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Effect of seed soaking and foliar sprays of plant growth regulators on physiological and yield attributes of okra [*Abelmoschus esculentus* (L.) Moench.] var. Parbhani Kranti

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ABSTRACT : A study was conducted to find out the effect of seed soaking and foliar sprays of plant growth regulators on physiological and yield attributes of okra var. Parbhani Kranti. The treatment comprised of the two concentration *i.e.*, seed soaking of GA_3 (50 and 100 ppm) and cycocel (100 ppm and 150) and foliar sprays of cycocel (250, 500, 750, 1000 ppm) at 30 and 45 days after sowing and control. The experiment was laid out in Randomized Block Design with two replications. Soaking of okra seeds with GA_3 @ 100 ppm and foliar sprays of cycocel @ 750 and 1000 ppm at 30 and 45 DAS, respectively were found to be beneficial to increase the physiological attributes like leaf area (1134.6 cm^2), leaf area index (1.32 m^2), chlorophyll a (1.41 mg/g), chlorophyll b (0.48 mg/g), total chlorophyll (1.89 mg/g) and yield attributes like early flowering (34.00 days), increase number of flowers (23.40), fruit set (87.54 %), diameter of fruit (2.26 cm), number of fruits per plant (20.46), yield (201.30 g/per plant) and reduce length of fruit (10.00 cm) of okra.

KEY WORDS : GA_3, Cycocel, Okra

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Okra [*Abelmoschus esculentus* (L.) Moench] is an annual vegetable crop and belong to family Malvaceae. The primary centre of its origin is believed to be the tropical or subtropical Africa (Chauhan, 1972). It has been grown in the Mediterranean as well as in the tropical and sub-tropical region of many countries.

Among fruit and vegetables, okra is an important vegetable having good demand throughout the year for its tender fruits. In recent years, scientists have given due attention to the idea of regulating plant growth as third most important factor in improving the growth, yield and quality with the application of plant growth regulators in various ways.

Treatment of seed and foliar spray with plant growth regulator is one of the most popular methods and has been claimed as an effective tool by many workers for improving rate and amount of germination. Among the several growth substances, gibberellic acid (GA_3) and cycocel (CCC) are found very promising and these are being used in a fruit and vegetable crops. The role of GA_3 in cell elongation in plants has been well established which resulted in increasing the plant height. GA_3 also enhance, early flowering in many plant species. Contrary to GA_3, cycocel has been found to retard plant height by reducing internodes length and also simultaneously it

induces the formation of lateral shoots thereby plant possesses more number of fruits bearing shoots.

RESEARCH METHODS

The present investigation, effect of seed soaking and foliar spray of plant growth regulators on growth, yield and quality of okra var. Parbhani Kranti was undertaken at instructional cum research farm, Department of Horticulture, College of Agriculture, Latur, 2010-2011 under shade net condition. The experiment was laid out in Randomized Block Design with two replications. There were 13 treatments compressed of two concentrations of GA_3 at 50 and 100 ppm, cycocel 100 and 150 ppm seeds soaking for 12 hours and foliar spray of cycocel (250, 500, 750, 1000 ppm) at 30 and 45 days after sowing and control. The treated seeds of okra were used for sowing. The seeds were dibbled manually with a recommended seed rate of 10 kg/ha, these seeds were dibbled at each hill 30 cm apart of row and 15 cm betweens plants. Thinning was done to keep only one healthy seedling at each hill by removing weak seedling after 15 days of sowing. Cultural and plant protection measures were taken of uniformly in all plots as when required. Observations on physiological and yield attributes were recorded.

Statistical analysis :

The obtained data was analyzed by statistical significant at P<0.05 level, S.E. and C.D. at 5 per cent level by the procedure given by (Gomez and Gomez, 1984).

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Effect on physiological attributes :

The data presented in Table 1 revealed that the highest leaf area was recorded in treatment T_2 *i.e.* GA_3 @ 50 ppm and foliar sprays of cycocel @ 250 and 500 ppm at 30 and 45 DAS (1249.5cm^2), respectively, followed by T_1 *i.e.*, seed soaking of GA_3 @ 100 ppm and foliar spray of cycocel @ 250 and 500 ppm at 30 and 45 DAS (1225.5 cm^2), respectively, the lowest leaf area was recorded (1075.7cm^2) in control. The leaf area was increased in seed soaking of GA_3, it might be due to role of GA_3 in cell division (Pawar and Joshi, 1977). Similar results were reported by Prasad and Shrihari (2008), the highest leaf area index was recorded in treatment T_2 *i.e.*, seed soaking of GA_3 @ 50 ppm and foliar spray of cycocel @ 250 and 500 at 30 and 45 DAS (1.39 m^2), respectively, followed by treatment T_1 *i.e.*, seed soaking of GA_3 @ 50 ppm and foliar spray of cycocel @ 250 and 500 ppm at 30 and 45 DAS (1.35 m^2), respectively the lowest leaf area index was recorded (1.19 m^2) in control. It was may be due to GA_3 play important role in cell division Surendra *et al.* (2006). The highest chlorophyll

