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Effect of Foliar Spray of Boron and Plant Growth Regulators on Hybrid Seed Yield and Quality of Ridge gourd

MANJULA*, SR DODDAGOUDAR, SN VASUDEVAN, NM SHAKUNTALA AND AR KURUBAR

Department of Seed Science and Technology, College of Agriculture,
University of Agricultural Sciences, Raichur, Karnataka - 584104, India
*manujambavathi@gmail.com

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ABSTRACT: An experiment was carried out in a randomized block design with three replications to study the effect of boron and plant growth regulators on hybrid seed yield and quality of ridge gourd. The experiment consisted of seven treatments *viz*., T_1: control, T_2: boron (1 g/l), T_3: boron (1 g/l) + GA_3 (50 ppm), T_4: boron (1 g/l) + NAA (0.3 ml/l), T_5: boron (1 g/l) + triacontanol (1.5 ml/l), T_6: boron (1 g/l) + homobrassinolide (0.5 ml/l) and T_7: boron (1 g/l) + humic acid (2 ml/l). The sprays were given at two to three leaves, peak flowering and fruit initiation stages. Among the various treatments imposed, T_3: boron (1g/l) + GA_3 (50 ppm) recorded significantly higher vine length (422.0 cm), number of fruits per plant (5.83), fruit length (26.9 cm), fruit diameter (15.5 cm), fruit weight (27.8 g), number of seeds per fruit (46.7), seed weight per fruit (5.4 g), 100 seed weight (11.60 g), hybrid seed yield (31.5 g/plant), (294.6 kg/ ha), seed germination (88.0 %), dehydrogenase enzyme activity (1.293 OD value), shoot length (27.5 cm), root length (15.1 cm), seedling dry weight (942 mg) and seedling vigour index (3749) compared to control (380.0 cm, 5.20, 25.0 cm, 14.0 cm, 23.7 g, 45.5, 4.9 g, 10.80 g, 25.6 g, 239.6 kg, 79 %, 0.096, 23.5 cm, 12.7 cm, 675 mg, 2860.0 and), respectively. Hence, it is concluded that foliar spray of boron (1g/l) + GA_3 (50 ppm) once at two to three true leaves, peak flowering and fruit initiation stage improved the seed yield and quality of ridge gourd.

Keywords: *Luffa acutangula*, Ridge gourd, Boron, Foliar spray stage, Plant growth regulators, Seed yield, Seed quality

Ridge gourd (*Luffa acutangula* L.*)* belongs to genus *Luffa* of Cucurbitaceous family is popularly known as "Hirekayi" in Kannada. It is also called as angled gourd, angled loofah, Chinese okra, silky gourd and ribbed gourd. Tender fruits are green in colour which are used in soups and curries or cooked as a vegetable. Fruit contain edible protein (82 %), protein 0.5 g, fat 0.5 g, carbohydrate 3.4 g, energy 17 k cal, calcium 18 mg, vitamin C 5 mg, riboflavin 0.01 mg, phosphorous 26 mg, iron 0.5 mg and carotene 33 mg per 100 g of edible portion [1]. The fiber obtained from the mature dry fruits are used in industry for filters of various sorts, pot holders, table mats, bath room mats, slipper, shoe soles and as a good insulator for various purposes. Sometimes the dry fruits with good storability are used for ornamental purposes. It is emetic and traditionally used for treatment of stomach ailment and fever [2].

Plant growths regulators (PGR's) are the chemical substances, which when applied in small quantitycan modify the plant growth usually by stimulating part of the natural growth regulatory system. Though the PGR's have great potentialities to influence plant growth morphogenesis, its application and accurate assessments have to be judiciously planned in terms of optimal concentrations, stage of application, species specificity, seasons, *etc.,* which constitute the major impediments in PGR's applicability [3]. In view of their wide spectrum effectiveness on every aspect of plant growth, even a modest increase in crop yield by 10-15 per cent could bring about an increment in the gross annual productivity by 10-15 million tonnes.

In addition to growth regulators, micronutrients are also essential for plant growth and play an important role in balanced crop nutrition. A lack of any one of these micronutrients in the soil can limit the growth, even when all other nutrients are present in adequate amount. Among the various micronutrients, boron is one of the important micronutrients which is very much required for cell wall synthesis and is essential for cell division (creating new plant cells) along with calcium [4]. It helps in uniform size, colour and also stop fruit cracking and rotting. Its requirement is much higher for reproductive growth so it helps in pollination, seed set and its development. However, the information regarding the effects of boron, plant growth regulators on seed yield and quality in ridge gourd is lacking. With this brief background, an experiment was initiated to study the effect of foliar spray of boron and plant growth regulators on hybrid seed yield and quality of ridge gourd.

