*Cucurbita pepo* L.). International Journal of Horticultural Science and Technology. 2018;5(2):209-217.
4. Hilli JK, Vyakarnahal B, Biradar D, Hunje R. Effect of growth regulators and stages of spray on growth, fruit set and seed yield of ridge gourd (*Luffa acutangula* L. Roxb.). Karnataka Journal of Agricultural Sciences. 2010;23(2):239-242.
5. Kalloo G. Loofah-*Luffa* spp. In: Kalloo G, Bergh BO, editors. Genetic improvement of vegetable crops. Oxford: Pergamon Press; 1993. p. 265-266.
6. Karchi Z. Effects of 2-chloroethanephosphonic acid on flower types and flowering sequences in muskmelon. Journal of the American Society for Horticultural Science. 1970;95:515-518.
7. Karchi Z, Govers A. Effects of ethephon on vegetative and flowering behaviour in cucumber (*Cucumis sativus* L.). Journal of the American Society for Horticultural Science. 1972;97:357-360.
8. Kumar PS, Rao M, Tamang A, Kumar US. Effect of PGRs on growth, yield and quality attributes of watermelon (*Citrullus lanatus* Thunb.). Crop Research. 2022;57(5-6):375-379.
9. Kumari K, Kamalkant, Kumar R, Singh VK. Effect of plant growth regulators on growth and yield of bottle gourd (*Lagenaria siceraria* (Mol.) Standl.). International Journal of Current Microbiology and Applied Sciences. 2019;8(7):1881-1885.
10. Lwahori S, Lyons JM, Sims WL. Induced femaleness in cucumber by 2-chloroethanephosphonic acid. Nature. 1969;222:271-272.
11. Madhani DP, Patel KD, Sadare R, Jakhotra KK. Response of GA_3, NAA and ethrel on yield, quality and economics of ridge gourd (*Luffa acutangula* L.) cv. GRG-2. International Journal of Horticulture and Food Science. 2025;7(7):39-46.
12. Meshram LT, Sonkamble AM, Patil SR, Dahake LZ. Effect of plant growth regulators on growth and yield of watermelon. International Journal of Current Microbiology and Applied Sciences. 2020;11:529-534.
13. Nagamani S, Basu S, Singh S, Lal SK, Behera TK, Chakrabarty SK, Talukdar A. Effect of plant growth regulators on sex expression, fruit setting, seed yield and quality in bitter gourd (*Momordica charantia* L.). Indian Journal of Agricultural Sciences. 2015;85(9):1185-1191.
14. Pratt HK, Goeschl JD. Physiological roles of ethylene in plants. Annual Review of Plant Physiology. 1969;20:541-584.
15. Rajbhar P, Gurumurthy N, Mohd F, Singh AK, Singh SK. Effect of PGRs on cucurbits: an overview. International Journal of Environment and Climate Change. 2023;13(11):763-770.
16. Rashid MHA, Afroz M, Sony SK, Hossain MU. Role of plant growth regulators on seed germination performance of watermelon (*Citrullus lanatus*). Barishal University Journal of Biosciences. 2023;2:81-85.
17. Rudich J, Halevy AH, Kedar N. Increase of femaleness of three cucurbits by treatment with ethrel, an ethylene-releasing compound. Planta. 1969;86:76-82.
18. Sabu A, Kerketta A, Topno SE. Effect of different growth regulators on plant growth and yield of bottle gourd (*Lagenaria siceraria* L.) cv. Arka Bahar. International Journal of Plant and Soil Science. 2022;34(20):320-325.
19. Sanjeeva Y, Mallikarjun N, Shekharagouda P, Naik PV, NM SK. Synergistic effects of plant growth regulators and biostimulants on flowering and yield of ridge gourd (*Luffa acutangula* L.). Journal of Advances in Biology and Biotechnology. 2025;28(1):880-886.
20. Sinojiya AG, Kacha HL, Jethaloja BP, Giriraj J. Effect of plant growth regulators on growth, flowering, yield and quality of watermelon (*Citrullus lanatus* Thunb.) cv. Shine Beauty. Environment and Ecology. 2015;33(4A):1774-1778.
21. Sure S, Arooie H, Azizi M. Effect of GA_3 and ethephon on sex expression and oil yield in medicinal pumpkin (*Cucurbita pepo* var. *styriaca*). International Journal of Farming and Allied Sciences. 2013;2(9):196-201.
22. Trinadh P, Kumari KU, Jyothi KU, Sujatha RV, Paratpara M. Effect of foliar application of growth regulators and micronutrients on growth, reproductive yield and yield attributes of ivy gourd (*Coccinia grandis* L.). International Journal of Plant and Soil Science. 2022;34(10):325-330.
23. Warner HL, Leopold AC. Ethylene evolution from 2-chloroethylphosphonic acid. Plant Physiology. 1969;44:156-158.
24. Yadav P, Dhankhar SK, Mehar R. Use of growth regulators in vegetable crops. In: Pathania R, Jayasree V, Patel AJ, Sharma A, editors. Vegetable production: fundamentals and innovations. New Delhi: Stella International Publication; 2024. p. 110-128.
25. Yang SF. Ethylene evolution from 2-chloroethylphosphonic acid. Plant Physiology. 1969;44:1203-1204.