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Effect of apical pinching on Okra

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Abstract:

The present investigation effect of apical pinching on growth and yield of okra was carried out at Krishi Vigyan Kendra, Navsari Agricultural University, Surat (Gujarat) during *Kharif*- 2022 and 2023. The experiment was conducted in Randomized Block Design in Factorial concept with three replications. Significantly maximum number of branches per plant (2.29), plant height (26.65, 33.15, 47.33, 54.06 and 61.53 cm at 30, 45, 60, 75 and 90 DAS,
respectively), leaf area per plant (909.55 cm^2), number of nodes per plant (14.71), maximum number of pods per plant (14.14), yield per plant (175.16 g) and pod weight (12.01 g) were obtained with the treatment T4- apical pinching at fifty days after sowing in growth and yield characters. While, days to first flowering, days to 50 % flowering, number of leaves per plant (0-90 DAS), days to first picking and days to last picking were famed non-significant with all four levels of apical pinching.

Key-word: Apical pinching, Okra, yield, pods per plant

Introduction:

Okra [*Abelmoschus esculentus* (L.) Moench], a member of the Malvaceae family, is an annual fruit vegetable crop and having chromosome no. 2n=130, has captured a prominent position among vegetables. Okra is commonly referred to as *Gumbo* in the US, lady's finger in the UK, *Bhindi* in India and *Bhinda* in Gujarat. The crop was originated from Tropical Africa and first cultivated by the Egyptians in the 12th AD (Thompson and Kelly, 1979). It is widely grown throughout the world's tropical and subtropical regions. It is popular among vegetable growers throughout India due to adaptability to a wide range of growing conditions. Apical pinching is one of the crucial and recently practised agro techniques in okra, which has a direct correlation on yield. Apical pinching now a day's increasing attention in vegetable crops particularly in tomato, okra and cucurbitaceous crops. Apical pinching mostly decreases apical dominance there by arrests the vertical growth and hastens the growth of productive branches (Kabir, 2010). The physiology behind this operation is to alter the source sink relationship by curbing the vegetative growth thus it increases the photosynthetic activities, accumulation of photosynthates, fruit formation, fruit production and yield (Lakshmi, *et al.,* 2015). Apical pinching promotes lateral branches, increasing flowering sites, improves canopy structure and overall increasing the production in okra. It is important to note that the timing and method of pinching can influence the outcome and some

studies have shown mixed results regarding yield increases in okra.

Material and Methods:

The present investigation was carried out at Krishi Vigyan Kendra, NAU, Surat (Gujarat, India). Geographically Surat is situated on the bank of the perennial river Tapi which flow into the Arabian ocean. The location of Surat is 21°15' N Latitude and 72°52' E Longitude. The Arabian Sea is to its west at a distance of about 22 kilometres along the Tapi and about 16 kilometres by road. The experiment was conducted in Randomized Block Design in Factorial concept with three replications. According to treatment of the growth retardation methods apical pinching was done by removing small portion of main shoot (growing tip of the main stem) by cutter at 30, 40 and 50 days after sowing. Treatment combinations were T1: No apical pinching, T2: apical pinching at 30 DAS, T3: apical pinching at 40 DAS and T4: apical pinching at 50 DAS.

Results and Discussion:

Different timings of apical pinching had significant effect on number of branches per plant during both experimental years. Recorded maximum number of branches per plant was in P4- apical pinching 50 DAS during the both years (2.94 and 3.05 in the year 2022, 2023, respectively). Which was statistically at par with the treatments P2- apical pinching at 30 days after sowing (2.84 and 2.90 in the year 2022, 2023, respectively). Increase in number of branches may be due to suppression of vertical growth resulting in translocation of photosynthates to leaf axil thus encouraging the lateral branches. Due to repetitive removal of portion of main branch, axillary buds become free from correlative inhibition of apical dominance and started growing. This resulted into more branching and spread of plants Feroz *et al.* (2010). Maximum leaf area per plant was recorded in P4- apical pinching @ 50 DAS (909.11 cm^2 and 910.00 cm^2 in the year 2022, 2023, respectively) and none of the treatments statistically at par with it in both years also. While, the minimum leaf area per plant recorded in P1- no apical pinching (882.25 cm^2 and 876.03 cm^2 in the year 2022 and 2023, respectively) in okra. Upon removal of the terminal bud, apical dominance is removed, resulting in lateral bud growth through an auxin-mediated process (Patil *et al.* 2012) which increases branches. Even though the leaves were small in case of pruned treatments the overall leaf area was recorded highest in case of pruned treatments only. Similar opinions were expressed by Sanodiya *et al.* (2017), Sahu and Biswal (2017), Baraskar *et al.* (2018) and Muhammad *et al.* (2019). The highest number of nodes per main shoot was recorded in P4- apical pinching at 50 days after sowing (14.55 and 14.86 in the year 2022, 2023, respectively) which was statistically at par with treatments P3- apical pinching at 40 DAS (13.26 and 14.40 in the year 2022, 2023, respectively). While, the less number of nodes per main shoot recorded in P2- apical pinching @ 30 DAS (12.60 and 13.73 in the year 2022, 2023, respectively) in okra.