Table 1 : Effect of seed soaking and foliar sprays of plant growth regulators on physiolpgical attributes of okra

Treatments	Leaf area (cm^2)	Leaf area index (m^2)	Chlorophyll a (mg/g)	Chlorophyll b (mg/g)	Total chlorophyll (mg/g)
T_1	1225.5	1.35	1.23	0.39	1.62
T_2	1249.5	1.39	1.24	0.40	1.64
T_3	1187.5	1.32	1.25	0.40	1.65
T_4	1167.00	1.29	1.27	0.41	1.68
T_5	1153.6	1.35	1.27	0.43	1.70
T_6	1155	1.35	1.28	0.43	1.72
T_7	1138.5	1.34	1.29	0.44	1.73
T_8	1137.6	1.33	1.30	0.44	1.74
T_9	1130.2	1.33	1.37	0.46	1.83
T_{10}	1134.6	1.32	1.41	0.48	1.89
T_{11}	1124.2	1.31	1.31	0.44	1.75
T_{12}	1113.7	1.30	1.37	0.45	1.82
Control	1075.7	1.19	1.21	0.37	1.60
S.E. ±	26.16	0.012	0.031	0.0075	0.039
C.D. (P=0.05)	80.50	0.037	0.097	0.0231	0.12
C.V. (%)	8.20	6.31	7.44	6.49	7.20

a was recorded in treatment T_{10} *i.e.*, GA_3 @ 100 ppm seed soaking and foliar spray of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (1.41 mg/g), respectively, however, it was at par with treatment T_9 *i.e.*, GA_3 @ 50 ppm seed soaking and foliar spray of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (1.37 mg/g), respectively. The highest chlorophyll b was recorded in treatment T_{10} *i.e.*, seed soaking of GA_3 @ 100 ppm and foliar spray of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (0.48 mg/g), respectively, which was at par with treatment T_9 *i.e.*, seed soaking of GA_3 @ 50 ppm seed soaking and foliar spray of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (0.46 mg/g), respectively and the highest total chlorophyll was recorded (1.89 mg/g) with treatment T_{10} *i.e.*, GA_3 100 ppm seed soaking and foliar sprays of cycocel 750 and 1000 ppm at 30 and 45 DAS, respectively, followed by (1.83 mg/g) with treatment T_9 *i.e.*, GA_3 50 ppm seed soaking and foliar sprays of cycocel 750 and 1000 ppm at 30 and 45 DAS, respectively this may be due to increased chloroplasts in palisade and spongy cells due to cycocel treatment (Gowda and Gowda, 1980).

Effect on yield :

The data presented in Table 2 revealed that the significantly lowest number of days required for initiation of flowering was recorded in treatment T_{10} *i.e.*, seed soaking of GA_3 @ 100 ppm and foliar spray of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (34.00), respectively, however, it was at par with treatment T_9 *i.e.*, seed soaking of GA_3 50 ppm and foliar spray of cycocel 750 and 1000 ppm at 30 and 45 DAS (34.60), respectively, It happened because of early germination. Similar results were reported by Suryanarayan and Ariffudin (1980) and Patil *et al*. (2008). Higher concentration of cycocel induced early flowering which might be due to suppression of vegetative growth and induction of early reproductive phase (Acharya, 2004). The highest number of flowers per plant was recorded in treatment T_{10} *i.e.*, seed soaking of GA_3 @ 100 ppm and foliar spray of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (23.40), respectively, however, it was at par with treatment T_9 *i.e.*, seed soaking of GA_3 @ 100 ppm and foliar spray of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (22.20), respectively.

