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Effect of levels of nitrogen and gibberellic acid on growth, yield and quality of okra (*Abelmoschus esculentus* L. Moench)

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Abstract
The present experiment was carried out at R.A.K. College of Agriculture Sehore during Kharif season of the year 2011-12. The experiment was laid out in R.B.D. with 12 treatment combination consisting of 4 levels of nitrogen (75,100,125 and 150 kg/ha) and three concentrations of GA_3 (0,50,100 ppm) replicated three times. The growth parameters like plant height, plant spread, diameter of stem and number of leaves/plant found maximum at the application of 150 kg N/ha and 100 ppm GA_3. The fruit yield of okra var. VRO-6 was maximum 83.15q/ha with the application of 150 kg N/ha and 100ppm GA_3.

Keywords: Nitrogen, gibberellic acid, growth, yield, *Abelmoschus esculentus* L. Moench

Introduction
Okra (*Abelmoschus esculentus* (L.) Moench, 2n=130) is considered to be one of the most important vegetables in India and many countries, especially during summer season. Okra is a tall growing, annual, semi woody and warm season crop. It is self-pollinated crop, but occasionally up to 20% cross pollination occurs by insects. Okra pods are harvested when they reach the maximum size but still tender (may be 60-180 days from sowing) around 5-10 days after opening of flower depending on the cultivar grown (Adetuyil *et al*., 2008) [1]. Okra is grown in tropical and subtropical parts of the world. Although okra is primarily a rainfed crop, it also comes up well under irrigated condition during kharif and summer season. All over India, its immature tender fruits which are botanically called capsules are used as vegetable. Also these tender fruits can be dehydrated and marketed for vegetable purpose. Its leaves are used for preparing a medicament to reduce inflammation. It is an excellent source of Iodine for control goiter (Chadha, 2001) [2]. The roots and stems of okra are used for clearing the sugar cane juice while preparing jaggery and sugar.

Among the macro- nutrients nitrogen tends primarily to encourage vegetative growth and to impart a deep green colour to the leaves. It is the essential constituent of proteins and chlorophyll. Deficiency of nitrogen adversely affected growth, flowering and fruiting. Flowers buds often turn pale and shed prematurely, the maturation of the fruit is early and size and quality of fruits are poor. Excessive amount of nitrogen is also harmful and produces succulence in the plants and enhance their sensitivity to water and temperature stress and plant become susceptible to lodging and attack by pathogens and insects.

Growth and yield of okra depends upon many factors including seed quality, nutrition, climatic conditions and cultural practices (Kusvuran, 2012) [7]. The application of plant growth regulators is known as one of the most effective treatments used now a days in agriculture, productivity of horticulture crop productions were increased by application of different growth regulators (Jafarullah *et al*., 2007) [5]. Chemical substances like plant growth regulators can bring changes in the phenotypes of plants and affect growth either by enhancing or by stimulating the natural growth regulatory systems from seed germination to senescence (Das and Das, 1995) [3]. These can improve physiological efficiency of plants including photosynthetic capacity and effective partitioning of assimilates. Regulators mainly regulate the plant physiological and biochemical processes. PGRs are known as chemical messengers because they are produced in one part of plant and affect on another part. Exogenous application of plant growth regulators improved the yield production and fruit quality of horticulture crops. The plant growth regulators have multifarious uses on fruit vegetable *i.e*, seed germination, sex modification, fruit set, size manipulation of fruits, earliness of crop and enhanced production. Some of them are naturally occurring, organic substances that affect the

plant growth when used at low concentrations and sometimes they act as inhibitors at high concentrations. Gibberellins, which is natural plant hormone. GA_3 has many effects on plant growth such as enhance stem and internodes elongation, produce seed germination, enzyme production during germination and fruit setting and growth (Davies,1995; Karssen *et al*., 1989) [4, 6]. So, taking into consideration of these, experiment was conducted to study the effect of levels of nitrogen and gibberellic acid on growth, yield and quality of okra (*Abelmoschus esculentus* L. Moench)"