MATERIALS AND METHODS

The field and laboratory experiments were conducted to study the effect of foliar spray of boron and plant growth regulators on hybrid seed yield and quality of ridge gourd under protected cultivation during Rabi, 2017, at Main Agricultural Research Station, University of Agricultural Sciences, Raichur and the laboratory study was carried out at Laboratory of Seed Science and Technology Department, College of Agriculture, Raichur The experiment was laid out in a randomized block design with seven treatments *viz.*; T_1: control, T_2: boron (1 g/l), T_3: boron (1 g/l) + GA_3 (50 ppm), T_4: boron (1 g/l) + NAA (0.3 ml/l), T_5: boron (1 g/l) + triacontanol (1.5 ml/l), T_6: boron (1 g/l) + homobrassinolide (0.5 ml/l)and T_7: boron (1 g/l) + humic acid (2 ml/l). The healthy and bold seeds of ridge gourd were dibbled with a spacing of 4 × 4 feet to a depth of 4 cm. After germination one seedling per hill was maintained. The plant protection measures were adopted as and when required. The above mentioned plant growth regulators were sprayed along with boron at three different stages *viz.,* two to three leaf, peak flowering and fruit initiation stage only to female parent. In each treatment five plants were randomly selected and tagged for recording various biometric observations. The fruits were harvested when they turned to complete brown colour and the observations on number of fruits per plant, fruit diameter, fruit length, fruit weight, were taken. Then the seeds were extracted from the fruits and the observations on number of seeds per fruit, seed weight per fruit, 100 seed weight, hybrid seed yield per plant, per ha, seed germination percentage, shoot length, root length, seedling dry weight, seedling vigour index and dehydrogenase enzyme activity were recorded. The seed germination test was conducted as per standard procedure [5] by rolled towel method. From the germination test, ten normal seedlings were selected randomly from each treatment for measurement of shoot and root length and then average of which were reported. Then the seedlings were subjected for oven drying at 70^oc for 24 hours and the seedling dry weight was recorded. Later on the seedling vigour index was computed using the formula [6]. The data obtained from the experiment were subjected to statistical analysis [7].

RESULTS AND DISCUSSION

The data on vine length presented in table 1 indicated significant differences between the treatments. Among the treatments, boron (1 g/l) + GA_3 (50 ppm) recorded significantly higher vine length (422.0 cm). This was due to the increase in plasticity of the cell wall followed by hydrolysis of starch to sugars which lowers the water potential of cell, resulting in the entry of water into the cell causing elongation. These osmotic driven responses under the influence of gibberellins might have been attributed to increase the photosynthetic activity, accelerated translocation and efficiency of utilizing photosynthetic products, thus, resulting in increased cell elongation and rapid cell division in the growing portion. Similar reports on increase in vine length were earlier reported in ridge gourd [8] due to foliar spray of GA_3 (50 ppm), [9] in bitter gourd with GA_3 (20 ppm) and [10] with GA_3 (300 ppm) in sweet potato. Similarly, it was reported in tomato and cauliflower [11, 12] that higher vine length due to foliar spray of boron (100 ppm and 0.5 %, respectively).

The results of the present study revealed that, among the different treatments, foliar spray of boron1g/l + $GA_3$50 ppm *i.e.,* T_3 showed significantly higher number of fruits per plant (5.83), fruit length (26.9 cm) and fruit diameter (15.5 cm) compared to control (Table 1). This might be due to better nutrient translocation from roots to apical parts of the plant which might have helped in development of more number of fruits per plant. These results are well supported [8], who reported more number of fruits per plant, higher fruit length and fruit diameter due to foliar spray of NAA (50 ppm) in ridge gourd, and in tomato because of foliar spray of GA_3@ 50 ppm [13, 14] and foliar spray of GA_3 @80 ppm [15]. Similarly, in bitter gourd due to foliar spray of boron (100 ppm) [16] in sweet potato higher fruit length and diameter due to foliar spray of GA_3 (300 ppm) was reported [10].