Foliar spray of cycocel at higher concentration increased the number of flowers as compared to other treatment. These effects were perhaps, due to the fact that the treated plants were able to build up carbohydrate reserve favourable for more number of flowers (Vijayaraghavan, 1999). Similar results were reported by Pal *et al*. (1970); Arora and Dhankhar (1992). The highest fruit set percentage per plant was recorded in treatment T_{10} *i.e.*, seed soaking of GA_3 @ 100 ppm and foliar spray of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (87.54 %), respectively, however, it was at par with treatment T_9 *i.e.*, seed soaking of GA_3 50 ppm and foliar spray of cycocel @

Table 2 : Effect of seed soaking and foliar sprays of plant growth regulators on yield of okra

Treatments	Days to flowering	Number of flowers	Fruit set (%)	Number of fruit/ plant	Yield/ plant (g)	Length of fruit (cm)	Diameter of fruit (cm
T_1	35.60	18.40	81.12	15.40	172.25	12.65	1.46
T_2	35.10	18.60	81.52	14.90	166.20	12.9	1.53
T_3	36.60	17.30	78.60	14.20	143.80	12.05	1.63
T_4	36.50	17.35	80.61	13.60	155.80	11.90	1.66
T_5	34.90	21.30	84.09	16.40	178.20	11.50	1.71
T_6	34.70	20.60	85.70	17.40	181.00	11.60	1.79
T_7	35.30	19.50	83.99	17.20	182.40	11.15	1.84
T_8	35.80	20.30	85.39	18.30	185.00	10.80	1.75
T_9	34.60	22.20	86.63	19.30	195.30	10.60	2.01
T_{10}	34.00	23.40	87.54	20.46	201.30	10.00	2.26
T_{11}	34.80	21.70	86.54	18.80	194.50	9.65	1.92
T_{12}	34.80	21.80	86.24	18.65	190.55	9.15	1.95
Control	39.60	12.60	75.20	10.15	134.10	13.00	1.25
S.E. ±	0.79	1.07	1.21	0.81	10.66	0.68	0.12
C.D. (P=0.05)	2.44	3.30	3.73	2.49	32.59	2.10	0.38
C.V. (%)	7.16	7.73	6.06	6.95	8.59	8.57	10.21

750 and 1000 ppm at 30 and 45 DAS (86.63 %), respectively. The increase in fruit set percentage was may be due to the presence of plant growth regulators (Gibberellins) essential for pollen tube germination and fertilization of the ovary and resulting growth of the ovary (Arora and Dhankhar, 1992). Similar result was reported by Pawar and Joshi (1977).

The highest number of fruits per plant was recorded in treatment T_{10} *i.e.*, seed soaking of GA_3 @ 100 ppm seed soaking and foliar spray of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (20.46), respectively, however, it was at par with treatment T_9 *i.e.*, seed soaking of GA_3 @ 50 ppm and foliar spray of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (19.30), respectively, significantly higher number of fruits per plant, was obtained with increase in concentration of foliar spray of cycocel. The highest yield per plant was recorded in treatment T_{10} *i.e.*, seed soaking of GA_3 @ 100 ppm and foliar sprays of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (201.30 g), respectively, however, it was at par with treatment T_9 *i.e.*, seed soaking of GA_3 @ 50 ppm and foliar sprays of cycocel @ 750 and 1000 ppm at 30 and 45 DAS (195.30 g), respectively. Higher concentration treated plants had higher number of internodes *i.e.*, short internodal length, which resulted to produce more number of fruits. Significant improvement in yield may be due to cycocel reduced height of plant and increased branching resulting in diversion of food material for the improvement of flowering and fruiting. It might be also the result of decrease in level of auxin, this is resulted in increase in level of cytokinins that resulted in more flowering and fruiting (Mehrotra *et al.*, 1973). Similar results were reported by Patel (1998) Patil and Patil (2010) and Prasad and Shrihari (2008).

Conclusion :

On the basis of different characteristics it could be concluded that soaking of okra seeds with GA_3 @ 100 ppm found to be beneficial to increase the physiological attributes like leaf area (1134.6 cm^2), leaf area index (1.32 m^2), chlorophyll a (1.41 mg/g), chlorophyll b (0.48 mg/g), total chlorophyll (1.89 mg/g) and yield attributes like early flowering (34.00 days), increase number of flowers (23.40), fruit set (87.54 %), diameter of fruit (2.26 cm), number of fruits per plant (20.46), yield (201.30 g/per plant) and reduce lenght of fruit (10.00 cm) of okra.

REFERENCES

Acharya, U.K. (2004). Effect of plant growth regulators on growth and yield of spring summer season okra [*Abelmoschus esculentus* (L.) Moench]. M.Sc. Thesis, Department of Horticulture, IASS, Rampur, Chitwan, Nepal. 75pp.