Materials and Methods

A field study was undertaken during kharif season of 2011-12 at Horticulture Research Farm, Department of Horticulture, R.A.K. College of Agriculture, Sehore (M.P.). The experimental site situated on 27º12 North latitude and 77º0 East longitude at an altitude of 498.77 meters from mean sea level. It lies in the western track of Vindhyan Plateau agro climatic zone of Madhya Pradesh and enjoy sub-tropical climate. The soil of the experimental field was medium black. There were twelve treatments combination. The treatments comprises of four level of Nitrogen (N_1-75 kg/ha, N_2-100 kg/ha, N_3-125 kg/ha, N_4-150 kg/ha) and three levels of GA_3 (G_1-0 ppm, G_2-50 ppm, G_3-100 ppm). The experiment was laid out in Randomized Block Design with three replication. Half of the nitrogen dose was applied as basal dose, one fourth of nitrogen in each treatment was applied at 30 days after sowing as first top dress and the rest one fourth of nitrogen was applied at the time of flowering as second top dress. Gibberellic acid was sprayed at flowering stage. Five tagged plant from each plot were selected for recording observation of growth and yield parameters.

Result and Discussion

The data on growth parameters (Table-1) indicated that the growth parameters of the crop viz. plant height at 30 DAS, plant spread at 30 DAS, stem diameter at 30 DAS was recorded maximum 16.41 cm, 18.80 cm, 0.34 cm and 8.55 respectively under the treatment N_4G_3 (N-150 kg/ha + GA_3-100 ppm) and minimum under the treatment N_1G_1 (N-75 kg/ha + GA_3-0 ppm). An increase in the levels of nitrogen from 75 to 150 kg/ha significantly increased the plant height, plant spread, stem diameter and leaves per plant. Such behaviors of nitrogen can be explained due to the fact that nitrogen plays an important role in the plant metabolism. It forms the main constitutes of protoplasm in plants. Thus, the increase in nitrogen supply, accelerate synthesis of amino acids in plants which indirectly exhibited by enhanced growth of plants and their parts. The beneficial effects of nitrogen in increasing vegetative growth are in conformity with the findings of Singh (1995) [12]. Singh and Kumar (1998) [13], Maurya *et al.* (1987) [8], Syed *et al*. (1997) [14], Singh *et al*. (1998), Paliwal *et al*. (1999) and Naruka and Paliwal (2000) also reported that foliar application of GA_3 at various concentration enhanced the vegetative growth of okra.

The physiological characters (Table-1) like days to first flowering, number of flowers per plant, days to setting of first fruit and days of maturity were significantly influenced by the application of nitrogen and gibberellic acid. This result find the support with the work of Singh and Kumar (1998) [13].

The yield characters (Table-2) like length of fruit, girth of fruit, weight of fruit and yield per hectare were significantly affected by different levels of nitrogen and GA_3. The above yield characters recorded maximum under the treatment N_4G_3 (N-150 kg/ha + GA_3-100 ppm) while recorded minimum under the treatment N_1G_1 (N-75 kg/ha+GA_3-0 ppm). The observation are in confirmation with the findings of Singh and Kumar (1998) [13] and Singh *et al*. (1998) [11]. Dry weight of 100 g fruits of okra found maximum 10.42 under the treatment combination N_4G_3 (N-150 kg/ha + GA_3-100 ppm) and minimum 9.81 under the treatment combination N_1G_1 (N-75 kg/ha + GA_3-0 ppm). Data presented in (Table-2) indicate that the net profit (Rs. 116548 per hectare) was recorded under the treatment N_4G_3 (N-150 kg/ha + GA_3-100 ppm) with beneficial cost ratio of 3.34.