Among the different treatments, foliar spray of boron 1g/l + $GA_3$50 ppm (T_3) showed significantly higher fruit weight (27.8g) and number of seeds per fruit (46.7) compared to control (23.7g and 45.5). This increase in fruit weight and number of seeds per fruit was due to better vegetative growth, higher fruit length and width and

Table 1. Effect of foliar spray of boron and plant growth regulators on growth and hybrid seed yield and its attributing parameters in ridge gourd

Treatments	Vine length (cm)	No of fruits per plant	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	No of seed sper fruit	Seed weight per fruit (g)	100 seed weight (g)	Hybrid seed yield (g/plant)	Hybrid seed yield (kg/ha)
T_1:Control	380.0	5.20	25.0	14.0	23.7	45.5	4.9	10.80	25.6	239.6
T_2 :Boron (1 g)	383.3	5.26	25.3	14.1	24.6	45.7	4.9	10.90	25.9	242.8
T_3:Boron (1g) + GA_3 (50 ppm)	422.0	5.83	26.9	15.5	27.8	46.7	5.4	11.60	31.5	294.6
T_4:Boron (1g) + NAA (0.3 ml/l)	396.7	5.77	26.8	15.3	26.8	46.4	5.2	11.40	30.4	285.5
T_5:Boron (1g) + Triacontanol (1.5ml/l)	396.7	5.60	26.7	15.1	26.4	46.2	5.2	11.33	29.3	274.0
T_6 :Boron (1g) + Homobrassinolid (0.5 ml/l)	393.2	5.53	26.3	15.0	25.5	45.9	5.1	11.20	28.4	266.3
T_7:Boron (1g) + Humic acid (2ml/l)	384.0	5.33	26.2	14.8	24.6	45.6	5.0	11.12	26.9	252.2
Mean	393.7	5.46	26.2	14.8	25.6	46	5.1	11.19	28.3	265.0
SEm(±)	3.9	0.16	0.5	0.3	0.7	0.4	0.1	0.25	1.0	10.1
CD (p=0.05)	12.2	0.49	1.6	1.0	2.1	1.4	0.3	0.77	3.2	31.1

greater accumulation of photosynthates in the seed. Similar results were reported by foliar spray of GA_3 (50 ppm) in pumpkin [17]. While, spray with GA_3 (50 ppm) in bitter gourd [18] observed higher fruit weight and number of seeds per fruit. Similarly, in guava [19] reported higher fruit weight due to foliar spray of boron (0.2 %) and in tomato [20] with boron (350 ppm).

In the present study, foliar spray of boron (1g/l) + GA_3(50 ppm) showed significantly higher seed weight (5.4g) per fruit and 100 seed weight (11.60g) compared to control (4.9g and 10.80g), respectively (Table 1). This may be due to better translocation of photosynthates from source (food reserves from leaf) to sink (seed through fruit) by GA_3 spray (50 ppm) as reported in okra [21]. This might have favoured increased supply of photosynthates and improved mobilization efficiency in plants resulting in better seed development in pods. These results are in agreement with the findings in okra [21], tomato [22] and brinjal [23]. Similar results were also reported by foliar spray of GA_3 (50 ppm) in pumpkin [18].While, in soybean higher seed weight and 100 seed weight by that foliar spray of GA_3 (100 ppm) was noticed [24]. Higher seed weight per fruit and 100 seed weight have been reported in okra [25] with foliar spray of GA_3 (50 ppm) and foliar spray of GA_3 (50 ppm) in bitter gourd [19].

From the present study, it was observed that, among the different treatments, foliar spray of boron (1g/l) + GA_3 (50 ppm) showed significantly higher seed yield (31.5 g/ plant) and (294.6 kg/ha) and the least seed yield (25.6 g/ plant) and (239.6 kg/ha) were observed in control (Table 1). The increase in seed yield per plant and per ha was due to better vegetative growth, more leaf area and days from pollination to maturity resulting in greater accumulation of photosynthates in the seed resulting in better yield attributing characters ultimately leading to higher seed yield. Similar results of higher seed yield per plant and per ha were reported by foliar spray of GA_3 (50 ppm) in pumpkin [17] and by foliar spray of GA_3 (100 ppm) in soybean [24]. While, higher seed yield per plant and per ha were reported due to GA_3 (50 ppm) in bitter gourd [19, 26], due to GA_3 (50 ppm) in pumpkin [27] and due to GA_3 at (300 ppm) in sweet potato [17]. Similarly, in pigeon pea [28] reported higher seed yield per plant and per ha due to foliar spray of boron (300 ppm) and due to foliar spray of boron (91.4g) in cotton [29].