Table 1: Effect of apical pinching on number of branches per plant, leaf area per plant (cm^2) and number of nodes per main shoot in okra

Treatments	Number of branches per plant		Leaf area per plant (cm^2)		Number of nodes per main shoot	
	2022	2023	2022	2023	2022	2023
P1	2.56^{b}	2.84^{a}	882.25^{c}	876.03^{c}	12.73^{b}	**14.33^{a}**
P2	2.84^{ab}	2.90^{a}	893.57^{bc}	893.08^{b}	12.60^{b}	**13.73^{a}**
P3	2.74^{ab}	2.88^{a}	902.35^{ab}	899.04^{b}	13.26^{ab}	**14.40^{a}**
P4	2.94^{a}	3.05^{a}	909.11^{a}	910.00^{a}	14.55^{a}	**14.86^{a}**
SEm (±)	0.11	0.09	4.07	3.57	0.50	**0.43**
CD at 5%	0.31	0.26	11.66	10.24	1.45	**1.25**
CV (%)	**15.37**	**12.04**	**1.75**	**1.54**	**14.76**	**11.83**

The maximum plant height (26.65, 33.15, 47.33, 54.06 and 61.53 cm at 30, 45, 60, 75 and 90 DAS, respectively). Pruning significantly reduces plant height due to the action of apical de-budding when compared with the control plants. It might be related to the flow of auxin in the plants, the synthesis of auxin on the shoot of the main stem is stopped due to the shoot pruning, while the synthesis of cytokinin increased and further affected the growth of branches Naruka and Paliwal (2000). Kokare *et al*. (2006) reported that pruning suppresses apical dominance. The above results are in line with the findings of Surendra *et al.* (2006), Aikins *et al*. (2017), Rahman *et al.* (2016) and Tswanya and Olaniyi (2016) in tomato, Mardhiana *et al.* (2017).

Table 2: Effect of apical pinching on plant height (cm) in okra

Treatments	Plant height (cm)									
	2022					2023				
	30 DAS	45 DAS	60 DAS	75 DAS	90 DAS	30 DAS	45 DAS	60 DAS	75 DAS	90 DAS
P1	25.30^{a}	32.06^{ab}	45.93^{a}	53.46^{a}	60.06^{a}	25.49^{b}	31.75^{b}	48.73^{a}	54.66^{a}	**62.96^{a}**
P2	25.36^{a}	32.04^{b}	44.86^{a}	52.33^{ab}	58.73^{a}	25.93^{ab}	32.01^{b}	48.93^{a}	54.13^{a}	**62.86^{a}**
P3	25.03^{a}	31.96^{b}	44.26^{a}	50.74^{b}	58.40^{a}	25.29^{b}	32.26^{ab}	48.00^{a}	54.46^{a}	**63.86^{a}**
P4	25.23^{a}	33.28^{a}	44.73^{a}	51.60^{ab}	58.46^{a}	26.20^{a}	33.02^{a}	49.93^{a}	55.86^{a}	**64.60^{a}**
SEm (±)	0.24	0.44	0.85	0.79	0.94	0.24	0.48	0.89	1.18	**1.23**
CD at 5%	0.70	1.27	2.43	2.27	2.71	0.69	1.39	2.56	3.38	**3.53**
CV (%)	**3.80**	**5.37**	**7.32**	**5.92**	**6.23**	**3.66**	**5.87**	**7.09**	**8.35**	**7.51**