Arora, S.K. and Dhankhar, B.S. (1992). Effect of seed soaking and foliar spray of cycocel on germination, growth, flowering, fruit set and yield of okra [*Abelmoschus esculentus* (L.)]. *Veg. Sci.*, **19**(1) : 79-85.

Chaudhary, B. (1979). *Vegetable*, National Book Trust, India, NEW DELHI (INDIA).

Chauhan, D.V. (1972). *Vegetable production in India*. Ram Prasad and Sons, AGRA (INDIA) 275pp.

Gomez, K.A. and Gomez, A.A. (1984). *Statistical procedures for Agricultural Research*. A Willey International publication, John Willey and Sons, NEW YORK, U.S.A.

Gowda, N.C. and Gowda, P.M. (1980). Effect of inter- row spacings and cycocel on growth and yield of okra. *South Indian J. Hort.*, **31**(4/5) : 210-214.

Pal, R.N., Singh, R., Vij, V.K. and Sharma, J.N. (1970). Effect of gibberellins GA_3, GA_{4+7} and GA_{13} on seed germination and subsequent seedling growth in early Muscat grape (*Vitis vinifera*). *Vitis.*, **14** (4): 265-268.

Patel, K.D. (1989). Studies in to the effect of CCC and plant density on plant growth and yield component in okra [*Abelmoschus esculentus* (L.) Moench.] cv. PUSA SAWANI. M.Sc (Ag.) Thesis, Gujarat Agricultural University,Sardarkrushinagar, GUJARAT (INDIA).

Patel, K.V. (1998). Effect of plant growth regulators on growth and yield of okra [*Abelmoschus esculentus* (L.) Moench.]. M.Sc. (Ag.) Thesis, Navasari Agricultural University, Navsari, GUJARAT (INDIA).

Patil, C.N., Mahorkar, V.K., Dod, V.N., Peshattiwar, P.D., Kayande, N.V. and Gomase, D.G. (2008). Effect of seed treatment with gibberellic acid and malic hydrazide on growth,seed yield and quality of okra cv. PARBHANI KRANTI. *Asian J. Hort.*, **3**(1): 74-78.

Patil, D.R. and Patil, M.N. (2010). Effect of seed treatment with GA_3 and NAA on growth and yield of okra (*Abmelmoschus esculentus* L. Moench) cv. GO-2. *Asian J. Hort.*, **5** (2) : 269-272.

Pawar, P.R. and Joshi, A.T. (1977). Effect of seed treatment with plant growth regulators on germination, growth and yield of okra (*Abelmoschus esculentus* L.). *J. Maharashtra Agric. Univ.*, **2**(1) : 26-29.

Prasad, K. and Shrihari, D. (2008). Effect of seed soaking and foliar spray of cycocel on germination, growth and yield of okra [*Abelmoschus esculentus* (L.) Moench]. *J. Res. ANGRAU*, **36**(2&3) : 23-27.

Sharma, B.R. and Arora, S.K. (1993). Improvement of okra. *Adv. Hort.*, **5** (1) : 342-364.

Shukla, S.N. and Tewari, M.N. (1973). Note on the increase in fruit growth of okra [*Abelmoschus esculentus* (L.) Moench.] by treatment with growth retardants. *Indian J. Agric. Sci.*, **43**(10) : 969-971.

Singh, M. (2000). Effect of plant growth regulators on growth,yield and quality of okra [*Abelmoschus esculentus* (L.) Moench]. Thesis, Gujarat Agricultural University,Anand campus, Anand, GUJARAT (INDIA).

Surendra, P., Nawalagatti, C.M., Chetti, M.B. and Hiremath, S.M. (2006). Effect of plant growth regulators and micronutrients on yield and yield components in okra. *Karnataka J. Agric. Sci.*, **19** (2): 264-267.

Suryanarayan, V. and Ariffudin (1980). Effect of pre-treatment of seed with GA and NAA on growth and yield of okra var. Pusa Sawani. *Veg. Sci.*, **7** (1): 55-59.

Tosh, S.,Choudhuri, M.A. and Chatterjee, S.K. (1978). Effect of growth regulators on growth, development and yield of Lady finger [*Abelmoschus esculentus* (L.) Moench]. *Sci. & Culture*, **44**(12) : 544-547.

Vijayaraghavan, H. (1999). Effect of seed treatment with plant growth regulators on Bhendi [*Abelmoschus esculentus* (L.) Moench] grown under sodic soil conditions. *Madras Agril.J.*, **86** (4-6) : 247-249.