Significantly higher seed germination (88 %), dehydrogenase enzyme activity (1.293 OD value), shoot length (27.5 cm) and root length (15.1 cm) were recorded in T_3 (boron1g/l + GA_3 @50 ppm) compared to all other treatments and the least (79 %, 0.096 OD value, 23.5 cm, 12.7 cm and 36.2 cm), respectively, were recorded in control (Table 2). The increase in seed germination (%), dehydrogenase enzyme activity, shoot and root lengthmight be due to higher percentage of bolder seeds coupled with the heavier seed weight due to increased translocation and assimilation of photosynthates from source to the sink (seeds). Similar results were reported in tomato [30], in chilli [31-33], in brinjal [23] and in okra [25] by foliar spray of GA_3 (50 ppm). Similarly, highest seed germination by foliar spray of boron (0.5 %) in tomato was recorded [34]. While, in coriander [35] observed higher shoot length and root length by foliar

Table 2. Effect of foliar spray of boron and plant growth regulators on hybrid seed quality parameters of ridge gourd

Treatments	Seed germination (%)	Dehydrogenase enzyme activity (OD values)	Shoot length (cm)	Root length (cm)	Seedling dry weight (mg)	Seedling vigour index
T_1:Control	79 (63.0)*	0.096	23.5	12.7	675.0	2860
T_2 :Boron (1 g)	80 (63.4)	0.454	23.8	13.2	683.0	2960
T_3:Boron (1g) + GA_3 (50 ppm)	88 (69.7)	1.293	27.5	15.1	942.0	3749
T_4:Boron (1g) + NAA (0.3 ml/l)	87 (68.9)	1.110	26.3	14.8	804.8	3567
T_5:Boron (1g) + Triacontanol (1.5 ml/l)	86 (68.2)	1.070	26.1	14.7	751.3	3509
T_6 :Boron (1g) + Homobrassinolid (0.5 ml/l)	85 (67.2)	0.649	25.4	14.6	726.3	3400
T_7:Boron (1g) + Humic acid (2 ml/l)	83 (65.6)	0.616	24.4	14.5	719.5	3229
Mean	84 (66.6)	0.755	25.3	14.2	751.3	3324
SEm(±)	1.7 (1.3)	0.049	0.6	0.5	2.0	119
CD (p=0.05)	5.1 (3.9)	0.147	1.9	1.6	6.0	356

* Figures in the parentheses indicate angular transformed values

spray at GA_3 (10^{-6} molar). While, better shoot and root length by foliar spray of GA_3 (150 ppm) in capsicum was reported [36].

From the present study, it was observed that, among the different treatments foliar spray of boron (1g/l) + GA_3(50 ppm) *i.e.*, T_3 showed significantly higher seedling dry weight (942.0 mg) and seedling vigour index (3749) compared to all other treatments and the least 675.0 and 2860, respectively, were recorded in T_1 (control). This increase in seedling dry weight might be due to longer root and shoot length due to foliar spray of boron (1g/l) + GA_3 (50 ppm) which consequently registered higher seedling dry weight (Table 2). While, increase in seedling vigour index was due to higher germination (%) and total seedling length due to foliar spray of boron (1g/l) + GA_3(50 ppm). The results are in line with earlier findings in tomato [30] and chilli [31], which showed improvement in seedling dry weight, seedling vigour index due to foliar spray of GA_3. Similar results were reported in okra [37] by foliar spray at GA_3 (50 ppm) and highest seedling dry weight, seedling vigour index by foliar spray of boron (0.5 %) was recorded in tomato [34].

CONCLUSION

It can be concluded that foliar spray of boron (1g/l) + GA_3 (50 ppm/l) once at two to three true leaf, peak flowering and fruit initiation stage gave higher seed yield with better seed quality in ridge gourd.