Table 1: Effect of levels of nitrogen and gibberellic acid on growth parameters of okra

Treatments	Plant Height at 30 DAS (cm)	Plant spread at 30 DAS (cm)	Stem diameter at 30 DAS (cm)	Average leaves / Plant at 30 DAS	Days to flower initiation	Average no. of flowers per plant	Days to setting of first fruit	Days of maturity
N_1G_1 (N-75 kg/ha + GA_3-0 ppm)	10.37	11.50	0.22	6.13	40.03	22.22	42.40	105.7
N_1G_2 (N-75 kg/ha + GA_3-50 ppm)	10.60	11.80	0.23	6.93	38.50	25.36	40.20	107.7
N_1G_3 (N-75 kg/ha + GA_3-100 ppm)	11.30	11.98	0.25	6.33	36.70	27.48	38.10	108.3
N_2G_1 (N-100 kg/ha + GA_3-0 ppm)	11.46	13.36	0.24	6.76	38.81	23.86	42.16	109.3
N_2G_2 (N-100 kg/ha + GA_3-50 ppm)	11.63	13.55	0.26	7.83	37.90	25.93	40.10	108.7
N_2G_3 (N-100 kg/ha + GA_3-100 ppm)	11.73	13.68	0.23	7.00	36.23	27.93	37.80	107.0
N_3G_1 (N-125 kg/ha + GA_3-0 ppm)	13.73	15.50	0.26	7.63	38.30	24.53	41.80	107.3
N_3G_2 (N-125 kg/ha + GA_3-50 ppm)	14.05	15.76	0.28	8.30	37.26	26.02	39.60	111.0
N_3G_3 (N-125 kg/ha + GA_3-100 ppm)	14.27	15.91	0.31	7.53	35.90	28.11	37.50	110.7
N_4G_1 (N-150 kg/ha + GA_3-0 ppm)	15.76	17.50	0.29	8.23	38.37	24.95	41.16	107.3
N_4G_2 (N-150 kg/ha + GA_3-50 ppm)	16.13	18.10	0.31	8.50	36.56	26.60	39.05	111.0
N_4G_3 (N-150 kg/ha + GA_3-100 ppm)	16.41	18.80	0.34	8.55	35.15	28.93	37.10	112.3
SEm+-	0.23	0.31	0.011	0.30	0.50	0.26	0.35	1.03
CD at 5%	NS	NS	NS	NS	NS	0.75	NS	NS

Table 2: Effect of levels of nitrogen and gibberellic acid on yield and quality parameters of okra

Treatments	Average length of fruit (cm)	Girth of fruit (cm)	Weight of fruit (gm)	Fruit yield (q/ha)	Dry matter content of 100 g fruits (gm)	Net income (Rs/ha)	B:C ratio
N_1G_1(N-75 kg/ha + GA_3-0 ppm)	15.16	2.31	10.84	46.61	9.81	44448	1.91
N_1G_2(N-75 kg/ha + GA_3-50 ppm)	15.25	2.36	13.83	47.27	9.83	45723	1.94
N_1G_3(N-75 kg/ha + GA_3-100 ppm)	15.31	2.38	15.87	47.60	9.85	46348	1.95
N_2G_1(N-100 kg/ha + GA_3-0 ppm)	16.84	2.41	11.44	59.45	9.88	69828	2.42
N_2G_2(N-100 kg/ha + GA_3-50 ppm)	16.90	2.44	13.92	63.47	9.90	77823	2.58
N_2G_3(N-100 kg/ha + GA_3-100 ppm)	16.96	2.46	15.92	64.86	9.92	80568	2.64
N_3G_1(N-125 kg/ha + GA_3-0 ppm)	18.86	2.46	11.56	78.06	9.95	106748	3.16
N_3G_2(N-125 kg/ha + GA_3-50 ppm)	18.90	2.50	14.28	80.62	9.97	111823	3.26
N_3G_3(N-125 kg/ha + GA_3-100 ppm)	19.05	2.52	16.25	81.82	9.90	114188	3.31
N_4G_1(N-150 kg/ha + GA_3-0 ppm)	20.90	2.55	12.41	80.67	10.36	111668	3.25
N_4G_2(N-150 kg/ha + GA_3-50 ppm)	20.93	2.57	14.78	81.34	10.38	112963	3.27
N_4G_3(N-150 kg/ha + GA_3-100 ppm)	21.08	2.59	17.36	83.15	10.42	116548	3.34
SEm+-	0.08	0.03	0.15	0.66	0.018		
CD at 5%	NS	NS	NS	NS	NS		