An appraisal of result indicated that maximum number of pods per plant was recorded in P4- apical pinching at 50 days after sowing (14.48 and 13.80 in the year 2022, 2023, respectively) which was statistically at par with P2- apical pinching at 30 DAS (13.47 and 13.76 in the year 2022, 2023, respectively). While, the minimum number of pods per plant recorded in P1- no apical pinching (12.98 and 12.78 in the year 2022, 2023, respectively) in okra and the highest pod yield per plant (g) was recorded in P4- apical pinching at 50 days after sowing (176.35 g and 173.96 g in the year 2022, 2023, respectively) which was statistically at par with treatment P3- apical pinching at 40 DAS (162.29 g and 163.14 g in the year 2022, 2023, respectively). While, the lowest pod yield per plant recorded in P1- no apical pinching (156.77 g and 160.23 g in the experimental year 2022, 2023, respectively). Apical pinching helps in the production of more side branches, resulting in increased photosynthetic activity and accumulation of photosynthates, ultimately resulting in increased yield (Olasantan, 1986). Basically, pruning is intended to control the optimal number of leaves thereby improving the yield. Pruning is an attempt to create a better state of the plant, so that sunlight can enter to the whole parts of the plant, increase interception of light into the canopy of plants and increase the availability of air circulation and CO_2 in the canopy. The sufficient light, CO_2 and other supporting factors will increase the photosynthesis rate which leads to increase the availability of photosynthesis. The excessive vegetative growth caused a suboptimal use of photosynthesis results and led to decrease the yield production. Hence pruning facilitates opening of leaves to sunlight and prevent shading, partitioning of assimilates was high in pruned plants and therefore more pods were produced. Similar results were obtained by Sarkar *et al.* (2007), Olasantan and Salau (2008), Feroz *et al.* (2010), Aliyu *et al*. (2015), Rahman *et al.* (2016), Ahmad *et al.* (2016), Sowmya *et al.* (2017), Aikins *et al.* (2017) and Ali *et al.* (2021). Apical bud pinching made a way out to produce more branches. As in case of okra except below 2-3 nodes all above nodes produce fruits hence this increase in branches might have led to the increase in number of fruits. These results are in accordance with Marie *et al.* (2007), Olasantan and Salau (2008), Kabir (2007), Aliyu *et al.* (2015), Sahu and Biswal (2017) in okra. Similar opinions were made by Maity *et al.* (2016). Increase in photosynthetic activity produces more carbohydrates which directly influenced the fruit size, number of fruit and ultimately final yield. Choudhury *et al.*

(2014) reported that foliar application of GA3 was highly efficient in production and translocation of assimilates to the developing sink in cowpea. Significantly highest pod weight was recorded in P4- apical pinching @ 50 DAS (12.08 g in the year 2022) which was statistically at par with treatment P1- no apical pinching (11.91 g in the year 2022). While the minimum pod weight recorded in P2- apical pinching @ 30 DAS (11.81 g during year 2022) in okra.

Table 3: Effect of apical pinching on number of pods per plant, pod yield per plant (g) and pod weight (g) in okra

Treatments	Number of pods per plant		Pod yield per plant (g)		Pod weight (g)	
	2022	2023	2022	2023	2022	2023
P1	12.98[b]	12.78[b]	156.77[b]	160.23[b]	11.91[a]	**11.89[a]**
P2	13.47[a]	13.76[a]	159.81[ab]	164.34[ab]	11.80[a]	**11.82[a]**
P3	13.42[ab]	13.67[ab]	162.29[ab]	163.14[ab]	11.66[a]	**12.06[a]**
P4	14.48[a]	13.80[a]	176.35[a]	173.96[a]	12.08[a]	**11.94[a]**
SEm (±)	0.40	0.41	4.98	5.36	0.15	**0.16**
CD at 5%	1.14	1.18	14.07	15.36	0.45	**0.48**
CV (%)	**11.22**	**11.52**	**11.71**	**12.67**	**5.19**	**5.47**

Conclusion:

From the two years study it can be concluded that in okra apical pinching done at 50 days after sowing resulted in better growth and yield of plants. Maximum internodal length per plant (5.56 cm), number of branches per plant (2.99), plant height (26.65, 33.15, 47.33, 54.06 and 61.53 cm at 30, 45, 60, 75 and 90 DAS, respectively), leaf area per plant (909.55 cm^2), number of nodes per plant (14.71), number of pods per plant (14.14), yield per plant (175.16 g) and pod weight (12.01 g) were recorded in growth characters. While, days to first flowering, days to 50 % flowering, number of leaves per plant (0-90 DAS), days to first picking and days to last picking were famed non-significant with all four levels of apical pinching.

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