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REFERENCES

1. SHESHADRI VS AND PARTHASARTHY (1980). Vegetable crops with physiology and biochemical aspects of sesame. *Karnataka Journal of Agricultural Sciences*, **20**(1): 110-112.
2. CHAKRAVARTHY ML (1959). Monograph of Indian cucurbitaceous (taxonomy and distribution). *Records of the botanical distribution of India*, **17**: 6-7.
3. SHAHID MR, M AMJAD, K ZIAF, MM JAHANGIR, S AHMAD, Q IQBAL AND A NAWAZ (2013). Growth, yield and seed production of okra as influenced by different growth regulators. *Pakistan Journal of Agricultural Sciences,* **50**(3): 387-392.
4. ROSS ON, SB GARY AND GP JEFFREY (1997). Boron toxicity. Plant and Soil, **193**: 181–198. Retrieved from https://en.wikepedia.org/wiki/Boron_deficiency
5. ISTA (2013). International Rules of Seed Testing. *Seed Science and Technology*, **27**: 25-30.
6. ABDUL-BAKI AA AND JD ANDERSON (1973).Vigour determination in soybean by multiple criteria. *Crop Science*, **13**(2): 630-633.
7. SUNDARRAJAN N, S NAGARAJU, S VENKATARAMANA AND MH JAGANATHA (1972). Design and analysis of field experiments. University of Agricultural Sciences, Hebbal, Bengaluru.
8. HILLI JS (2005). Studies on seed production and post harvest techniques in ridge gourd (*Luffa acutangula* L. roxb). Ph. D. Thesis, University of Agricultural Sciences Dharwad (India).
9. BIRADAR G, CM NAWALAGATTI, MB DODDAMANI AND MB CHETTI (2010). Effect of plant growth regulators on morpho-physiological parameters and yield in bitter gourd. *International Journal of Agriculture Sciences,* **6**(2): 504-507.
10. KOTESWARA RG, P ASHOK, DV SWAMI AND K SASIKALA (2017). Effect of plant growth regulators on vegetative and root tuber yield characters of orange flesh sweet potato varieties. *International Journal of Agriculture Sciences*, **9**(30): 4403-4407.
11. SIVAIAH NK, SK SWAIN, VARMA, V SANDEEP AND B RAJU (2013). Effect of foliar application of micronutrients on growth parameters in tomato (*Lycopersicon esculentum* Mill.). *Discourse Journal of Agriculture and Food Sciences*, **1**(10): 146-151.

12. KUMAR C, HC RATURI AND SP UNIYAL (2013). Response of boron and lime application on growth and seed yield of snowball cauliflower (*Brassica oleracea* var. *botrytis* L.) cv. PSBK-1. *Asian Journal of Horticulture*, **8**(1): 246-249.

13. SINGH BK, V KUMAR, AK SINGH AND VK RAI (2001). Role of NAA on growth, yield and quality of tomato (*Lycopersicon esculentum* Mill). *Agriculture, Ecosystems & Environment*, **27**(3): 1091-1093.

14. BHOSLE AB, SB KHORBHADE, PB SANAP AND MJ GORAD (2002). Effect of plant hormones on growth and yield of summer tomato. (*Lycopersicon esculentum* Mill.). *Orissa Journal of Horticulture,* **30**(2): 63-65.

15. PRASAD RN, SK SINGH, RB YADAVA AND SNS CHAURASIA (2013). Effect of GA_3 and NAA on growth and yield of tomato. *Vegetation Science,* **40**(2): 195-197.

16. PATIL BC, A LAXMAN, KH PADANAD, Y KUMAR, JB GOPALI AND S SHETTY (2013). Response of foliar application of micro-nutrients on yield and economics of bitter gourd (*Momordica charantia* L.). *Asian Journal of Horticulture*, **8**(2): 677-679.

17. ARORA SK AND PS PARTAP (1988). Effect of plant growth regulators on vegetative growth, flowering and fruit yield in pumpkin (*Cucurbita moschata* Duch. Ex. Poir.). *Haryana Agricultural University Journal of Research* **18**(4): 284-290.

18. NAGAMANI S, S BASU, S SINGH, SK LAL, TK BEHERA, SK CHAKRABARTY AND A TALUKDAR (2015). Effect of plant growth regulators on sex expression fruit setting, seed yield and quality in the parental lines of bitter gourd. *Indian Journal of Horticulture*, **3**(9): 282-285.

19. RAJPUT RP, HJ SENJALIYA, GS VALA AND GS MANGROLIYA (2014). Effect of various plant growth regulators on yield and quality of guava (*Psidium guajava* L.) cv. Lucknow-49. *International Journal of Agriculture Sciences*, **11**(1): 179-182.

20. HARRIS KD AND L LAVANYA (2016). Influence of foliar application of boron, copper and their combinations on the quality of tomato (*Lycopersicon esculentum* Mill.). *Research Journal of Agriculture and Forestry Sciences,* **4**(7): 1-5.