Conclusion

All the growth, physiological, yield and quality characters of okra were all affected significantly by the dose of nitrogen and gibberellic acid. From the above results, it can be concluded that 150 kg N/ha and 100 ppm concentration of GA_3 as seed treatment is the best treatment for obtaining higher fruit yield of okra. None of the combination of nitrogen and gibberellic acid has shown significantly effect on various characters recorded.

References

1. Adetuyil FO, Osagie AU, Adekunle AT. Effect of Postharvest storage techniques on the Nutritional properties of Benin Indigenous Okra (*Abelmoschus esculentus* (L) Moench). Pak. J of Nutri. 2008; 7(5):652-657.
2. Chadha KL. Hand Book of Horticulture ICAR Pub. 2001, 422.
3. Das BC, Das TK. Efficacy of GA_3, NAA and Ethrel on seed expression in pumpkin (*Cucurbita moschata* Poir.) cv. Guamala Local. Orissa J Hort. 1995; 23:87-91.
4. Davies PJ. The plant hormones their nature occurrence and function. Physiology, Biochem. and Molecular biology, Kluwet. Dordrecht, Netherland. 1995, 1-12.
5. Jafarullah MD, Abdul Fattah Q, Feroza H. Response of growth, yield attributes and yield to the application of KNP and NAA in Cowpea (*Vigna aunguiculata* L. WALP). Bangladesh J of Bot. 2007; 36(2):127-132.
6. Karssen CM, Zagorski S, Groot SPC. Key role of endogenous gibberellins in the control of seed germination. Ann. of Bot. 1989; 63:71-80.
7. Kusvuran S. Influence of drought stress on growth, ion accumulation and antioxidative enzymes in okra genotypes. Int. J Agric. Biol. 2012; 14:401-406.
8. Maurya AN, Muthoo AK, Kumar Ashok. A note of the use of gibberellic acid (GA_3) and urea sprays in increasing yield of bhindi (*Abelmoschus esculentus* (L) Moench). Haryana J Hort. Sci. 1987; 16(1, 2):148-150.
9. Naruka IS, Paliwal R. Ameliorative potential of gibberellic acid and NAA on growth and yield attributed of okra. South Indian Horticulture J. 2000; 48(1, 6):129-131.
10. Paliwal R, Naruka IS, Yadav KK. Effect of nitrogen and sulphur on growth and yield of okra (*Abelmoschus esculentus* (L) Moench) cv. Pusa Sawni. Prog. Hort. 1999; 31(1, 2):94-97.
11. Singh B, Naruka IS, Singh Laxman. Effect of foliar application of nitrogen (urea) and gibberellic acid (GA_3) on growth and yield of okra (*Abelmoschus esculentus* (L) Moench) cv. Pusa Sawni. Prog. Hort. 1998; 30(3, 4):175-180.
12. Singh IP. Effect of various doses of nitrogen on seed yield and quality of okra (*Abelmoschus esculentus* (L) Moench). Annals Agri. Res. 1995; 16(2):227-229.
13. Singh PV, Kumar Jitendra. Effect of gibberellic acid as a pre sowing treatment and different levels of nitrogen on germination, growth, flowering and yield of okra (*Abelmoschus esculentus* (L) Moench). Indian J Agri Res. 1998; 32(1):31-36.
14. Syed Asghar Hussain SA, Nawab Ali. Effect of exogenous growth regulators on growth, flowering and yield of okra (*Abelmoschus esculentus* L.). Sarhad J Agri. 1997; 13(5):449-453.