21. PATIL SB (2005). Standardization of hybrid seed production techniques in brinjal (*Solanum melongena* L.). M.Sc. Thesis, University of Agricultural Sciences, Dharwad, Karnataka (India).

22. BHATT KL AND AK SINGH (1997). Effect of different levels of phosphorus, gibberellic acid and picking on seed production of okra [*Abelmoschus esculentus* (L.) Moench]. *Vegetation Science,* **24**(1): 4-6.

23. GOUDAPPALAVAR HB (2000). Effect of mother plant nutrition and chemical spray on seed yield and quality in tomato (Ph.D. Thesis, University of Agricultural Sciences Dharwad, Karnataka (India).

24. REHMAN MS, NS MOHAMAD, A TAHA AND MA KARIM (2004). Influence of GA_3 and maleic hydrazide and their time of spray on morphology, yield contributing characters and yield of soyabean. *Asian Journal of Plant Sciences,* **3**(5): 602-609.

25. RAVAT A AND N MAKANI (2015). Influence of plant growth regulators on growth, seed yield and seed quality in okra (*Abelmoschus esculentus* L. Moench) cv. GAO-5 under middle Gujarat condition. *International Journal of Agriculture Sciences*, **11**(1): 151-157.

26. AKTER K AND A REHMAN (2010). Effect of foliar application of IAA and GA_3 on sex expression, yield attributes and yield of bitter gourd (*Momordica charantia* L.). *Chittagong University Journal of Biological Sciences,* **5**: 55-62.

27. SURE S, H AROOIE AND M AZIZI (2012). Influence of plant growth regulators (PGRs) and planting method on growth and yield in oil pumpkin (*Cucurbita pepo* var. *styriaca*). *Notulae Scientia Biologica*, **4**(2): 101-7.

28. KALYANI RR, V SREE DEVI, NV SATYANARAYANA AND MKV RAO (1993). Effect of foliar application of boron on crop growth and yield of pigeonpea (*Cajanus cajan* (L.). Mills paugh). *Indian Journal of Plant Physiology,* **4**(2): 223-226.

29. AHMAD SLH, S AKHTAR, N AHMAD, IQBAL AND M NASIM (2009). Cotton (*Gossypium hirsutum* L.) varieties responded differently to foliar applied boron in terms of quality and yield. *Soil and Environment*, **28**(1): 88-92.

30. BALAKUMAR T AND NA BALSUBRAMANIAN (1988). Effect of hormonal treatments on biomass production in tomato. *Tropical Agriculture,* **65**(7): 373-375.

31. SINGH DK AND G LAL (1995). Effect of plant growth regulators on the fruit set, yield and quality of chilli (*Capsicum annuum* L.) cultivars. *Advanced Horticulture,* **4**(2): 133-141.

32. REVANAPPA (1993).Response of green chilli (*Capsicum annuum* L.) genotypes to nitrogen levels, plant density and growth regulators. Ph.D. Thesis, University of Agricultural Sciences, Dharwad, Karnataka (India).

33. BALARAJ R (1999). Investigations of seed technological aspects in chilli (*Capsicum annuum* L.). Ph.D. Thesis, University of Agricultural Sciences Dharwad, Karnataka (India).

34. HAMSAVENI MR, MB KURDIKERI, M SHEKARGOUDA, SD SHASHIDHARA AND PR DHARMATTI (2003). Influence of harvesting stages and post harvest ripening periods on seed quality in tomato (cv. Megha). *Karnataka Journal of Agricultural Sciences,* **16**(4): 597-599.

35. IDREES N, M MASROOR, A KHAN. T AFTAB AND M NAEM (2010). Synergistic effects of GA_3 and triacontanol on growth, physiology, enzyme activities and essential oil content of *Coriandrum sativum* L. *Asian and Australasian Journal of Plant Science and Biotechnology*, **4**(1): 24-29.

36. SINGH P, D SINGH, DK JAISWAL, DK SINGH AND V SINGH (2017). Impact of naphthalene acetic acid and gibberellic acid on growth and yield of capsicum, *Capsicum annum* (L.) cv. Indra under Shade Net Conditions. *International journal of current microbiology and applied science,* **6**(6): 2457-2462.

37. SANODIYA K, G PANDEY, SAKLESH, SP RAJPUT AND A VERMA (2017). Effect of seed treatment with growth regulator on growth, yield and seed quality parameters of okra (*Abelmoschus esculentus* L.) cv. Utkal Gaurav. *International Journal of Chemical Studies,* **5**(5): 2301-2304.